Assessment and Rehabilitation of Central European Highway Structures

ARCHES

FEHRL

Load test results Internet data base – a new tool in bridge assessment

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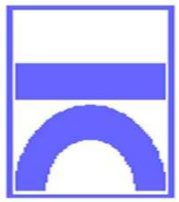

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Warsaw, Poland

Internet database of load test results and analytical calculations

1. Introduction
2. Internet Software Application
3. The Data Base Analysis
4. Conclusions

Introduction

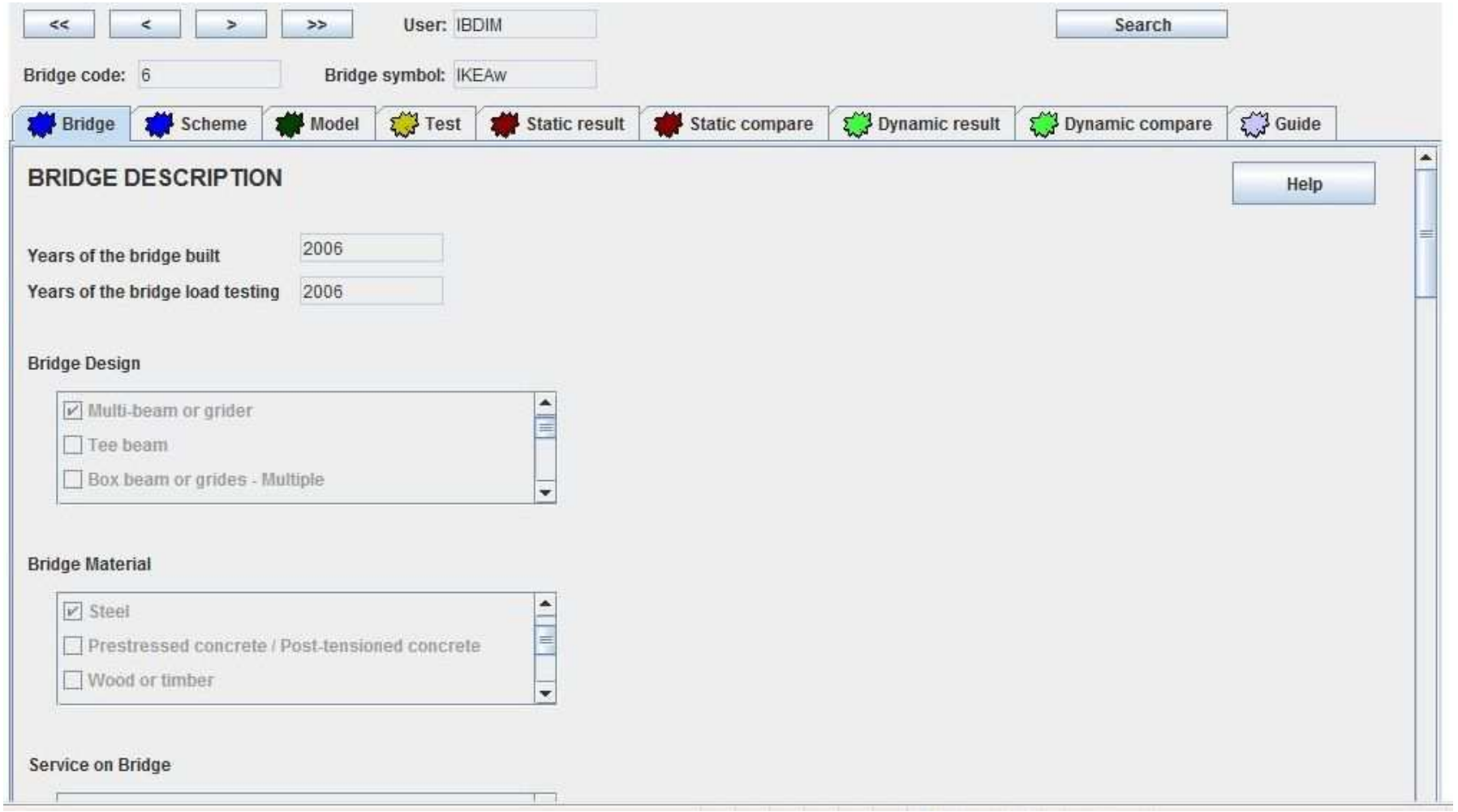
- **Many European countries perform load tests on new and rehabilitated bridges.**
- **The information about load test results could be used to optimize assessment of existing bridges.**
- **The database will allow the end users, to judge quickly the behavior of the structure under the loading and suggest the structural assessment method to be used – computation analysis or load testing.**

Application - The data format

The data are organized with the use of sheets
The data set (one record of the database) contains of 4 parts:

- **Bridge description**
  - Bridge description sheet
  - Bridge schemes & photos sheet
- **Analytical model description**
  - Analytical model description sheet
- **Load testing description**
  - Load testing description sheet
  - Static Loading-Results sheet
  - Dynamic Loading-Results sheet
- **Comparison of the load test results and analytical calculations**
  - Static Loading-Comparison sheet
  - Dynamic Loading-Comparison sheet

Application - Review the data Data - Bridge description sheet

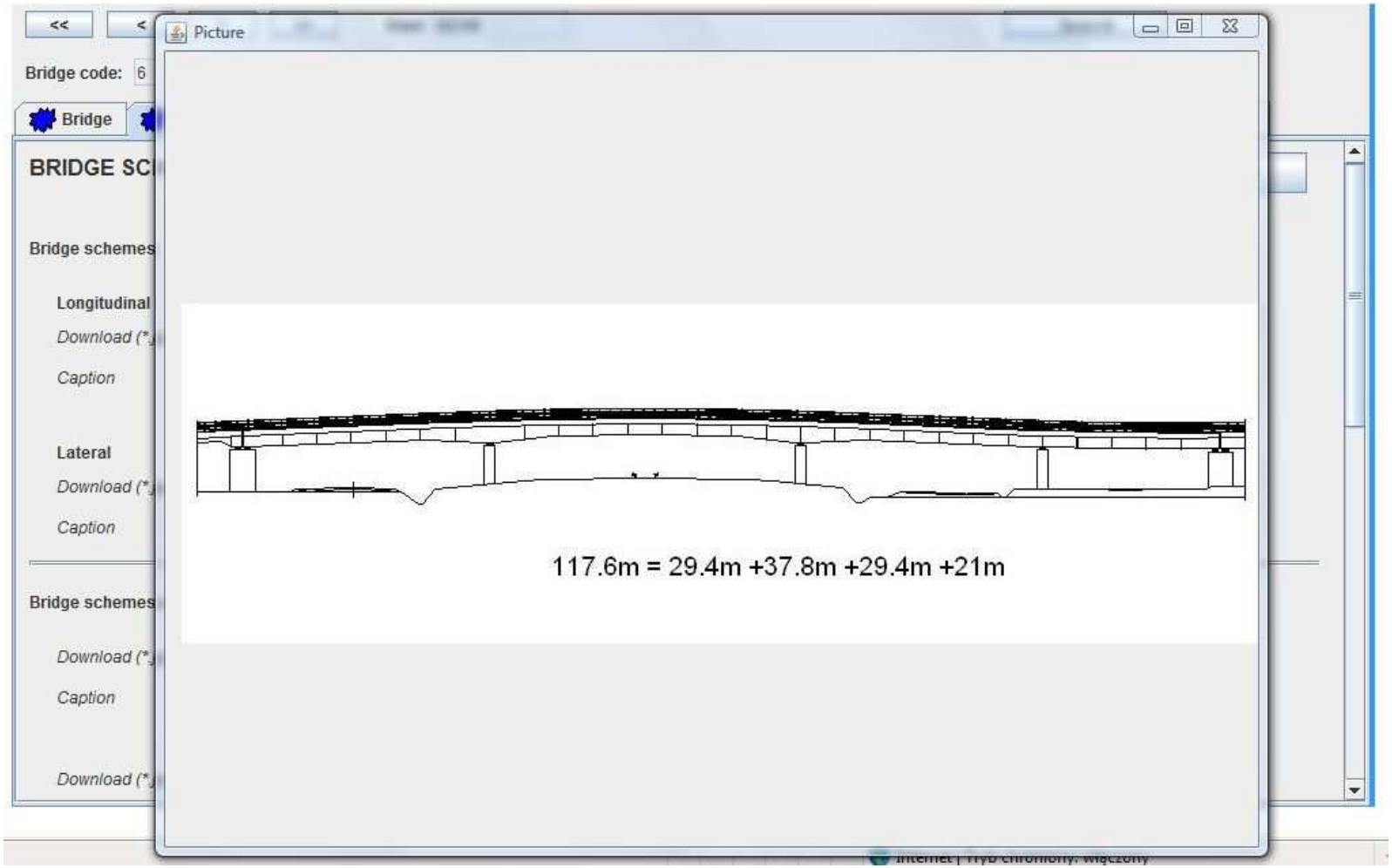


General information about the bridge – bridge design & material

Application - Review the data Data - Bridge description sheet

General information about the bridge – bridge dimensions

Application - Review the data Data - The bridge schemes & photos sheet

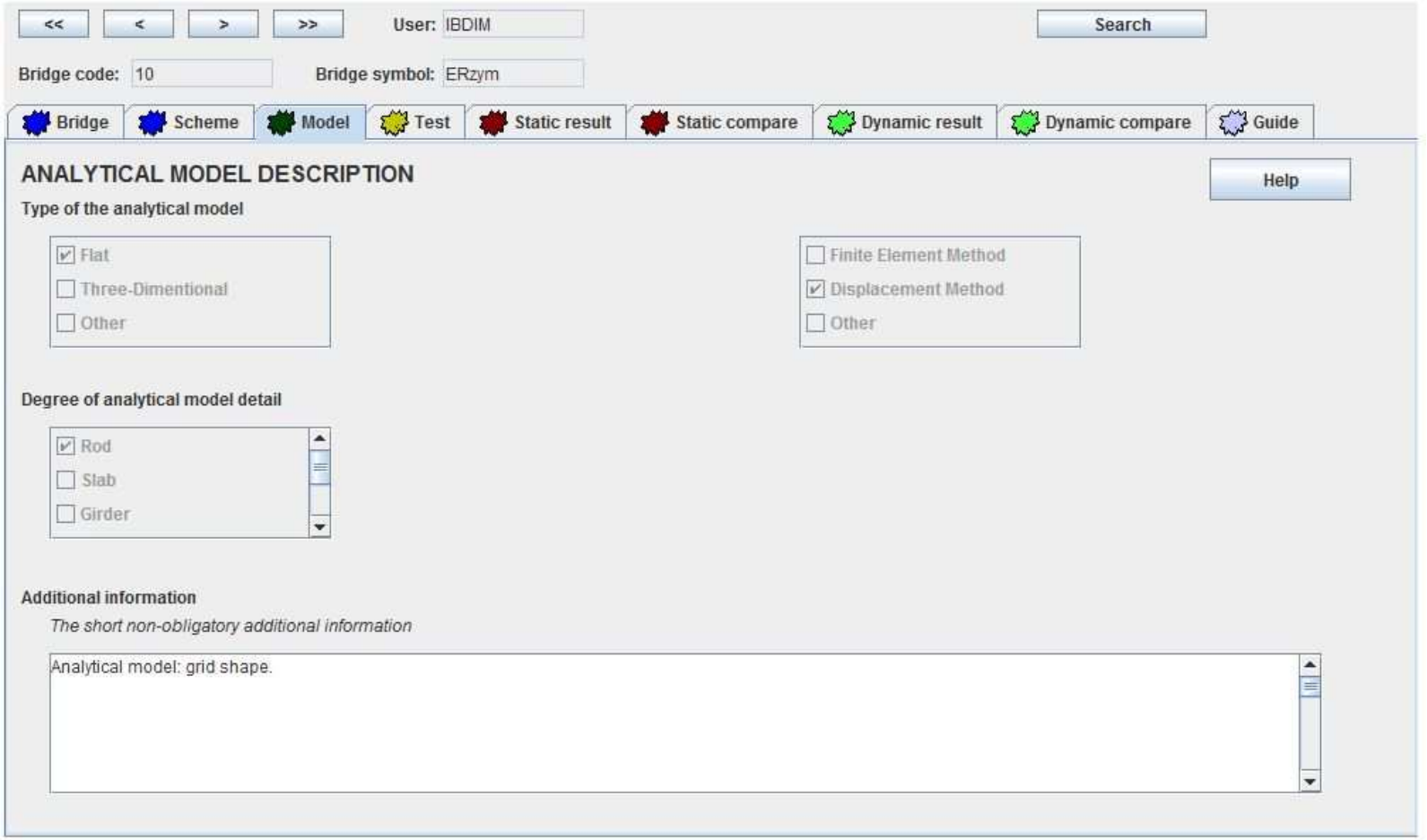


The longitudinal scheme of the bridge

Application - Review the data Data - The bridge schemes & photos sheet

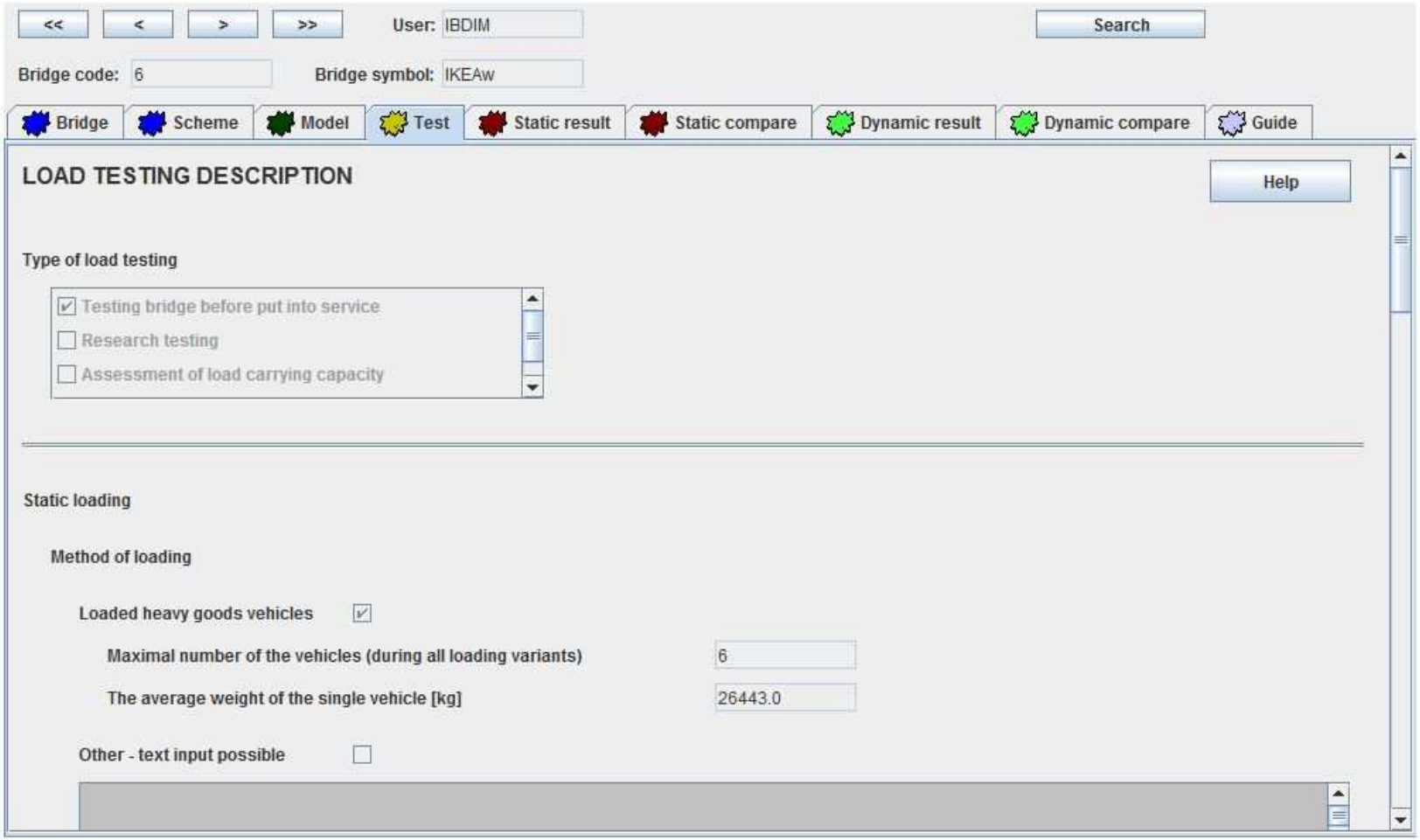
The photo of the bridge

Application - Review the data Data - Analytical model description sheet



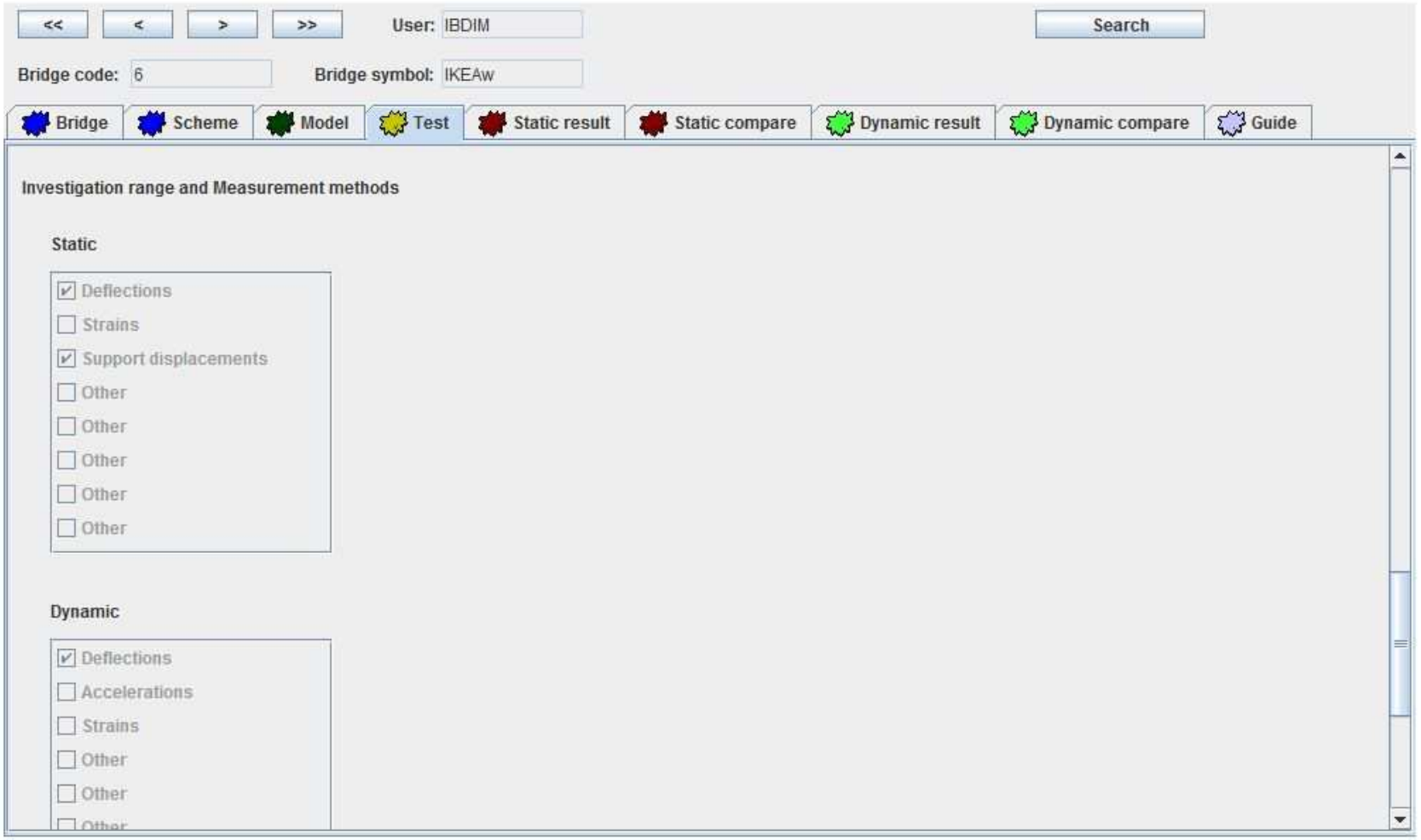
The general information about the analytical calculations method

Application - Review the data Data - Load testing description sheet



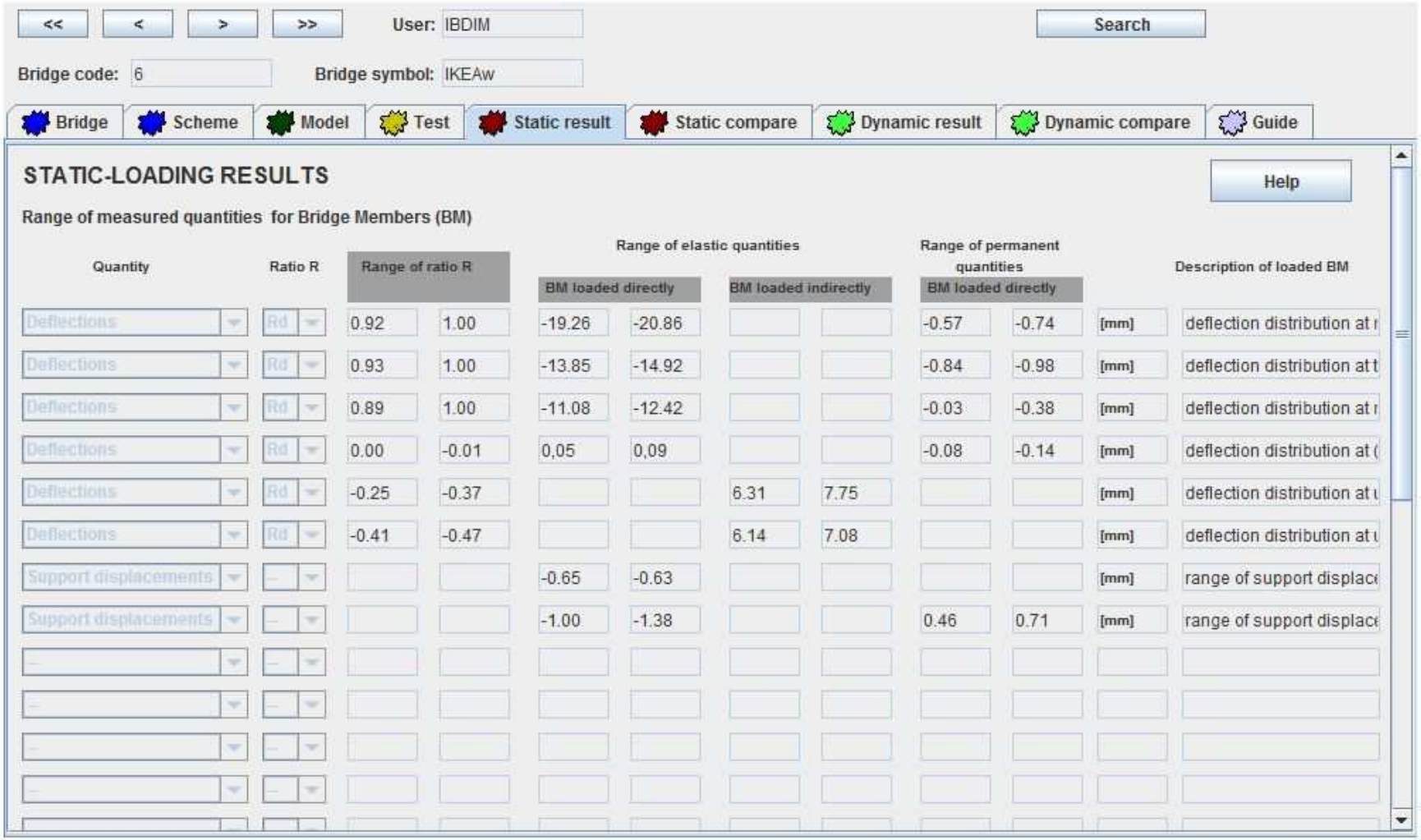
The general information about the static and dynamic method of loading

Application - Review the data Data - Load testing description sheet



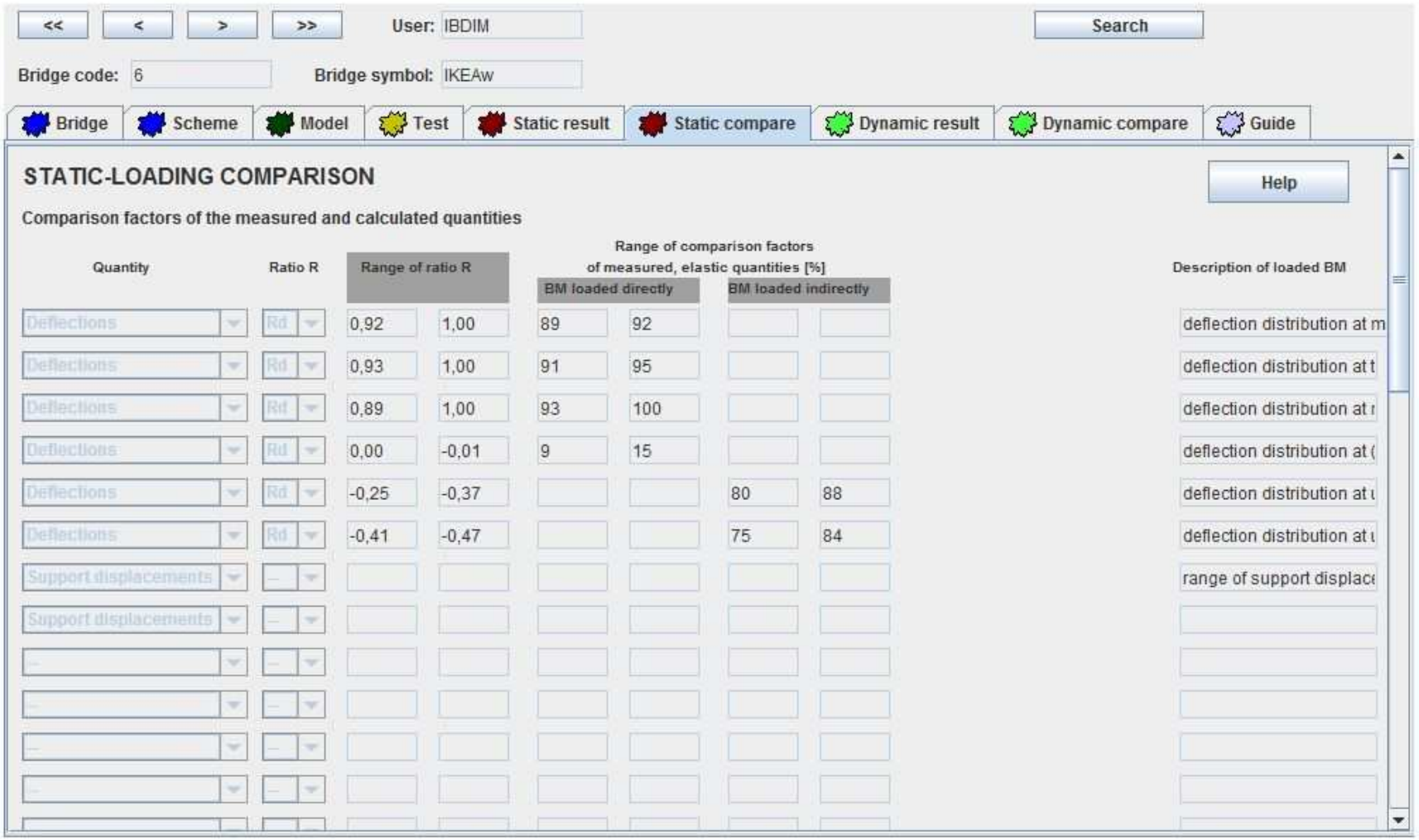
The general information about investigation range

Application - Review the data Data - Static Loading-Results sheet



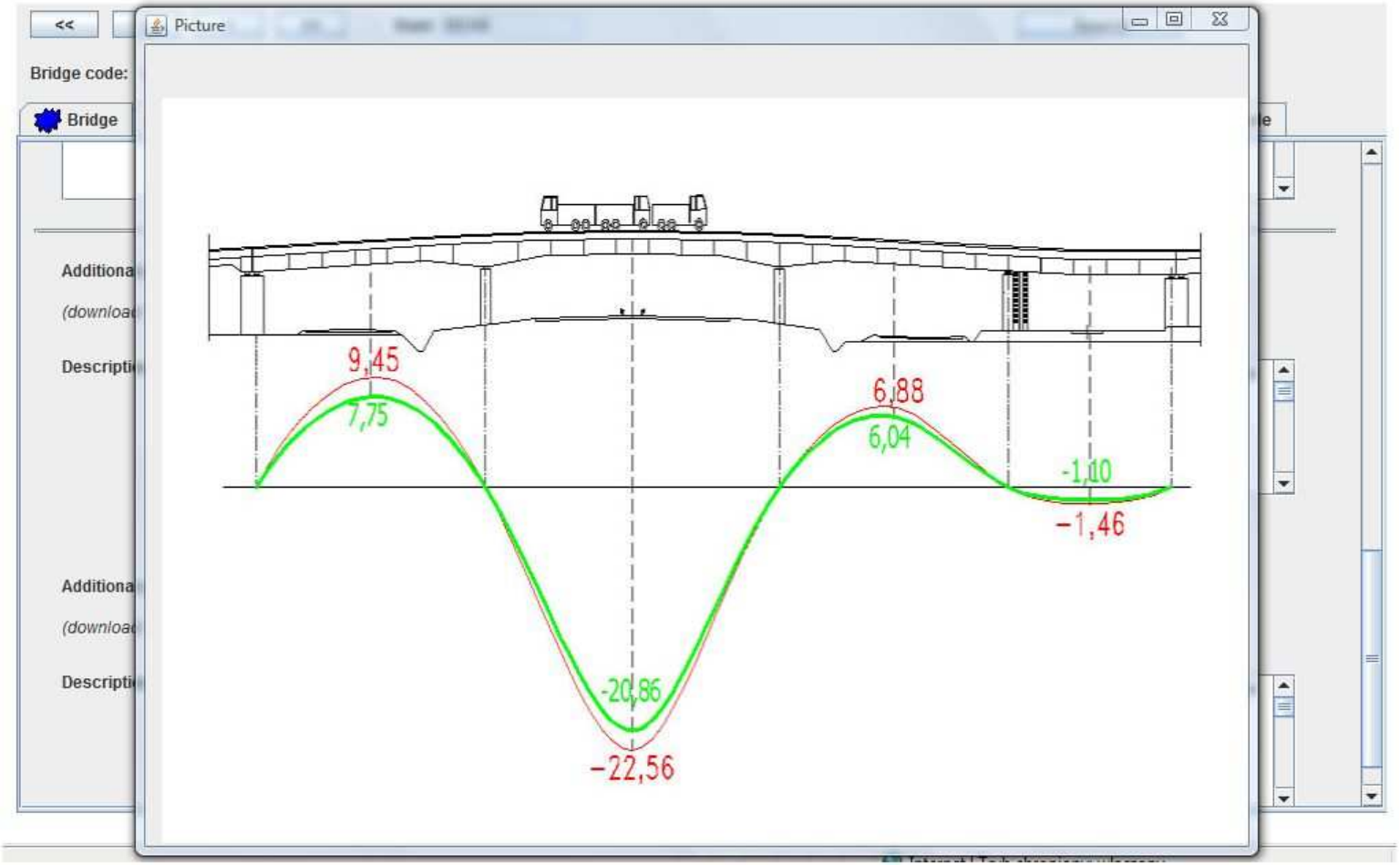
The ranges of measured quantities for different bridge members

Application - Review the data Data - Static Loading-Comparison sheet



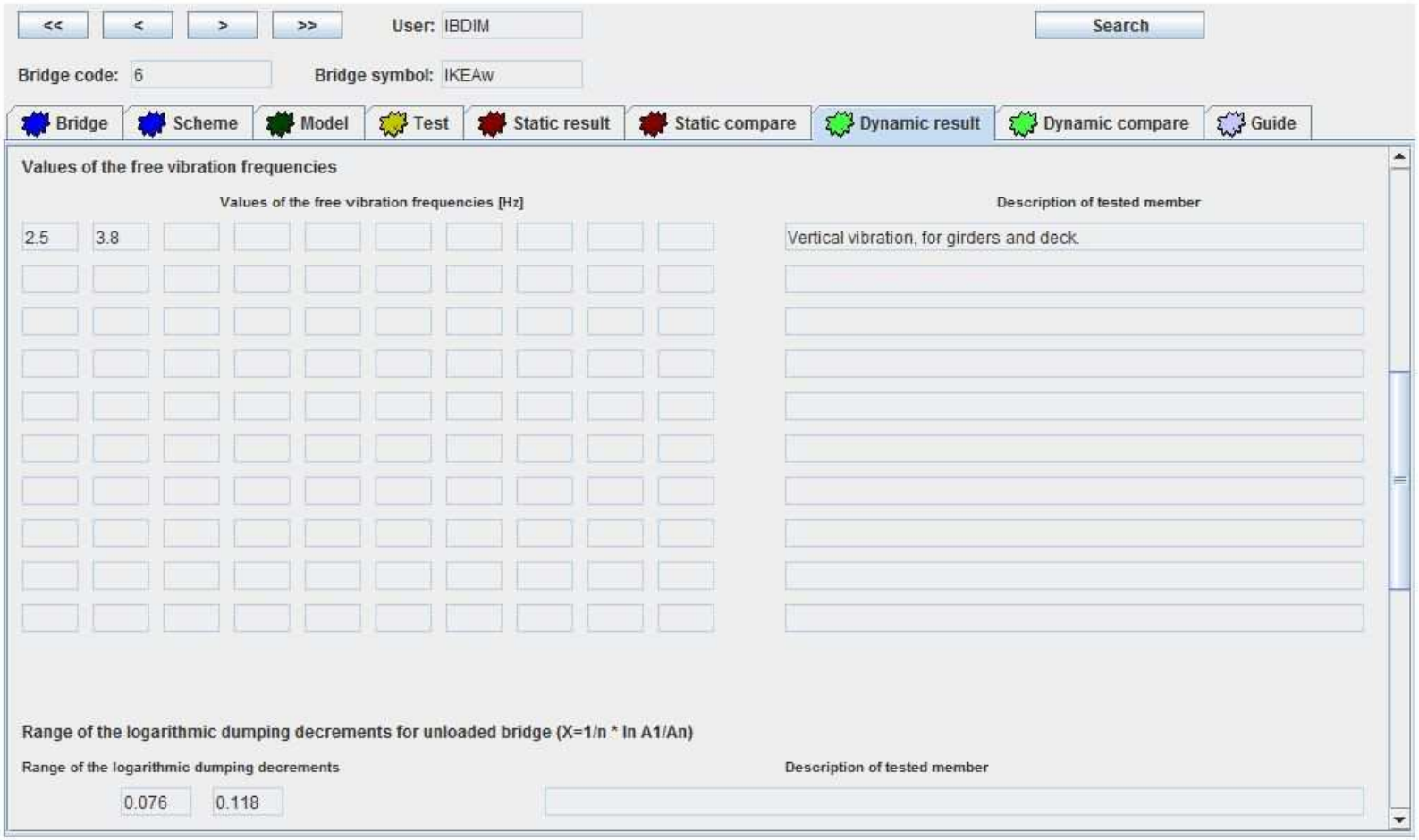
The table with static loading comparison factors

Application - Review the data Data - Static Loading-Comparison sheet



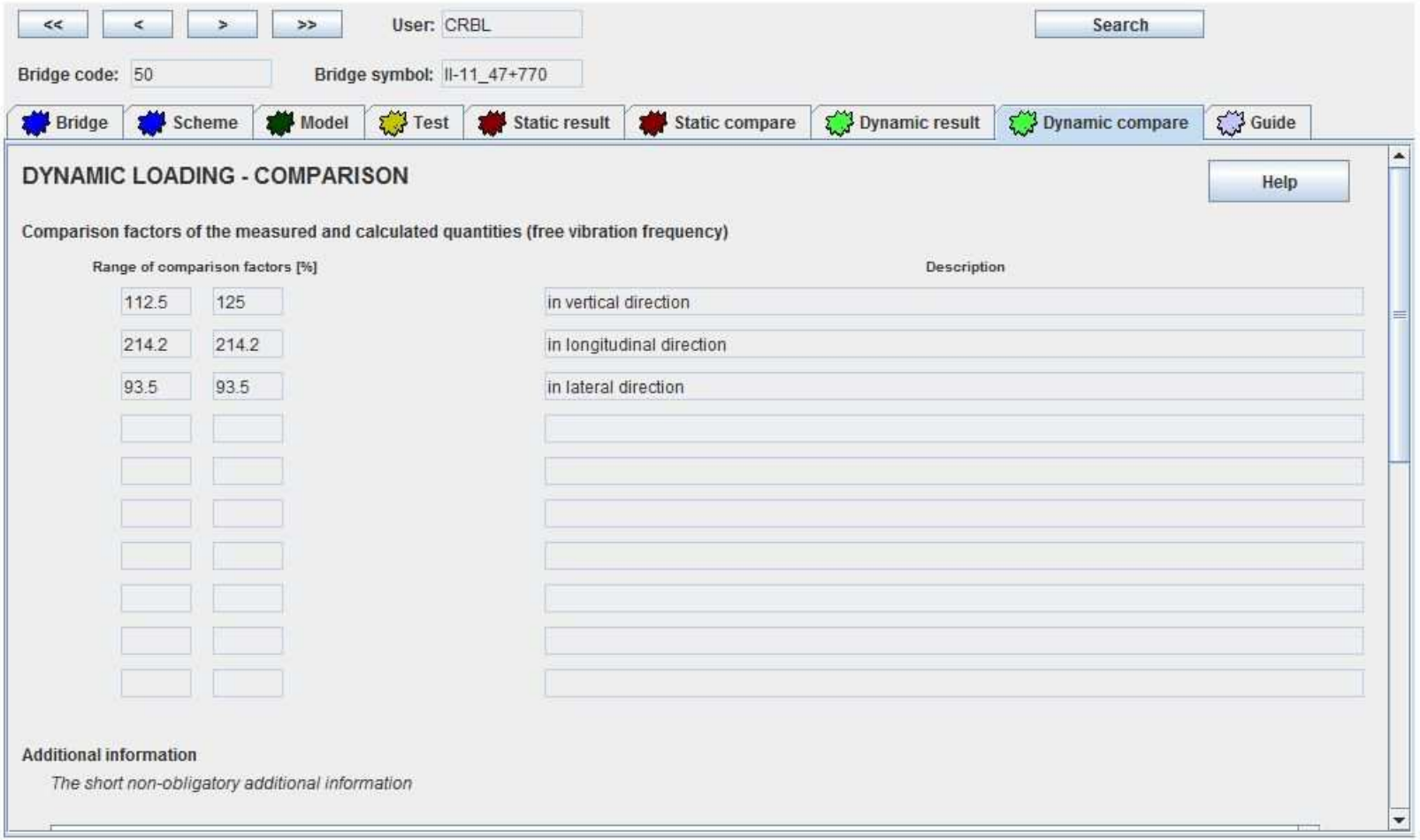
The additional graphic data: the example distribution diagrams of the measured and calculated deflection in longitudinal bridge section

Application - Review the data Data - Dynamic Loading-Results sheet



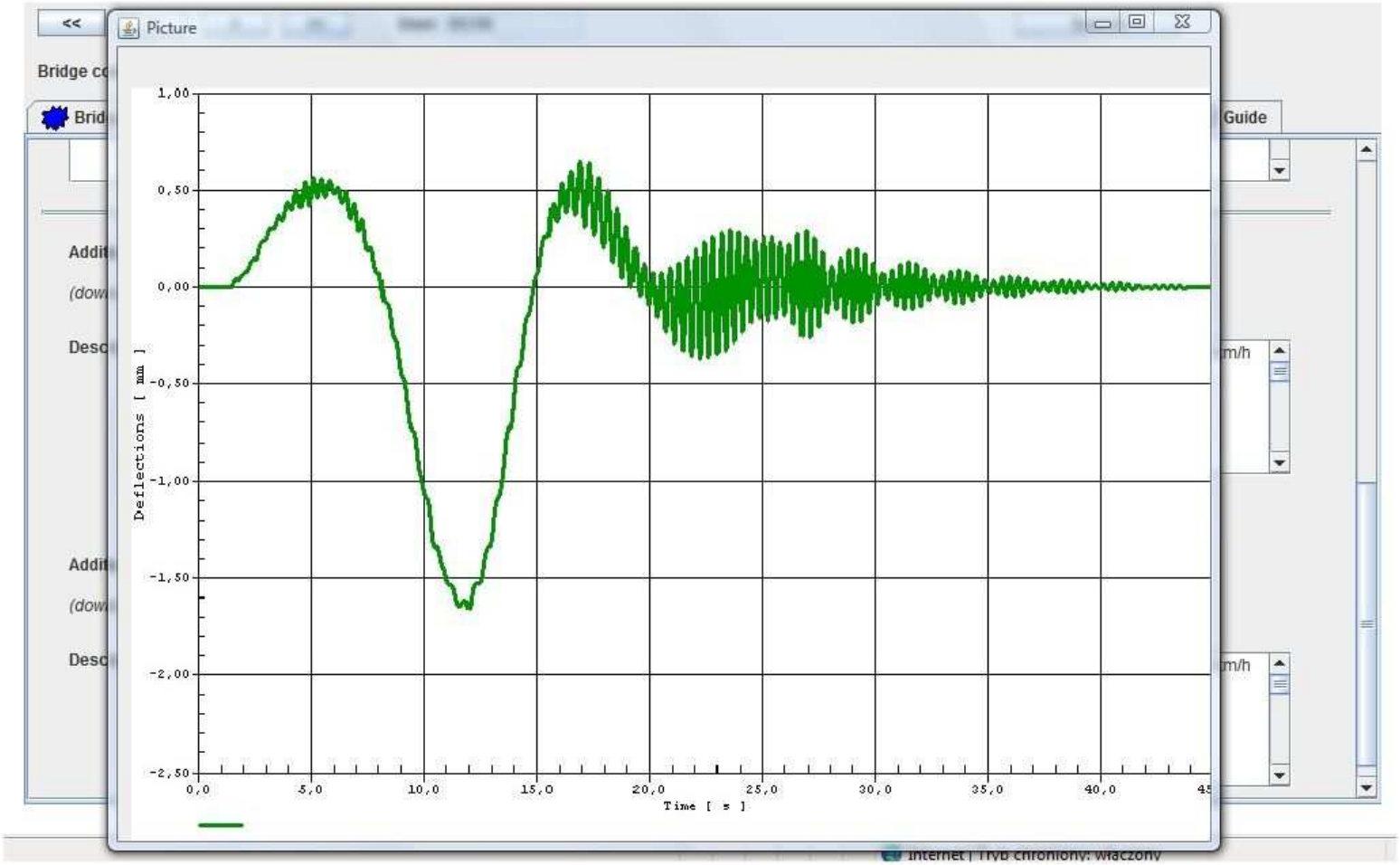
The table with values of the free vibration frequencies

Application - Review the data Data - Dynamic Loading-Comparison sheet



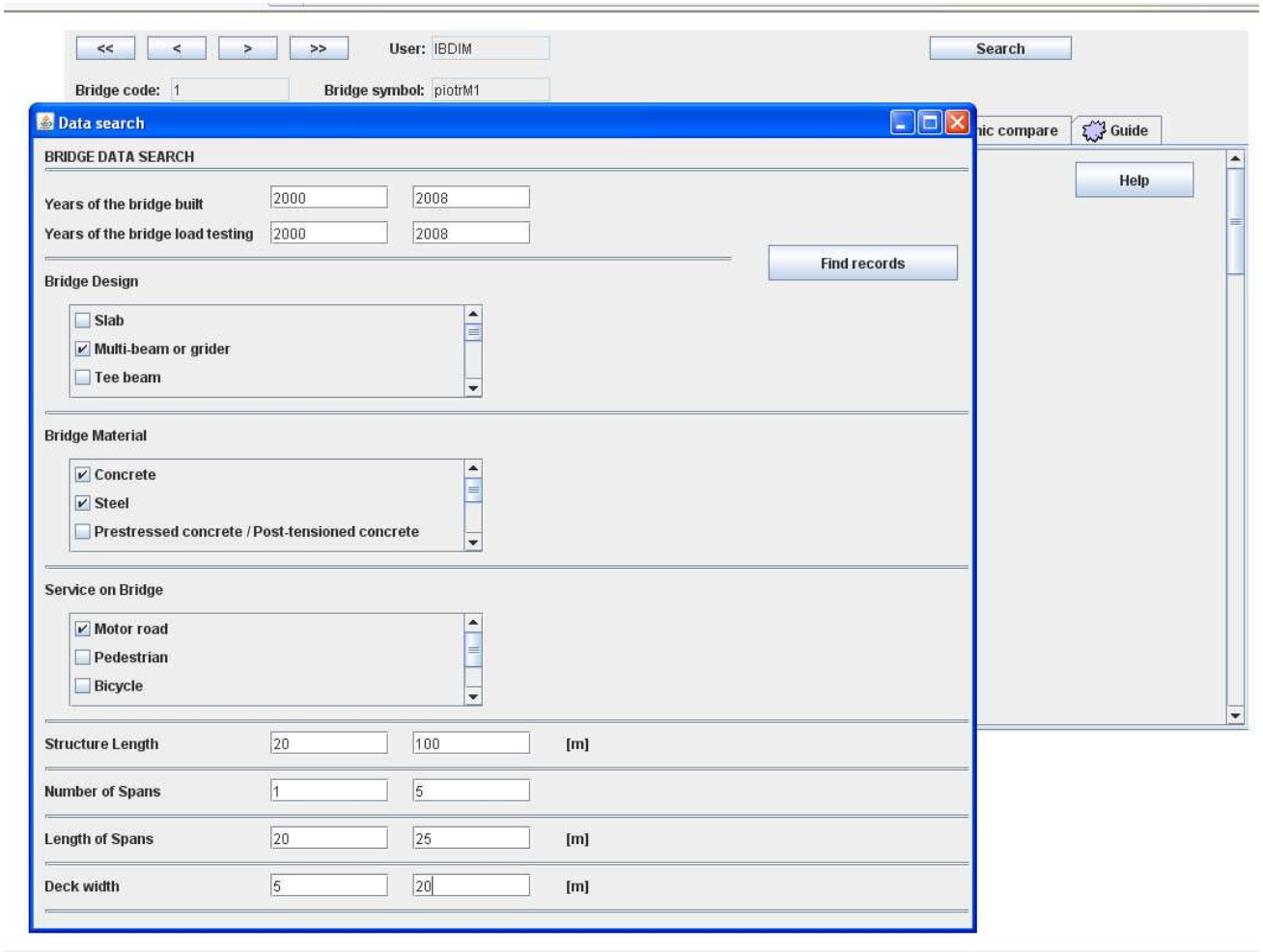
The table with comparison factors of the measured and calculated free vibration frequency

Application - Review the data Data - Dynamic Loading-Comparison sheet



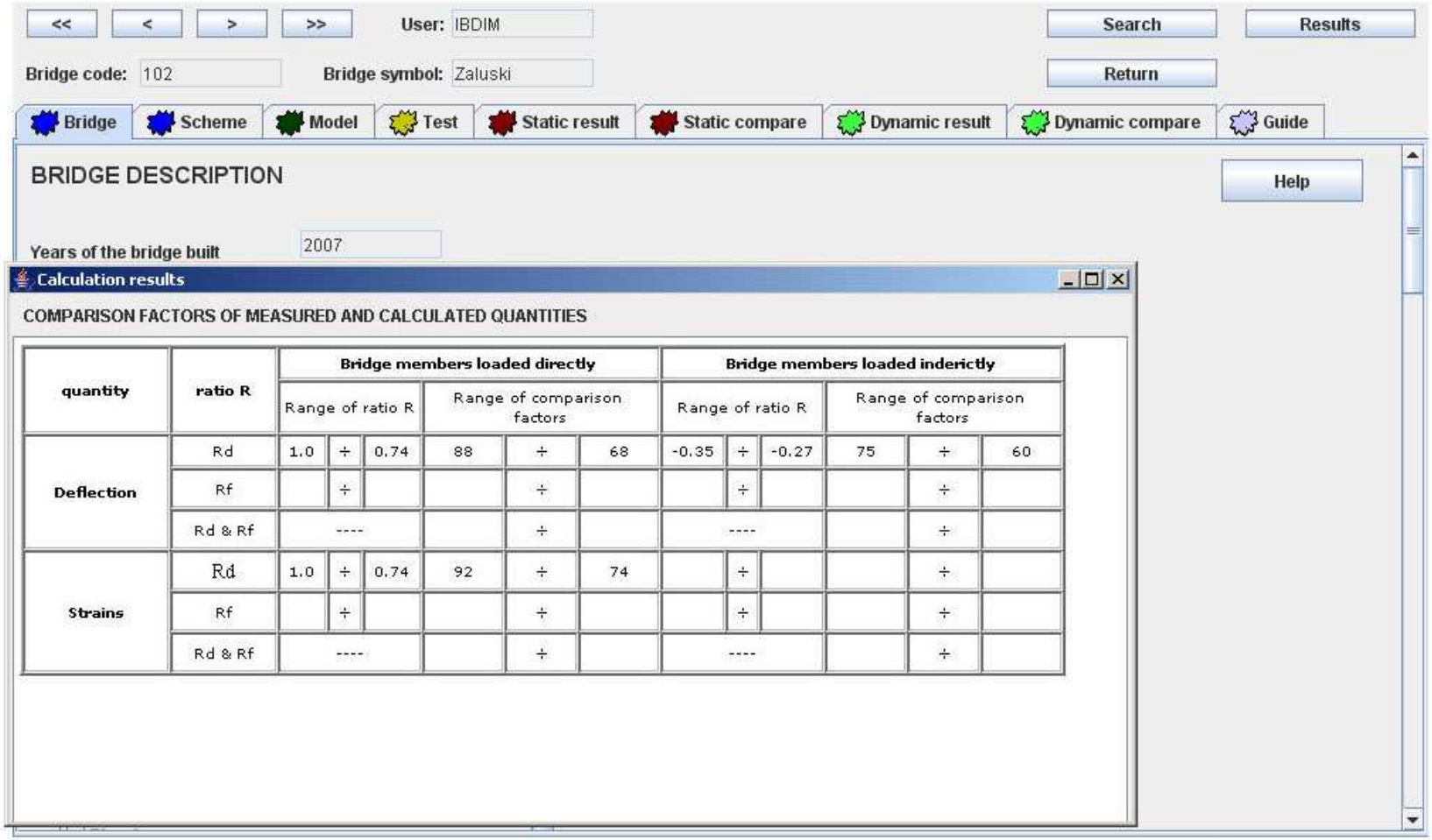
The additional graphic data: The example deflection-time diagram of the measured forced and free vibrations during truck passage with the 50 km/h speed

Application - Analysis of the data



The window of the selecting criteria to find records

Application - Analysis of the data



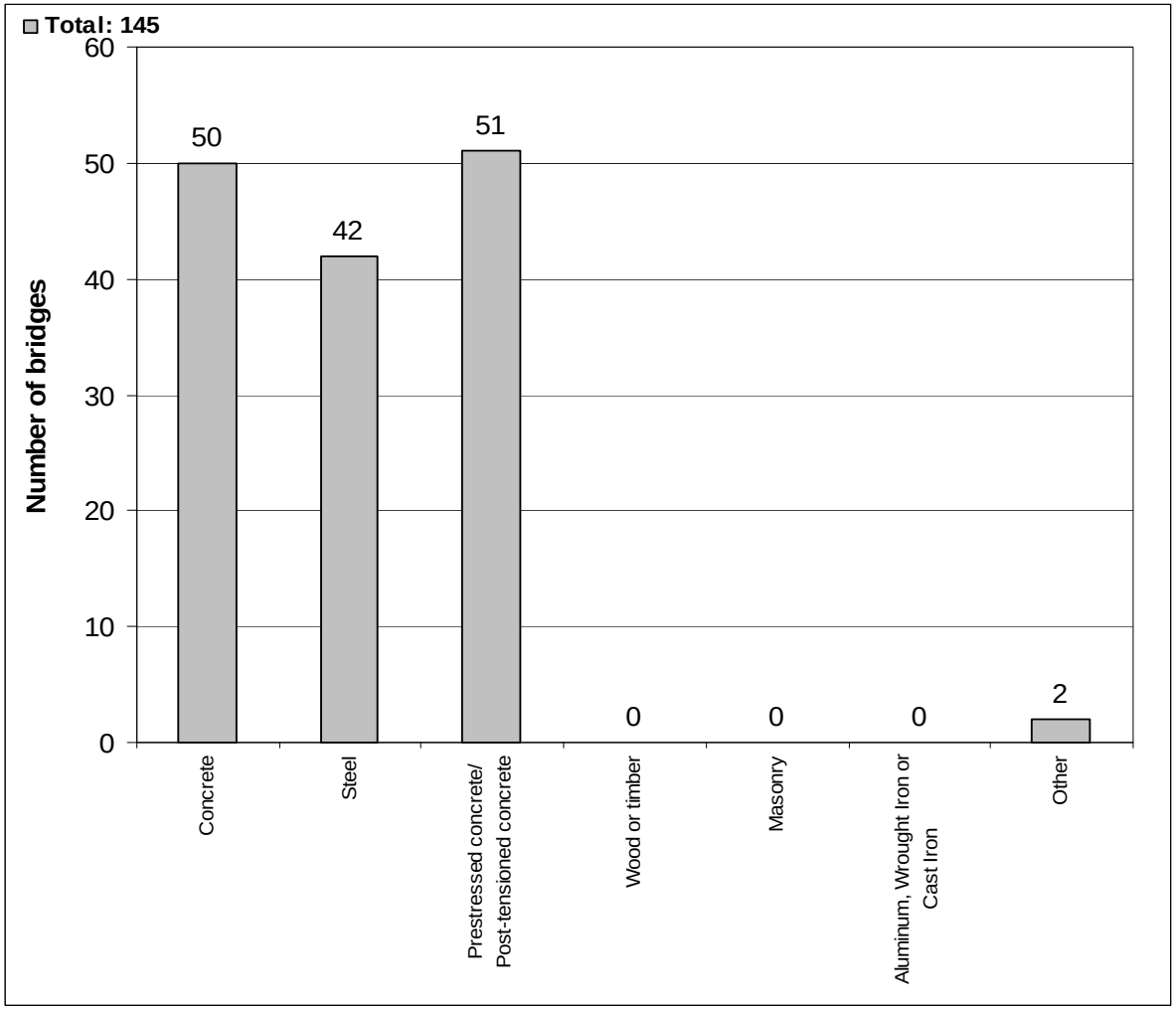
quantity	ratio R	Bridge members loaded directly						Bridge members loaded indirectly					
		Range of ratio R			Range of comparison factors			Range of ratio R			Range of comparison factors		
Deflection	Rd	1.0	÷	0.74	88	÷	68	-0.35	÷	-0.27	75	÷	60
	Rf		÷			÷			÷			÷	
	Rd & Rf	----				÷		----				÷	
Strains	Rd	1.0	÷	0.74	92	÷	74		÷			÷	
	Rf		÷			÷			÷			÷	
	Rd & Rf	----				÷		----				÷	

The table with analyse of the comparison factors distribution

The data base analysis – bridge review

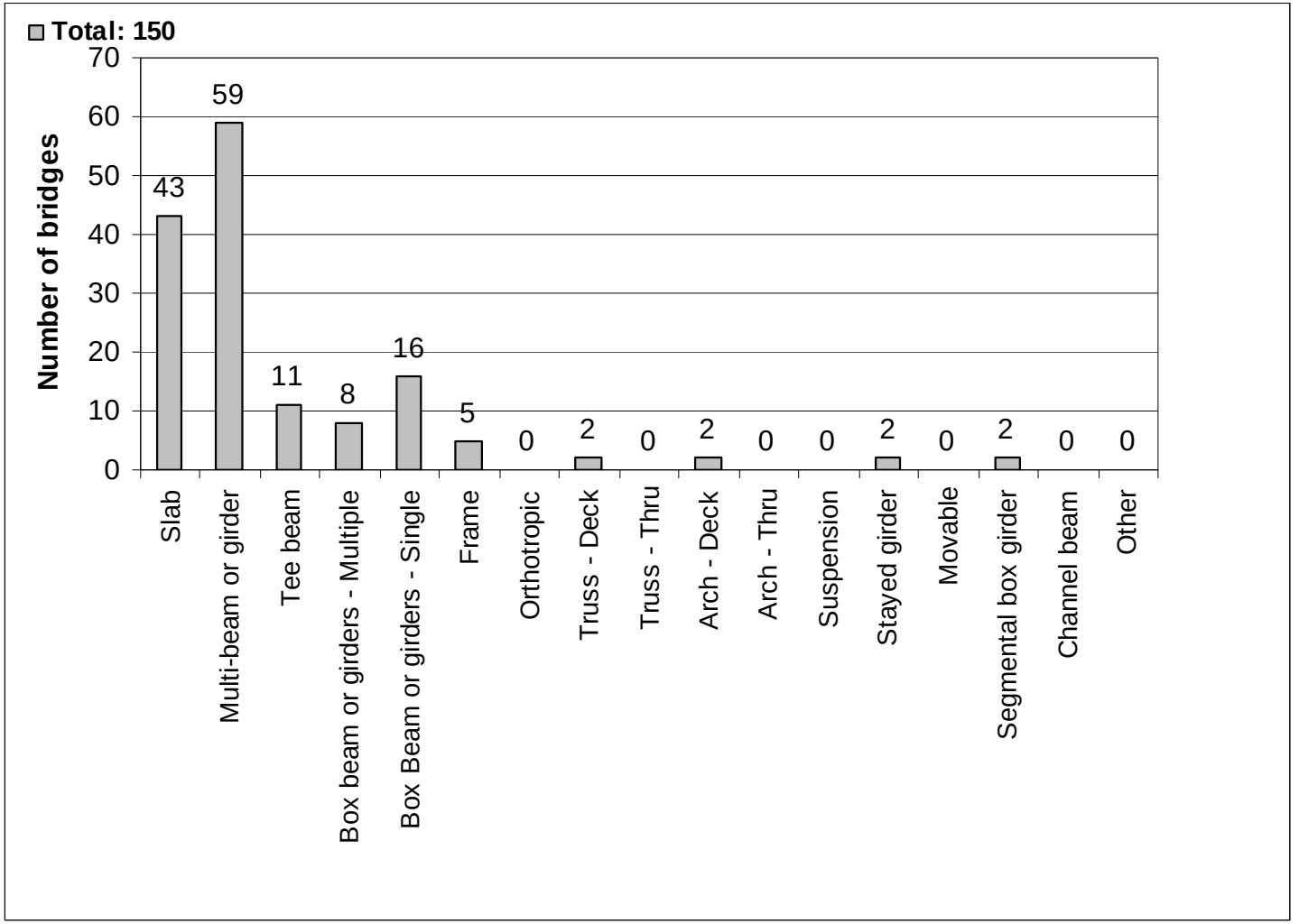
110 records

Czech Republic
Croatia
Bulgaria
France
Poland
Spain
Slovenia



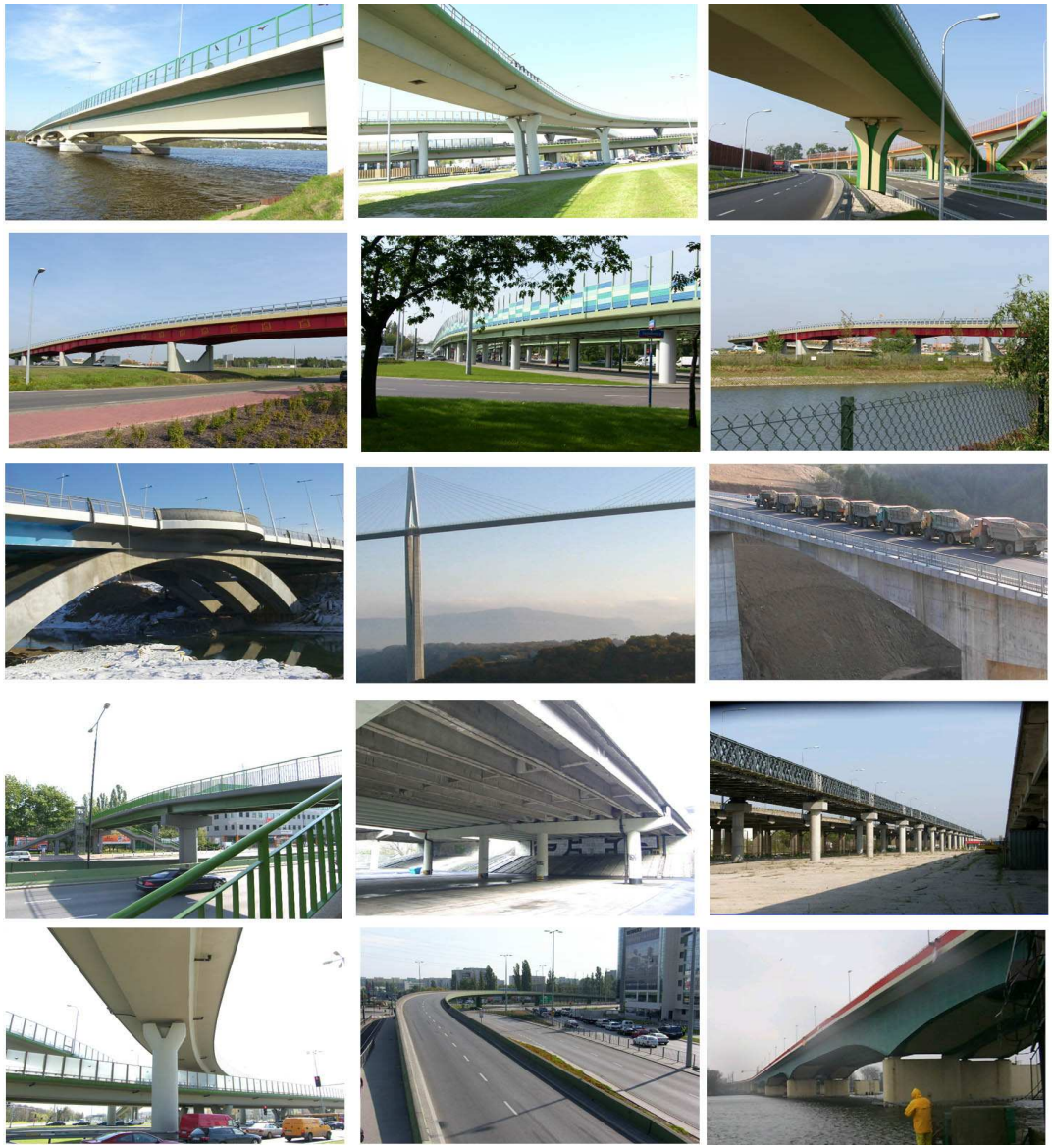
The bridge material distribution

The data base analysis – bridge review



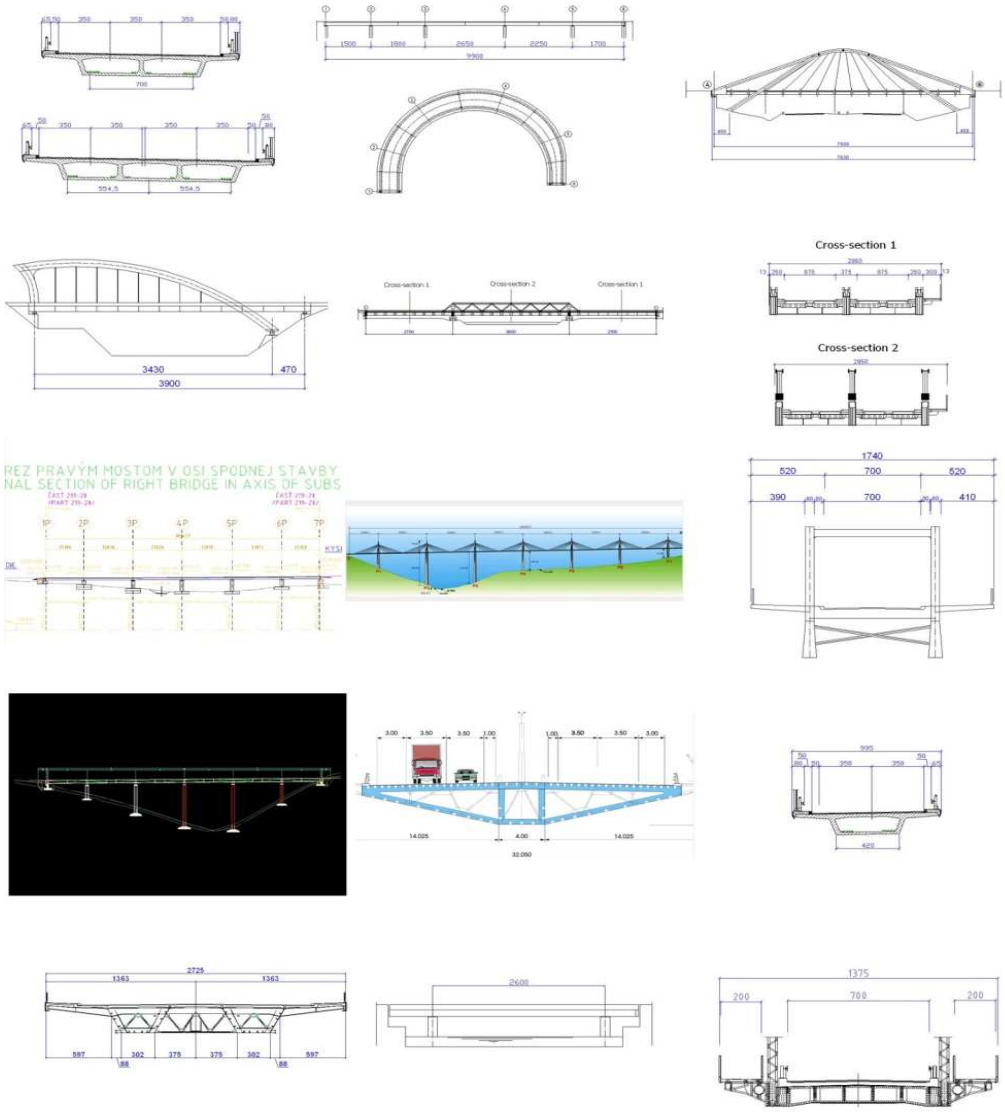
The bridge design distribution

The data base analysis – bridge review



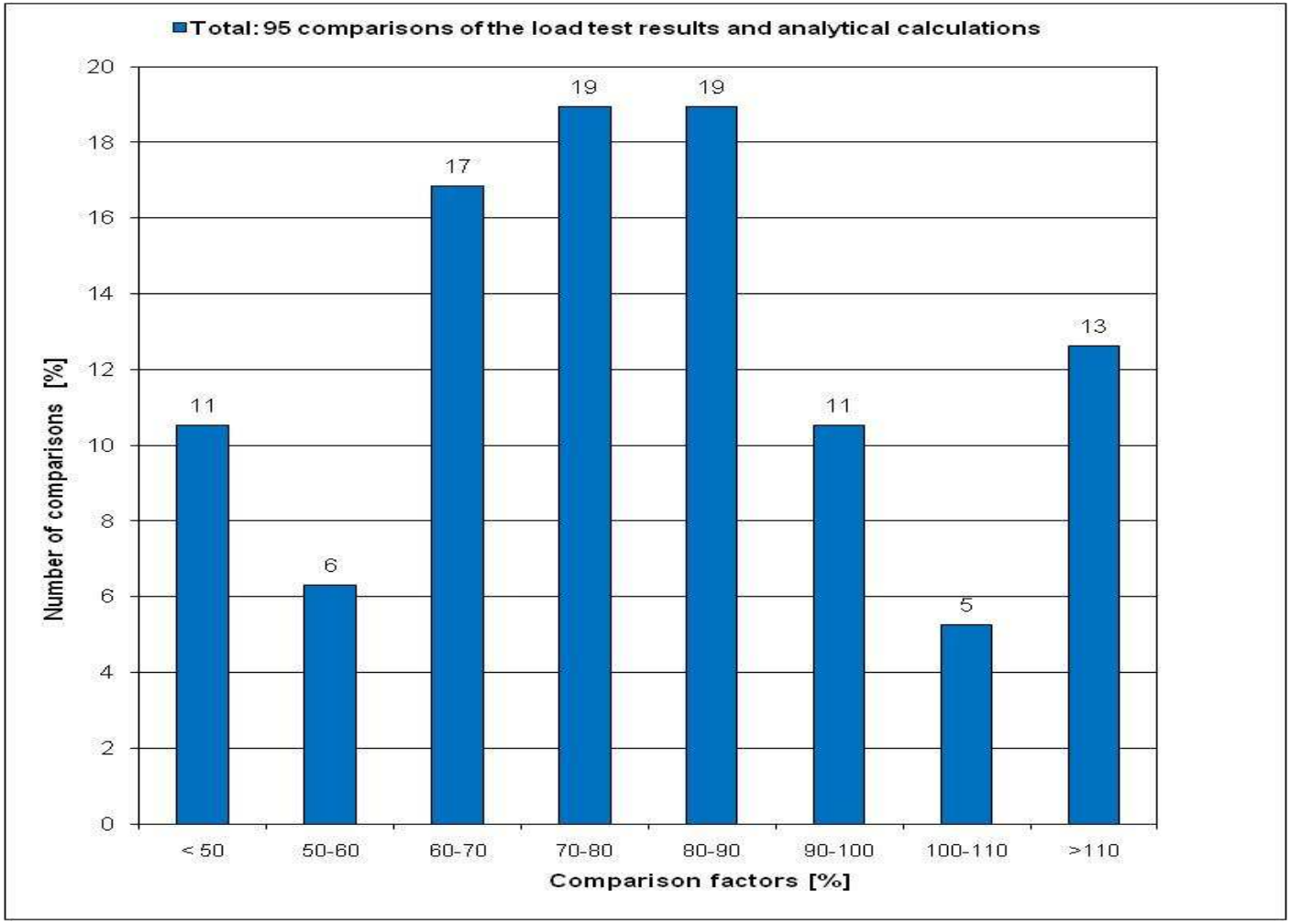
The example bridge photos

The data base analysis – bridge review



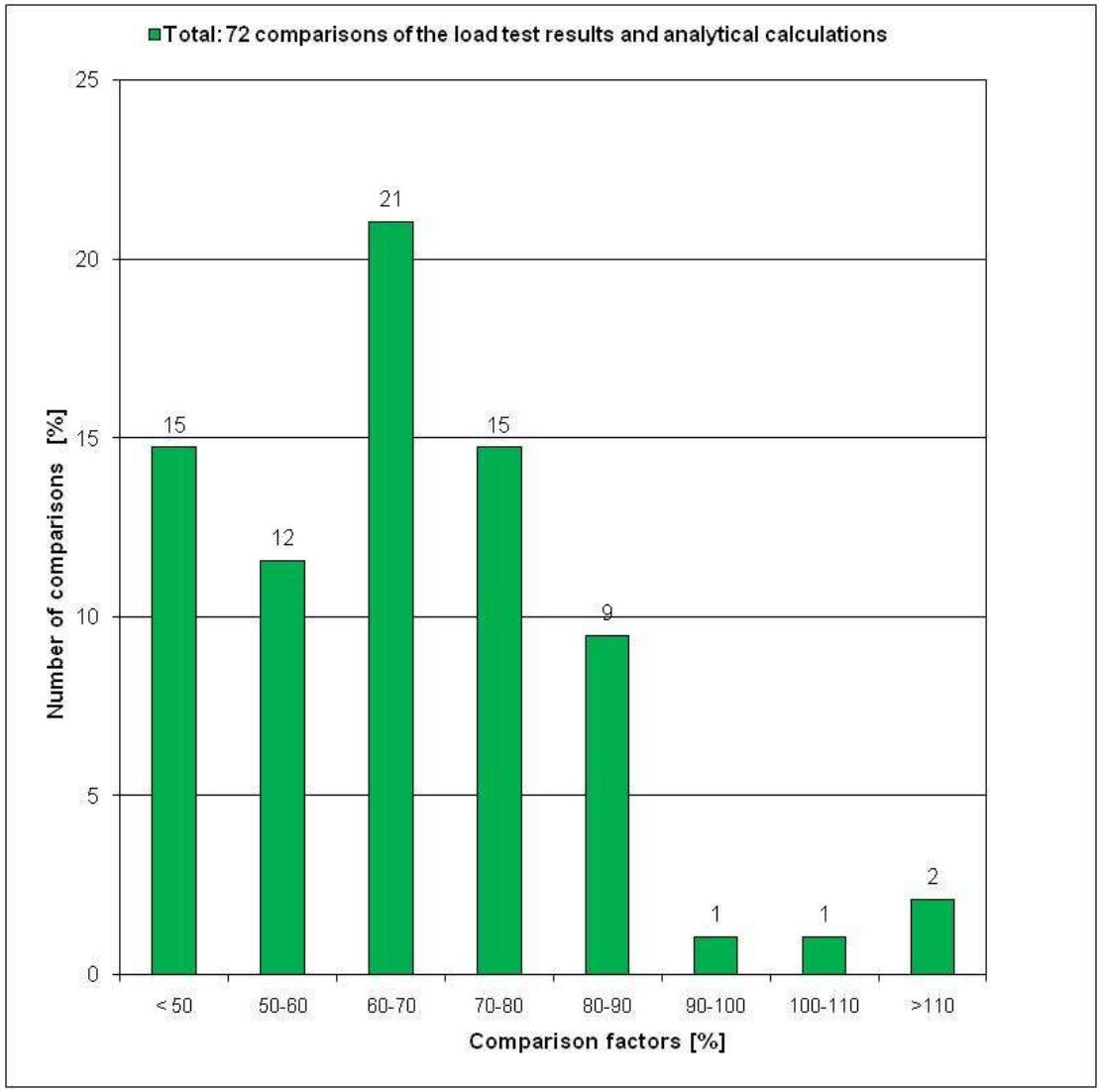
The example bridge schemes

The data base analysis - The comparison factor reviews – static loading



The distributions of average comparison factors for bridge elements loaded directly

The database analysis - The comparison factor reviews – static loading



The distributions of average comparison factors for bridge elements loaded indirectly

The database analysis - The comparison factor reviews – static loading

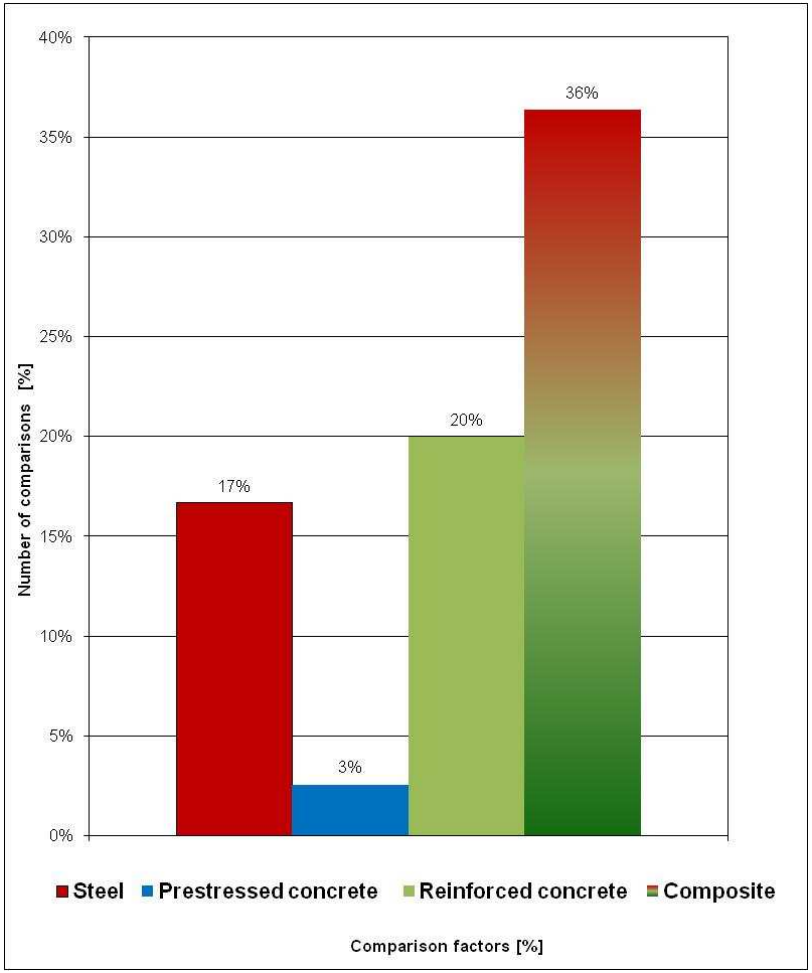
The compatibility of test results and analytical calculation

The assessment process of load carrying capacity based on diagnostic load testing results

An acceptable match is considered to have been reached, when the differences between the site-measured maximum deflections and the analytical values are within the following limits:

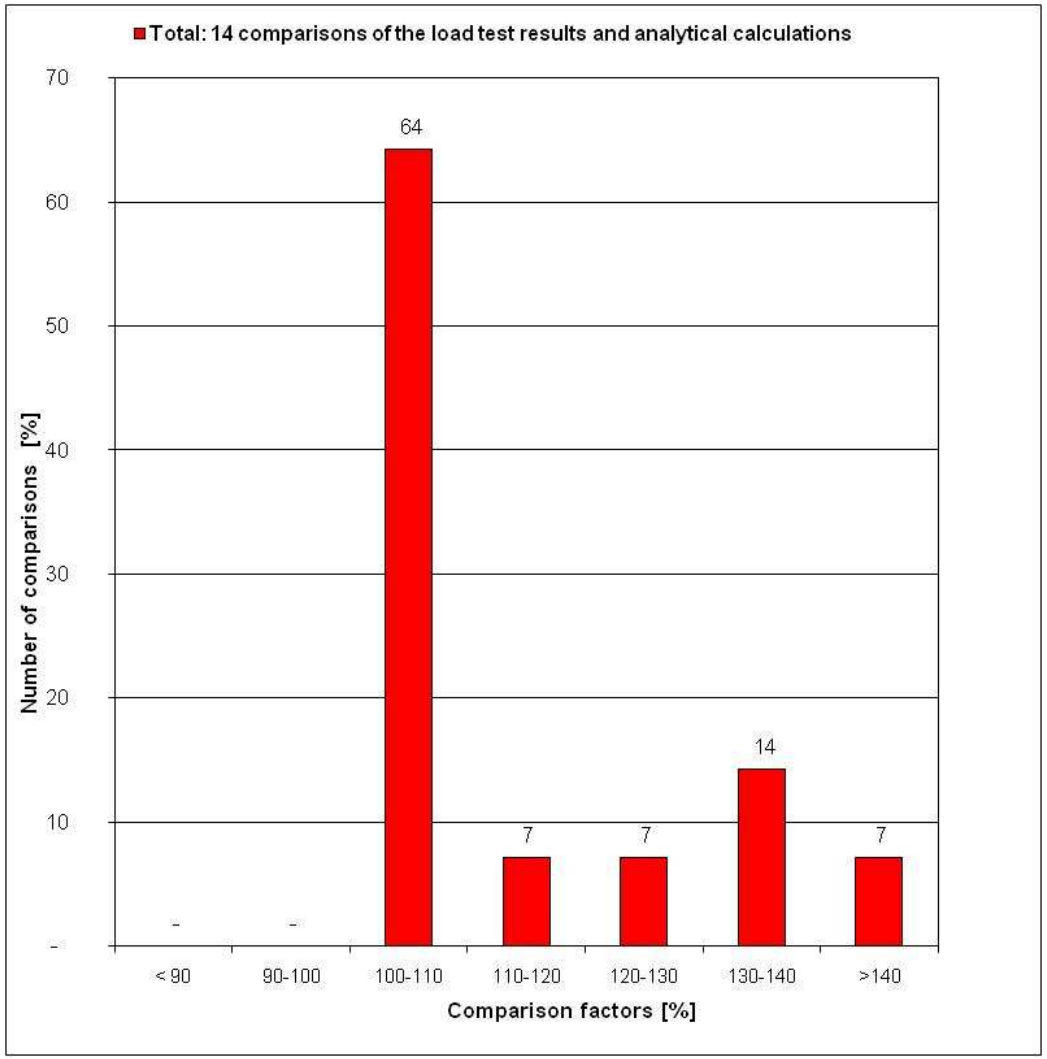
+/- 10% for prestressed concrete and metallic bridges
+/- 15 % for reinforced concrete and composite bridges.

The database analysis - The comparison factor reviews – static loading



The distribution of comparisons factor with the acceptable match in the function of bridge material

The database analysis - The comparison factor reviews – dynamic loading



The distribution of comparisons factor of calculate and measured free vibration frequency

Conclusions - The database analysis - The comparison factor reviews

- Only 3%-36% (depends on the bridge structural material) of presented in the database comparisons contain loaded bridge member with the acceptable match.
- The majority of analytical models presented in the database requires calibration.
- The hypothetical assessment of bridge load capacity with the use of those models without calibration would have unacceptable error.

Conclusions - Internet data base

- The Internet database of load test results and analytical calculations seems to be useful for the end users, to present quickly the behavior of the structure under the loading and suggest the compatibility range between real bridge behavior and results of the analytical calculations.

- The database, to be more useful should contain more information. The additional information about analytical model (the scheme of bridge analytical model, number of the elements and nodes) seems to be very interesting.

- The suitable for the user would be a full database filling.

- The changes require the database developing and inputting the data into the database directly after the load testing execution.

Thank You for Attention

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The application is available at the Internet address:
http://ambergate.ibdim.edu.pl/arches

User: **wp222**
Password: **base**

The system requirements:

- Windows XP, VISTA,
- Minimum display resolution: 1024 x 768,
- Microsoft Internet Explorer ver. min 6.0,
- Sun Java system min. v. 1.6 installed & allowed in Internet Explorer Settings.

Next login
User: **load**
Password: **testing**