Simple Classification Method for the Bridge Capacity Rating

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Abstract. **The load carrying capacity of the existing bridges mostly depends on the value of traffic load. During last year's the heavy traffic flow on the Latvian highways had considerably increased, therefore it is critical to determine the possibility of nowadays carrying traffic loads for bridges and overpasses built in different times, by using different design codes and characteristic of design loads. This paper presents simple bridge load carrying capacity rating method, based on the classification of traffic loads and load bearing capacity of bridge structures. The proposed method will assist in assessment and management of the existing bridges and ensure safe load transportation.**

Keywords: **bridge, load bearing capacity, rating, traffic load**

INTRODUCTION

Traffic flow has increased considerably on the Latvian roads and bridges during the last year's. Many bridges are in operation for a long term. They are built in different time periods by using design codes and characteristic traffic loads of that time. Today bridges that have been built between 1873 and 2009 are operated. In figure 1 are shown the distribution of number of highway bridges in Latvia constructed in different years. From figure1 we can see that 9% of all bridges are built 50 years ago, 17% - 40 years, 35% - 30 years and 28% - 20 years ago. More than 65% of bridges are older than 30 years.

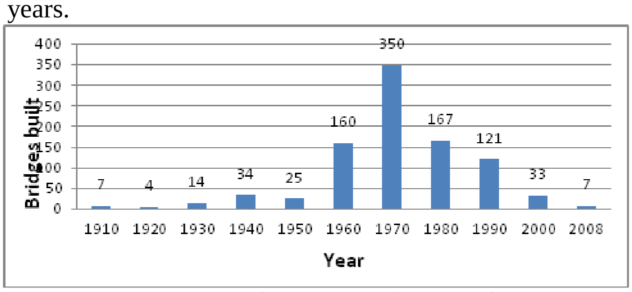


Fig.1. Graphical interpretation of distribution of number of highway bridges according to its life time in Latvia

Weight of heavy trucks often exceeds the value provided in the traffic regulations. Increased heavy traffic flow decreases the traffic safety level on the Latvian highways [2]. Due to the frequent overloading the bridge structures lose it's load carrying capacity, and as result - decrease the structural safety level [1],[2]. Therefore, it is required to develop a simple and understandable method for the evaluation of load carrying capacity of bridges built in different time periods by using different structural codes.

There are various methods developed for rating of the load bridge carrying capacity. The most popular one is the method developed by AASHTO [3], that provide the use of rating factor (RF)

$$RF = \frac{M_u - \delta M_{dl}}{\delta \varepsilon M_{ll}} \qquad (1)$$

where M_u – ultimate moment capacity; M_{dl} and M_{ll} – moment of effects from the dead load and live loads.

In last decades the bridge rating methods have been developed based on the structural reliability analysis and the probabilistic methods, see [4],[5],[6],[7]. The bridge rating method based on the classification of loads and the load bearing structures have been developed in [8]. Proposed method will determine the load carrying capacity of bridge, taking into account the working load classes specified.

About 95% of overloads will exceed the load allowed on public roads only up to 100%. For the vehicle loads exceeded in the Traffic Rules determined loads have been used special regulations and normally then are allowed only one vehicle on a bridge.

The purpose of this paper is the development of bridge classification method based on the traffic load and bridge bearing structure classification to evaluate the permissible traffic loads on the existing bridges. The proposed method classifies typical heavy traffic vehicles as well the bridge load carrying capacities depending on the span type and the characteristic loads provided by codes (taking into account year of construction).

DEVELOPMENT OF THE BRIDGE ANALYSIS METHODS OVER TIME

The traffic loads models and the structural codes have evolved over time. Many bridges built more than 50 years ago are still in operation and should ensure safe load transportation. Short historical overview will introduce the earlier traffic models and design codes used in Latvia and show differences in values of nowadays and earlier traffic loads and approaches to the bridge analysis methods.

The method of the design codes for bridges in Latvia was used from the beginning of twentieth century. The first traffic load model consisted of concentrated load - horse cart and uniformly distributed pedestrian load was used from 1900 to 1915. For the bridges located near the cities the load model consisted of 8 horse carts (fig.2) with common weight of 660 pood or 10.56 t and pedestrian load of 400 kg/m^2.

From 1915 to 1930 the traffic loads consisted of the row of lories (fig.3) with mass of 9 t, the road roller (as heavy load) with mass of 11,5t – 15 t and the pedestrian load 550 kg/m^2.

From 1930 to1945 the main values of the traffic loads characteristics were changed again, the new loads model -

caterpillar tank with 36 t and 50 t weight was introduced, the weight of road roller was increased alike up to 17,5t and 24t.

From 1945 to 2000 former Soviet Union codes were used in Latvia. From 1945 characteristic live load model N-13 and single vehicle load model NG-60 were used, whereas commencing 1953 the live load model N-18 and the single heavy vehicle load model NK-80 were employed. Starting from 1962 the load model N30 was introduced. Before that time the load models consisted from a row of real lories or separate heavy vehicles [9].Commencing 1986 the load model characteristic was changed to the load model that represented road traffic effects and consisted of concentrated load AK as a tandem and uniformly distributed load in form of two lines of 0.6 m width and a separate heavy vehicle model NK-80 [10].

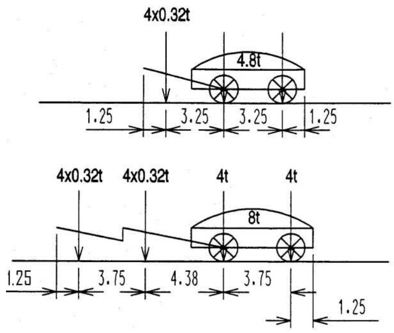


Fig.2. Characteristic load model of horse carts used from 1900 till 1915

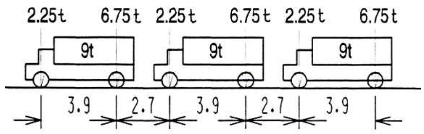


Fig.3. Characteristic load model of lories used from 1915 till 1930

From 2000 the loads characteristics proposed in Eurocode 1 [11] for the bridge design have been used. This model also consists of concentrated and uniformly distributed loads, which cover most of the effects from the traffic of lories and cars.

The methods of structural analysis had also evolved over the time. At the end of the 19th century the empirical formulas and calculation methods were employed for dimensioning of structural elements of bridges. Early design codes in the beginning of the 20th century were based on the working stress concept, in which representative load effects are compared to the permissible stresses. The representative load effects were determined according to the stress-strain curve for serviceability and linear elastic behaviour. From 1955 to 1962 for bridge design the improved permissible stress method was used, allowing the use of the strain-stress curve for serviceability failure. The allowable stress method compared to the contemporary methods produces more conservative results that increase with higher proportion of the dead load.

From 1963 the approach of limit states for the structural design were developed that produce more uniform levels of safety for all types and sizes of bridge.

The various traffic loads and allowable stress and limit state methods have been used to create the stock of existing bridges which are acceptably safe, but degree of safety vary from bridge to bridge according the applied loads and design concept.

Consequently it is crucial to develop a simple method for the evaluation of the load carrying capacity for bridges built in different time periods.

LOAD CLASSIFICATION

The loads applied on the bridge arise from the permanent loads, effect of the live load resulting from traffic and pedestrian passage, and the environmental impact.

Permanent loads include the weight of the structure, the weight of permanent filling material and attached utilities, the ground, the ground water and the pressure of water.

For typical bridges the most important loads are the loads from vehicular traffic including their static and dynamic effects. The traffic loads on the existing bridges are all traffic loads that could use the public roads, i.e.:

- ordinary (everyday) traffic load (including lightweight vehicles and vehicles with allowed weight limited by 44t),
- heavy weight traffic load,
- very heavy traffic load.

The principle of classification proposes that all bridges are classified under the working load classes, which may be allowed without restrictions. The working classes are equivalent loads that have to cover the load effect of a number of vehicles and are permitted on different roads. Each working load class has rules for maximum permitted load on single axles and the permitted mass.

Ordinary traffic loads

The ordinary traffic loads include vehicles indicated in the Traffic Rules and permitted by the authority without any restrictions on public roads. For the bridge loading purposes, only heavy vehicles have significant weight and therefore they only may be classified. For all vehicles the single axle load should not exceed 10 t, with exception of trucks where operational axle may be 11.5t. The distance between axles should not exceed the values given in the Appendix 3 to the Traffic Rules [12].

All trucks that correspond to the ordinary traffic loads according to the axle distribution may be classified under five working load classes:

SK 10/18	-	two-axel vehicle with single largest axle load of 11,5 t and total weight of 18 t or less
SK 10/25	-	three-axel vehicle with single largest axel load of 11,5 t and total weight of 25 t or less
SK 10/36	-	four-axel vehicle with single largest axel load of 11,5t and total weight of 36 t or less
SK 10/40	-	five -axel vehicle with single largest axel load of 11,5t and total weight of 40 t or less
SK 10/44	-	six-axel vehicle with single largest axel load of 10 t and total weight of 44t or less.

The examples of classification of typical heavy vehicles are shown in table 1. The working load class may be decreased, if a vehicle is not fully loaded. In the last two columns of the table 1 working load classes for vehicles with 75% and 50% characteristic mass are presented.

Heavy weight traffic loads

Heavy weight traffic loads are loads from vehicles carrying indivisible load, exceeding the legal load limit. For example, cranes (fig.4) or vehicles carrying large prefabricated structures. The maximum weight of these vehicles may vary from 45 to 80 t. These vehicles require a load permit but no extra capacity rating of bridges. It is assumed that the transportation of these loads occurs only a few times per week.

Fig. 4. Crane as an example of the heavy weight (60 t) traffic load

All trucks that correspond to the ordinary heavy weight traffic loads according to the axle distribution may be classified in three working load classes:

SK 10/50 - vehicles with total mass of 50 t or less

SK 10/60 - vehicles with total mass of 60 t or less

SK 10/80 - vehicles with total mass of 80 t or less

The number of axles in heavy vehicle traffic must ensure that the greater load on the axle does not exceed 10 tons (except for the operational axle - 11.5 t), and the load on a one double wheel does not exceed 5 tons, but if there are more than two double wheels on one axle, then the largest load on a single wheel does not exceed 3 tons. The distance between axles could not exceed the values given in the Appendix 3 of the Traffic Rules [12].

Very heavy traffic load

Very heavy traffic loads are loads from huge vehicles carrying indivisible loads with weight exceeded 80 t (fig.5). These vehicles require a load permit. It is assumed that the transport of these loads occur only a few times per year. In most cases these vehicles require extra capacity rating of bridges.

Transportation of very heavy vehicle can be performed via special routs. Before transportation a careful bridge inspection and recalculation of load carrying capacity should be made, considering the damages recognised by the bridge inspection.

The Proposed method does not include rules for classification of very heavy traffic loads.

TABLE 1

Characteristic for the heavy traffic working load classes

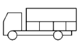
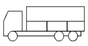
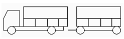
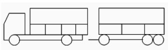
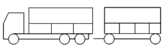
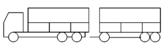
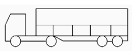
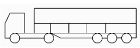
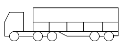
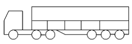
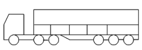
N.	Vehicle type	Characteristic of mass (t)	Loads classes according to the loading percentage of the characteristic of mass		
			100%	75%	50%
1.		18	SK 10/18	-	-
2.		25	SK 10/25	SK 10/18	SK 10/18
3.		36	SK 10/36	SK 10/25	SK 10/18
4.		40	SK 10/40	SK 10/25	SK 10/18
5.		40	SK 10/40	SK 10/25	SK 10/18
6.		40	SK 10/40	SK 10/25	SK 10/18
7.		36	SK 10/36	SK 10/25	SK 10/18
8.		40	SK 10/40	SK 10/36	SK 10/18
9.		40	SK 10/40	SK 10/25	SK 10/18
10.		40	SK 10/40	SK 10/25	SK 10/18
11.		44	SK 10/44	SK 10/36	SK 10/18

Fig.5. Example of a very heavy (160 t) traffic load

Bridge Capacity Rating

Nowadays the methods of structural analysis for existing bridges enable a more accurate modelling of the interaction of all structural elements and thus obtaining more precise characteristics of structural resistances, as well as propose the change of material properties over the time. Therefore the actual bearing capacity of bridges built 50-60 years ago may be recalculated to the actual loads and the updated load bearing capacity will be within the range between 1.5 to 1.8 times higher. It also confirms that the old bridge's capacity can sustain the modern traffic loads, even though the value of traffic loads over the time had increased several times.

The bridge capacity rating is performed by calculations using the limit state approach. More than 80% of bridges in Latvia are built between 1950 and 1990. The bridges of that time period may be characterised as the precast simply supported span structures. The bridges in bridge stock are divided into 16 characteristics depending on the material, form and length of spans. The typical bridge structures are given in second column of the table 2 and the table 3.

A minimum acceptance level of bearing capacity of bridges and overpasses is determined from ordinary and heavy traffic load characteristics. The working load class for each type of bearing structure may be obtained depending on the type and length of the load bearing structure, as well from the values of load characteristics used in the structural analysis. The minimum working load classes for different bridge types arising from the ordinary loads are given in table 2, but from the heavy traffic loads are shown in table 3.

For the span structures not included in tables 2 and 3, the working load classes can be calculated separately.

The design of reconstruction or strengthening of the bridge structures normally include the evaluation of carrying capacity in connection to the value of adjustment factor α for load model 1 (LM1) proposed under the standard LVS EN 1991-2 [11]. Using this value and taking into account the span design the working load class for renovated structure type can be provided. For some popular types of span structures the corresponding working load classes depending of the value of adjustment factor α are specified in the last columns of tables 2 und 3.

The working load classes specified in table 2 and 3, assume that the structures are in a relatively good technical condition. If the structure have visible damages (normal and shear cracks in concrete with width > 1 mm; delamination and spalling of concrete elements; uncovered and corroded main reinforcement; separated diaphragms; longitudinal cracks in asphalt pavement for bridges with precast beams; bearings out of position, etc.) an individual evaluation of load bearing capacity should be conducted.

In most cases, the bridge bearing capacity, and herewith the working load class of the span structure determine the technical condition of the span structure. However, in any case the possible damages in piers or abutments should be also evaluated, which could reduce the load carrying capacity. The main damages that could be considered by evaluation of reinforced concrete piers or abutments are: the concrete delamination and spalling; the long vertical cracks over corroded main reinforcement; the rupture or disintegration of concrete on pier or abutment head; inclined cracks in pier or abutment heads that indicated on its settlement. By evaluation of the stone and masonry piers or abutments the following damages may be considered: the vertical or inclined cracks that indicate of irregular settlements; the delamination or spalling near the water line; the scouring. If the extent of deteriorations is significant the capacity evaluation of piers and abutments should be conducted.

The proposed method is adapted to the Latvian highways. An example of the bridges and overpasses classification on the road A1 Riga – Estonian border are given in table 4.

TABLE 2

The bridge working load classes for the ordinary traffic load

Nr.	Type of the Bridge Span Structure	Characteristic Load Systems					
		N-10 NG-40	N-13 NG-60	N-18 NK-80	N-30 NK-80	AK NK-80	EC-1 SM1 α = 0.8 -1
1.	Reinforced concrete diaphragm simple beams (type 56): Spans: 8.66 – 11.36 m Spans: 14.06 – 22.06 m	 - -	 SK 10/25 SK 10/36	 SK 10/36 SK 10/44	 SK 10/44 SK 10/44	 - -	 - -
2.	Reinforced concrete simple beams without diaphragm (type 56): Spans: 8.66 – 11.36 m Spans: 14.06 – 16.76 m	 - -	 - -	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 - -	 - -
3.	Pre-stressed wire beams: Spans: 11.36 m Spans: 14.06 – 16.76 m	 - -	 - -	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 - -	 - -
4.	Pre-stressed double T beams: Spans: 16.76 m Spans: 18 – 33 m	 - -	 SK 10/36 -	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44
5.	Simple slab with holes Spans: 18 m	 -	 -	 SK 10/44	 SK 10/44	 -	 -
6.	Simple slabs Spans: ≤ 4.5 m Spans: ≥ 4.5 m Precast reinforced concrete. Cast in place reinforced concrete	 SK 10/44 SK 10/36 SK 10/44	 SK 10/44 SK 10/40 SK 10/44	 SK 10/44 SK 10/44 SK 10/44	 SK 10/44 SK 10/44 SK 10/44	 SK 10/44 SK 10/44 SK 10/44	 SK 10/44 SK 10/44 SK 10/44
7.	Precast reinforced concrete ribbed slabs	SK 10/25	SK 10/40	SK 10/44	SK 10/44	-	-
8.	Simple cast in place reinforced concrete beams with two cantilevers Central span: 14 – 17 m Central span: 21 – 27 m	 SK 10/40 SK 10/40	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 - -	 - -
9.	Continuous reinforced concrete beams (Zuravlov type) Longest span: 15 – 18 m Longest span: 21 – 24 m	 - -	 - -	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 - -	 - -
10.	Continuous reinforced concrete slabs with holes Spans: 12 – 15 m Spans: 18 – 24 m	 - -	 - -	 SK 10/44 SK 10/44	 SK 10/44 SK 10/44	 - -	 - -
11.	Continuous reinforced concrete T beams Spans: 12 – 18 m	 -	 -	 SK 10/44	 SK 10/44	 -	 -
12.	Reinforced concrete frame bridges wit inclined piers	-	-	SK 10/44	SK 10/44	-	-
13.	Continuous reinforced concrete box girder – frame system bridges	-	-	-	SK 10/44	SK 10/44	-
14.	Individual designed bridges: Built till 1940 Built in period 1941 – 1960.g. Built in period 1960 – 1990.g Built after 1990.g.	 SK 10/18 SK 10/36 - -	 SK 10/36 SK 10/40 SK 10/40 -	 - SK 10/44 SK 10/44 -	 - SK 10/44 SK 10/44 -	 - - SK 10/44 SK 10/44	 - - SK 10/44 SK 10/44
15.	Composite steel-concrete continuous girders	-	SK 10/44	SK 10/44	SK 10/44	SK 10/44	SK 10/44
16.	Steel truss bridges	-	-	SK 10/40	SK 10/44	-	-

TABLE 3

The bridge working load classes for the heavy traffic load

Nr.	Type of the Bridge Span Structure	Load Characteristic Systems					
		N-10 NG-40	N-13 NG-60	N-18 NK-80	N-30 NK-80	AK NK-80	EC-1 LM1 $\alpha = 0.8 - 1$
1.	Reinforced concrete diaphragm simple beams (type 56): Spans: 8.66 – 11.36 m Spans: 14.06 – 22.06 m	- -	SK 10/50 SK 10/50	SK 10/60 SK 10/60	SK 10/60 SK 10/60	- -	- -
2.	Reinforced concrete simple beams without diaphragm (type 56): Spans: 8.66 – 11.36 m Spans: 14.06 – 16.76 m	- -	- -	SK 10/60 SK 10/60	SK 10/60 SK 10/60	- -	- -
3.	Pre-stressed wire beams: Spans: 11.36 m Spans: 14.06 – 16.76 m	- -	- -	SK 10/50 SK 10/50	SK 10/60 SK 10/60	- -	- -
4.	Pre-stressed double T beams: Spans: 16.76 m Spans: 18 – 33 m	- -	- -	SK 10/50 SK 10/60	SK 10/60 SK 10/80	SK 10/60 SK 10/80	SK 10/80 SK 10/80
5.	Simple slab with holes Spans: 18 m	-	-	SK 10/80	SK 10/80	-	-
6.	Simple slabs Spans: ≤ 4.5 m Spans: ≥ 4.5 m Precast reinforced concrete. Cast in place reinforced concrete	- - -	SK 10/50 - SK 10/50	SK 10/60 SK 10/50 SK 10/60	SK 10/60 SK 10/50 SK 10/60	SK 10/80 SK 10/50 SK 10/80	SK 10/80 SK 10/80 SK 10/80
7.	Precast reinforced concrete ribbed slabs	-	-	SK 10/60	SK 10/60	-	-
8.	Simple cast in place reinforced concrete beams with two cantilevers Central span: 14 – 17 m Central span: 21 – 27 m	- -	SK 10/50 SK 10/50	SK 10/60 SK 10/60	SK 10/80 SK 10/80	- -	- -
9.	Continuous reinforced concrete beams (Zuravlov type) Longest span: 15 – 18 m Longest span: 21 – 24 m	- -	- -	SK 10/50 SK 10/44	SK 10/60 SK 10/60	- -	- -
10.	Continuous reinforced concrete slabs with holes Spans: 12 – 15 m Spans: 18 – 24 m	- -	- -	SK 10/60 SK 10/50	SK 10/60 SK 10/50	- -	- -
11.	Continuous reinforced concrete T beams Spans: 12 – 18 m	-	-	-	SK 10/50	-	-
12.	Reinforced concrete frame bridges wit inclined piers	-	-	SK 10/60	SK 10/80	-	-
13.	Continuous reinforced concrete box girder – frame system bridges	-	-	-	SK 10/80	SK 10/80	-
14.	Individual designed bridges: Built till 1940 Built in period 1941 – 1960.g. Built in period 1960 – 1990.g Built after 1990.g.	- - - -	- - SK 10/50 -	- SK 10/50 SK 10/60 -	- SK 10/60 SK 10/80 -	- - SK 10/80 SK 10/80	- - SK 10/80 SK 10/80
15.	Composite steel-concrete continuous girders	-	SK 10/60	SK 10/80	SK 10/80	SK 10/80	SK 10/80
16.	Steel truss bridges	-	-	SK 10/60	SK 10/80	-	-

TABLE 4

Load capacity rating for bridges on the road A1 Riga – Estonian border

N.	Bridge	Acceptable ordinary traffic loads	Acceptable heavy traffic loads
1.	Bridge across river Gauja	SK 10/44	SK 10/50
2.	Bridge across river Brasa	SK 10/44	SK 10/80
3.	Bridge across river Stalbe	SK 10/44	SK 10/60
4.	Bridge across river Mellupe	SK 10/44	SK 10/80
5.	Bridge across river Krāčupe	SK 10/44	SK 10/80
6.	Bridge across river Strenčupe	SK 10/44	SK 10/50
7.	Bridge across river Seda	SK 10/44	SK 10/60

CONCLUSIONS

The proposed classification method describes the allowable loads as the working load classes and evaluates the load carrying capacity of the existing bridges. The similar structures are merged into the bridge stocks for which the evaluation of the minimum accepted load carrying capacity are carried out, taking into account the type and length of the load bearing structure, as well the values of the characteristic loads used in structural analysis.

Obtained results are more conservative compare to probabilistic or reliability approaches, but is sufficiently effective and simple.

Developed classification method will simplify the evaluation of load carrying capacity of bridge, will help to manage the existing bridges, improve the safety level on Latvian highway bridges and ensure safe loads transportation.

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Andris Paeglītis, Ainārs Paeglītis. Vienkāršota metode tiltu nestspējas novērtēšanai
Uz Latvijas autoceļiem šodien tiek ekspluatēti 926 tilti, no tiem 827 ir dzelzsbetona, 21 tērauda, 19 koka un 14 akmens tilti. Tie ir būvēti dažādos laikos, un katrs no tiem ir sava laika tehnoloģijas un aprēķinu metodikas liecība. Esošo tiltu nestspēja galvenokārt ir atkarīga no satiksmes slodžu lieluma. Pieaugot satiksmes intensitātei, it īpaši kravas transporta kustībai, svarīgi ir noteikt, kādu slodzi spēj izturēt tilti un ceļa pārvadi, kuri projektēti, izmantojot atšķirīgas projekta normatīvās (raksturīgās) slodzes. Darba mērķis ir izstrādāt metodi tiltu nestspējas minimālā akceptējamā līmeņa noteikšanai uz valsts autoceļiem, izmantojot slodžu klases. Piedāvātā metode klasificē visus raksturīgākos kravas transportalīdzekļu veidus, kā arī klasificē tiltu konstrukciju nestspēju atkarībā no laidumu konstrukcijas veida (ņemot vērā tās šķēluma pretestību) un to aprēķināšanā izmantotās normatīvās slodzes shēmas.Visi iegūtie lielumi apkopoti tabulās un zīmējumos. Izstrādātā metode ļauj ātri un vienkārši novērtēt tilta nestspēju un iespēju transportēt pār tiltu virsnormatīvu smagsvara slodzi. Analizējot tiltu konstrukciju darba apstākļus un īpatnības, var izdalīt dažus galvenos tiltu ilgmūžību nodrošinošos faktorus, kas cieši saistīti ar aprēķina metožu un projekta slodžu izmaiņām laika gaitā. Šie faktori ir projekta slodzes, nesošo konstrukciju nestspējas un stiprības aprēķina metodes, tai skaitā pielietoto materiālu īpašības un pareizas ekspluatācijas (ikdienas) slodzes izvēle. Ņemot vērā, ka aplūkotās dzelzsbetona konstrukcijas ir sastopamas ne tikai Latvijā, bet arī Lietuvā un Igaunijā, šā raksta piedāvāto metodi var izmantot minēto valstu dzelzsbetona tiltu drošuma noteikšanai.

Андрис Паэглитис, Айнарс Паэглитис. Упрощенный метод оценки несущей способности мостов
Сегодня на латвийских дорогах эксплуатируются 926 мостов, из них 827 железобетонных, 21 металлических, 19 деревянных и 14 каменных. Эти мосты построены в разное время и являются свидетелями технологической и расчётной методики того времени. Несущая способность мостов в большой степени зависит от транспортных нагрузок. При увеличении интенсивности сообщения, особенно тяжелого транспорта, важно определить несущую способность мостов и путепроводов, построенных в различное время и по различным нормативным временным нагрузкам от подвижного состава на автомобильных дорогах, предусмотренных в строительных нормативах того времени. Целью работы является разработка метода для определения минимальной несущей способности мостов методом классификации нагрузки. Предлагаемый метод классифицирует все типичные виды тяжелого транспорта, а также классифицирует несущую способность мостовых конструкций в зависимости от вида несущей конструкции моста (с учетом сопротивления сечения) и схемы нормативной нагрузки. Предложенный метод позволяет быстро и достаточно просто определить несущую способность моста и определить возможность транспортировки сверх нормативной нагрузки. Ввиду того, что рассмотренные железобетонные конструкции встречаются не только в Латвии, но и в Литве и Эстонии, предложенная методика может быть применена для определения несущей способности и в этих странах.