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**Autor:** Vereschagin, Andrey  
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## Reconstruction of Bridges in the Historical Centre of St. Petersburg

Reconstruction de ponts dans le centre historique de Saint Petersburg

Wiederaufbau von Brücken im historischen Zentrum von Sankt Petersburg

**Andrey VERESCHAGIN**

Design Eng.

Lengiprotransmost Design

St-Petersburg, Russia

### 1. INTRODUCTION

St-Petersburgh, founded in 1703, occupied the territory in the mouth of the Neva river, which included about 40 islands, separated by rivers, channels and canals with their total number now reaching 86. Due to such situation, the builders had to erect bridges for connection of different parts of the new city from the very beginning. First of them were wooden-made and don't exist. First stone bridges appeared in 1760ies and some of them are still working. Later on first russian cast-iron, steel and concrete bridges were built in St-Petersburgh, forming distinctive outlook of the city's centre, contributing much to it's graceful silhouette.

For the last period of time city authorities have faced the necessity of reconstruction of the bridges, built between 1760 and 1916, because they were no longer capable to withstand the needs of transport from the points of their width, reliability and shipping conditions underneath. Serious deformations and damages made further service of some bridges dangerous. During the restoration work there appeared several methods of approach, depending upon architectural and transport requirements and conditions of existing structures.

### 2. PRESERVATION OF EXISTING STRUCTURES

This method was applied, when it was possible to use old structures after their strengthening. Examples:

- the Laundry bridge across the Fontanka river, built in 1769 as 3-span stone arch, faced with granite. It's piers' foundations were strengthened after the appearance of serious deformations and cracks of stone superstructure;
- the Upper Swan bridge across the Swan canal, built in 1768 as one-span stone arch. All it's constructions were remained and only new water-protection and asphalt were laid;
- the Kazan bridge across the Catherine canal, built in 1805 as one-span brick-work arch. After the guniting of the arch it's still working at the main city's thoroughfare-the Nevsky avenue.

### 3. RESTORATION OF OLD CONSTRUCTION IN NEW MATERIAL

This method was applied in the cases, when serious damages made further usage of old material impossible, but the old bridge had architectural value. Examples:

- the Hermitage bridge across the Winter canal, built in 1766 as one-span stone arch. It's stone arch was changed for concrete one, faced with granite, of the precisely same dimensions, after the appearance of serious destructions of old superstructure and piers' foundations;



- the General Post Office pedestrian bridge across the Moika river, built in 1824 with one-span suspension superstructure. After serious damages of the chains and pylons two extra piers were built, completely spoiling it's appearance. Recently it received original outlook after capital reconstruction.

#### 4.ERECTION OF A COMPLETELY NEW BRIDGE

This method was used, when existing bridge hadn't got any architectural value, but a new bridge had to provide harmonious unity with surrounding ensemble. Examples:

- the Italian pedestrian bridge across the Catherine canal. It's new one-span steel girder, decorated in the classical traditions of 19 century, changed wooden construction and became integral part of the heart of St-Petersburgh;
- the Second Winter bridge across the Winter canal. It's concrete arch, faced with granite, replaced old wooden superstructure, repeating the outline of the First Winter and the Hermitage bridges and giving an excellent finishing touch to the ensemble of the Winter canal.

#### 5.CHANGING OF ELEMENTS OF BRIDGE'S CONSTRUCTION

This method was used, when a part of a bridge had to be replaced due to certain circumstances, with a new construction becoming an integral part of the whole bridge. Examples:

- the Trinity bridge across the Neva, built in 1903. It's swing span failed to withstand the requirements of shipping, being only 22,8m wide. It was replaced by the bascule span, providing 43m clearance for ships, going by the Volga-Baltic water way. The outline of the new span produced the impression of continuation of old constant superstructure. Newly-built concrete arch, connecting the pier of the bascule span with the left bank of the Neva, made the whole construction completed, coinciding with the outline of the existing arches near the right bank;
- the Old Kalinkin bridge across the Fontanka river, built in 1780ies. It's removable central span, once used for shipping of sailing vessels, was changed by the stone arch, similar to the adjacent;
- the Big Okhta bridge across the Neva, built in 1911. During forthcoming reconstruction only the bascule span and the deck will be changed and it's 136m arch trusses will be preserved.

#### 6.CHANGING OF THE WHOLE OLD SUPERSTRUCTURE

This method was applied during the reconstruction of the Liteiny bridge across the Neva, built in 1879. It's old piers were widened, using the starlings, which made possible to install new continuous steel girder instead of former iron arches, having the carriageway's width increased from 18 to 28m. The swing span with the width 19,8m was replaced by the bascule one, providing 50m clearance. The new superstructure had got the original length of the spans and curvilinear outline, resembling old arches. The new bascule span with the outline, similar to the constant one, provided the completed and continuous silhouette to the whole construction.

#### 7.CONCLUSION

The choice of the method of reconstruction was made in each case after thorough inspection of the bridge's condition, archive studies, consultations with architects and art critics. This provided the opportunity to preserve unique architectural ensembles, strict and graceful view of St-Petersburgh.