Complete Structural Protection of the World's Largest Cable Stayed Bridge

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Summary

With a main span of 1104m, the Russkij Bridge in Vladivostok posed as a landmark for the Asia-Pacific Economic Summit held at Russkij Island in 2012. The structural protection was tailored to fit the peculiar exigencies of the structure (the world's longest cable stayed bridge), subject to extreme seismic and weather conditions. Additionally, the construction phase brought about a further challenge due to wind-induced vibrations occurring when the bridge cantilevers were not yet connected and 25MN longitudinal force was transmitted over a bolted temporary locking system.

Keywords: *cable dampers, hydraulic dampers, horizontal guide bearings, expansion joints, noise reduction*

1. INTRODUCTION

The Russkij Bridge features the world's largest main span for a cable stayed bridge (1,104m) and with 580m also the world's longest stay cables. Despite the challenging environmental conditions the bridge had to be designed for, consisting of major winds with a design speed of 36.68 m/s and a maximum earthquake magnitude at the bottom of the Japanese Sea of 8.1 on the MSK-64 scale, with probability of being exceeded once in 5000 years.

Fig. 1 Russkij Bridge

Also the construction mode posed a major challenge when the 2 cantilevers were not yet connected and subject to major vibrations caused by wind loads.

The structural protection system which mitigates the effects on such a monumental structure from environmental impacts and loads is composed of the following:

1. Stay cable dampers to act not only in their first mode, but also in modes 2 to 4, which may jeopardize the structural stability.

2. Viscous dampers as energy dissipaters to mitigate a potential seismic attack and as lock-up units for wind impacts (7 million load cycles)

3. Special horizontal load bearings at the pylons which have to cater for 20,000kN lateral force and 25,000kN longitudinal force which only occur in the construction phase. After completion, the

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