



## Loss of cable – design criteria for cable stayed bridges

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### Abstract

In Cable stayed Bridge design a loss of a cable is an accidental /extreme event, that may govern the design of the superstructure, pylon, or the cables. The common design method is to use linearization of the event by applying a dynamic amplification factor for the force effect. Another option is to perform dynamic analysis; however, the method is not standardized, widely used, nor is instructed in the standards.



*Figure 1. New Kirjalansalmi Bridge, illustration.*

Kirjalansalmi bridge in Parainen, Finland, is an old suspension bridge at the end of its service life. The bridge will be replaced by a new medium size of cable stayed bridge. In the preparation of the design basis, the phenomena of cable loss were studied by different methods. The aim of the study was to find reasonable requirements for the detailed design, so that the design will be reliable whilst not leading to too conservative design nor unnecessary cost increase. In this paper, the results of this study are presented.

**Keywords:** cable stayed bridges, stay cable, loss of cable, dynamic amplification, dynamic analysis, Eurocodes.

### 1 Design Description

The planned new Kirjalansalmi Bridge is a medium size cable stayed bridge, with a 250 meters long main span. The main span of the bridge is supported by two pylons (54,5 meters and 63 meters high from the deck level) with 7 + 11 pairs of cables. The pylons are free standing towers above the deck level and are connected by a cross

beam below the deck. The back spans are 80 meters and 120 meters long. The asymmetric structural layout is justified due to the terrain profile, especially regarding the soil conditions for the foundations. The superstructure is planned to be integral at Northern abutment, and continuous for the whole bridge length, including the approach spans. All intermediate supports are equipped with movable bearings, and the expansion joint is