Methods for analysing heavy transports on existing bridges

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Heavy transport vehicles that surpass the weight limits of a bridge can in some cases be given special permission for passage. If permission is given is based on an approach provided by the Swedish Transport Administration. Two methods used in Sweden were compared and evaluated. Grave inconsistencies were found with differences up to 50 percent regarding computed permissible weight that can pass a bridge.

All bridges in Sweden are categorized into four classes. The classes determine how heavy a passing vehicle is allowed to be. When a vehicle is too heavy, special computations can be performed to check if a vehicle can be permitted to pass anyway. For these computations, an approach is specified in guidelines provided by the Swedish Transport Administration. Two methods that are based on these guidelines are Brokontrollen, by the Swedish Transport Administration, and TungTransport by Tyréns AB. What differ between the methods is how bridges are modelled (how reality is approximated).

Despite being based on the same approach, Brokontrollen and TungTransport showed great discrepancies when they were compared. Which method allowed heavier transport varied from bridge to bridge. The results from the thesis show Brokontrollen permitted between 30 % lower and 50 % higher loads (weight) than TungTransport. A clear trend that was found was that TungTransport permitted higher loads for tensioned structures.

Furthermore, some variables that contribute to the difference between the two methods were identified. Firstly, a certain model (the mid-bridge model) in TungTransport was found to give questionable results. Secondly, TungTransport uses the axle widths of vehicles as input data for the permit computation while Brokontrollen does not. It was found that changing the axle width had a significant impact on the results from TungTransport and therefore the difference between the methods. Lastly, in some cases TungTransport was found to underestimate how much load a bridge can carry by not fully following the guidelines for the approach by the Swedish Transport Administration guidelines.

Due to the large discrepancies, it might be difficult to decide which method to use in practice. One might even question the approach implemented in the two methods all together. Depending on if the more or less conservative permission results are chosen, there is a risk for either unnecessary detour costs or bridge damage (repair costs). However, due to built-in safety margins in the bridge carrying capacity and additional margins from the implemented approach, one could argue to go for the less conservative results (given the models in the methods are not faulty).