

## Nordic method for assessment of bearing capacity at the pavement edge

Corresponding author: Johan Granlund – [johan.granlund@vectura.se](mailto:johan.granlund@vectura.se)



Co-authors: Jan M Jansen and Sebastian Pettersson

Traditional pavement bearing capacity analysis is based on an assumption of infinite geometry without road edge; "geometric compatibility". This is a simplification that leads to systematic under-dimensioned pavements at roads with narrow shoulders. The need for a model for analysis of bearing capacity at the road edge was in fact pointed out by Nils Odemark already in 1956. Weak edges exhibit fast deterioration, resulting in damages such as rutting, cracking and roughness in the outer (truck) wheel path. The problem of weak edges has been given much focus in Finland, Sweden and Norway. Some 10 % of budgets for maintenance of paved roads are spent on repair of edge deformations. For truckers, road edge damages bring serious risk for loss-of-control crashes. The crash type where most truck drivers are injured is the rollover. The high CoG. makes heavy trucks prone to lateral forces, such as from roll-vibration at non-uniform road edge deformations. In the Nordic countries, over 1 000 truck rollovers occur every year. Numerous trucks are carrying Hazardous Materials that, in case of leakage, may lead to severe environmental impact. Roll-related lateral buffeting is particularly hazardous on ice-slippery surfaces, as it may cause the truck (or driver, by improper maneuvering) to skid. Sustainable road edges require a relevant method for analysis of bearing capacity. Such a method has been in use in Denmark for decades. The Danish method has now been updated. The model shows that with regular 0.25 m shoulder, the outer wheel path may have as little as 45 % of the bearing capacity at the road center. Sensitivity analysis shows that key factors are slope towards ditch, shoulder width, depth of ditch and pavement bearing capacity at the road center. The analysis method is currently being reviewed in the Norwegian Durable Roads programme, where achieving stable road edges have been given top priority. The method has also made an immediate impact on the largest road reinforcement project ever in Sweden, the 157 km Pajala iron ore express road, a road that will be serving a 90 ton high-capacity truck every 7<sup>th</sup> minute starting in 2013. Since the problem with weak edges is shared also by Finland and Iceland, the method for analysis of bearing capacity at the road edge has potential to become a harmonized practice in our Nordic countries.