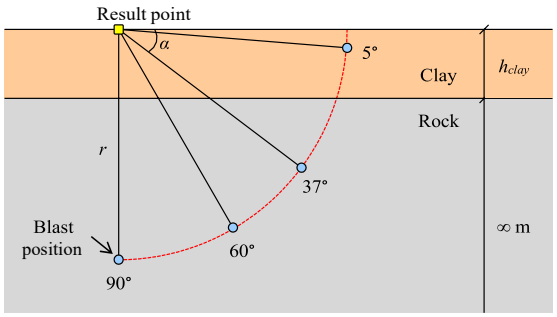
Blast induced ground vibrations

Blasting in rock induces ground vibrations, which in turn may cause structural damage to nearby buildings. To reduce the risk of such damages, restrictions are imposed on the speed of rock excavation, e.g. on the choice of method used or on blasting levels. The Swedish Standard states guidelines for vibration values that are permitted to avoid damage to buildings and structures. These values depend on e.g. distance and overburden type and are based on empirical research made in the 1960s. However, in many international standards the guidance levels are based on frequency analyses, and hence, the Swedish guidelines are considered obsolete and criticisms have been raised concerning their validity. Further, the influence of e.g. overburden is unclear, especially in a case where it consists of various materials and/or various type of foundation is used in the same building.

There is a desire in the industry to update the Swedish standard to more realistic guidance levels for vibrations and base this on more modern findings. To do so, though, better understanding is needed of how the load (i.e. vibrations) is affected by various parameters such as blast position, ground conditions and foundation type.

Vibrations in ground due to nearby blasting in rock



Influence of blast position and ground conditions

In this project the effect on the blast induced vibrations will be studied, and it will start with a literature survey, including:

- understanding of wave propagation, vibrations and damping,
- understanding of why vibrations cause damage to a structure, and how different properties influence the risk of damage,
- interaction from vibrations and buildings; important parameters are building type, material (e.g. concrete, steel, timber), type of overburden (e.g. rock, clay) and type of foundation (e.g. slab or piles).

The master's thesis is part of a current research project carried out at Chalmers, at Division of Dynamics and Division of Structural Engineering, and will be a continuation of a previous thesis project and recently published work from Chalmers. The goal of Chalmer´s research project is to produce knowledge that can be used in the development of the future Swedish standard regarding blast induced ground vibrations. This master´s thesis is a part in this and will mainly focus on how the ground vibrations are affected by various geometrical and material conditions; a parametric study will be carried out using a linear elastic finite element model, e.g. in COMSOL or Abaqus.

The master's thesis project is carried out as a co-operation between, Division of Dynamics and Division of Structural Engineering, both at Chalmers, and Norconsult. Supervisor will be Morgan Johansson (Norconsult/Chalmers, Structural Engineering) and examiner at Chalmers will be Peter Folkow (Chalmers, Division of Dynamics). Further, the progress of the master´s thesis will be followed by a reference board consisting of representatives from Swedish Transport Administration and Nitro Consult.

Deadline to apply for this Thesis project at Norconsult during 2022 is set to October 24, 2021. If applying to more than one project, please rank the projects in order of interest.

Send your application (personal letter, CV and copy of grades) to Morgan Johansson (morgan.johansson@norconsult.com).

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