

CIVIL • ENVIRONMENTAL • MANUFACTURING • MINING • OIL & GAS • POWER GENERATION

## PROJECT DESCRIPTION

SINTEF Building and Infrastructure

Trondheim, Norway



Griddle™

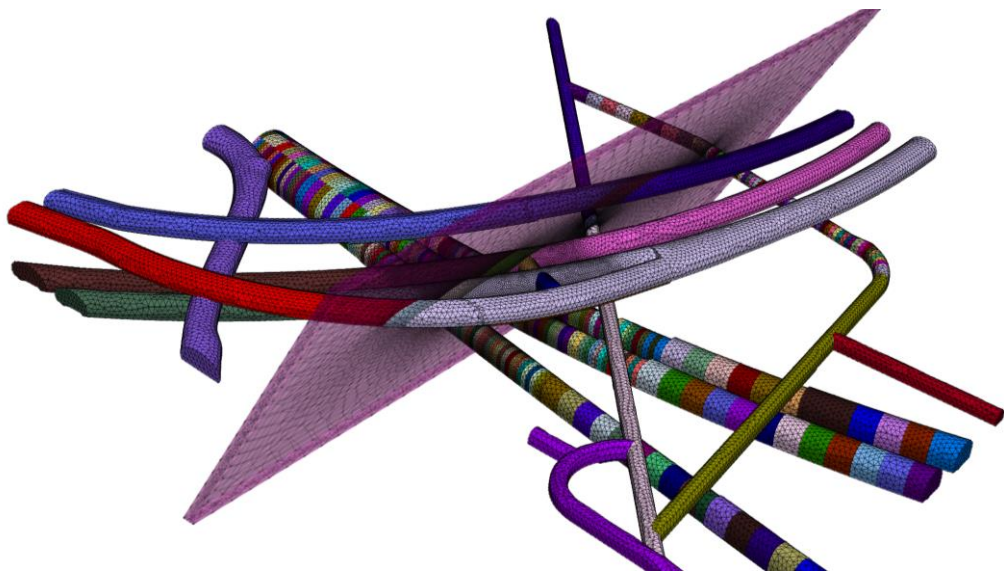
The Follo Line project is the largest railway project in Norway in modern times. The Follo Line is a high-speed railway partly in tunnel from the traffic hub at Ski to Oslo central station. The project comprise a 20 km long tunnel. The new railway is passing through central Oslo, beneath existing infrastructure which creates challenging conditions due to overlapping tunnels and multiple intersections. In order to minimize disturbance and unnecessary impact on the surrounding environment a majority of the Follo Line is excavated using TBM, with some sections excavated by drill & split - without using explosives. SINTEF has installed a monitoring and warning system to ensure the overall stability during construction of the new tunnels. A part of this job also necessitated the use of a numerical model due to the challenging conditions. These challenges include the distance between existing and new tunnels of a about 4 m and no disruption of traffic flow in the existing tunnels during construction of the new tunnels. The modelled section was excavated using drill & blast and drill & split.

## ITASCA'S ROLE

Itasca created a geometry model for SINTEF, using Itasca's pre-processor *Griddle*. The model contains a fault which intersects multiple tunnels. A detailed excavation sequence was included in the model with a total of 379 groups. A blast damage zone of 0.7 m beneath the existing Ekebergs tunnels was added to simulate damage induced to the rock mass during the excavation of Ekebergs tunnels.

## PROJECT RESULTS

The project resulted in a geometry file ready for analyses. SINTEF performed all the calculations and post-processing.



*Model geometry for the long tunnel for the Follo line, with the tunnel divided into excavation sequences.*