

Face logging in Copenhagen Limestone, Denmark - DTU Orbit (08/11/2017)

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The requirement for excavation support can be assessed from face logging. Face logs can also improve our knowledge of lithological and structural conditions within bedrock and supplement information from boreholes and geophysical logs. During the construction of 8 km metro tunnel and 4 km heating tunnel in Copenhagen more than 2.5 km face logs were made in 467 locations at underground stations, shafts, caverns and along bored tunnels. Over 160 geotechnical boreholes, many with geophysical logging were executed prior to construction works. The bedrock consists of Paleogene "Copenhagen limestone" and face logs show a sub-horizontally layered structure, with alternate extremely weak to extremely strong beds of variable thickness. The rhythmicity is thought to be climatically controlled. Stronger beds represent reduced sedimentation rate related to climatic deterioration while weaker beds result from high sedimentation rate in a warmer climate. Large scale level differences are explained by post-depositional tectonic activity and glacial disturbance. Local physical and biological variations have affected diagenetic processes, causing minor lateral variations in strength and bed thickness. The induration degrees recorded in face logs and boreholes are compared and correlated. Distinct geophysical log markers are used to divide the limestone into three units. These marker horizons are correlated between face logs and geotechnical boreholes. A 3D model of the strength variations recorded within the limestone is presented along with a longsection showing the sub-horizontal layering. Knowledge of the lateral bed continuity can be used to predict challenging levels within the limestone and levels more favourable for tunnelling.

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