DRIFTSÄTTNING AV EN SKJUVTESTUTRUSTNING MED EN UNIK KAPACITET

Webinarium

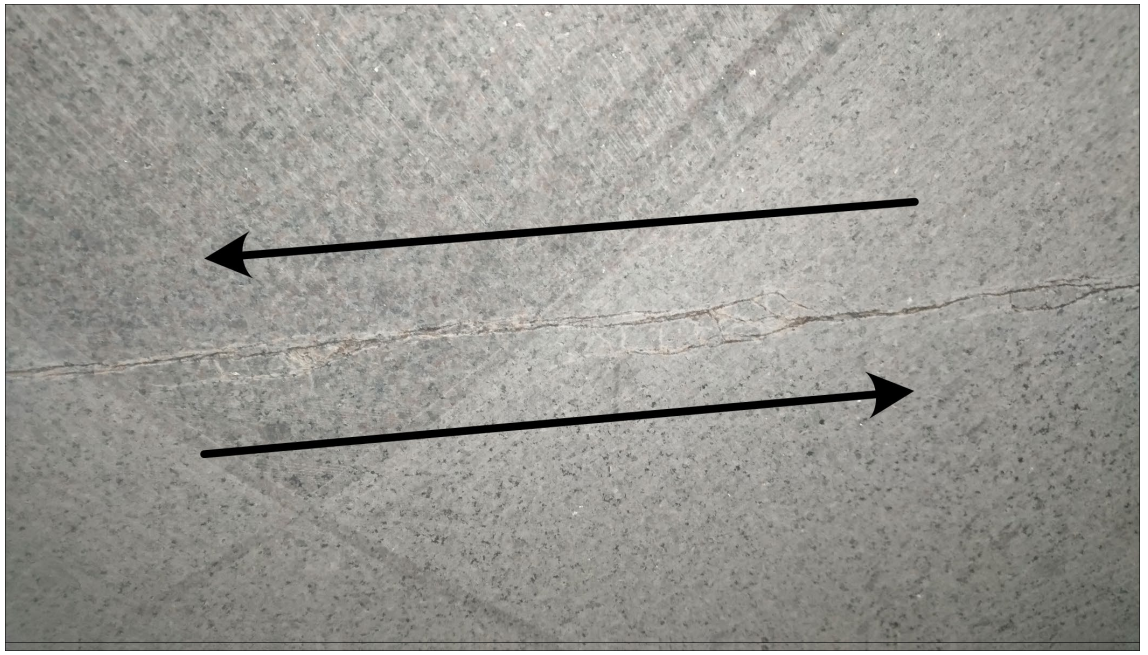
31 maj, 2023

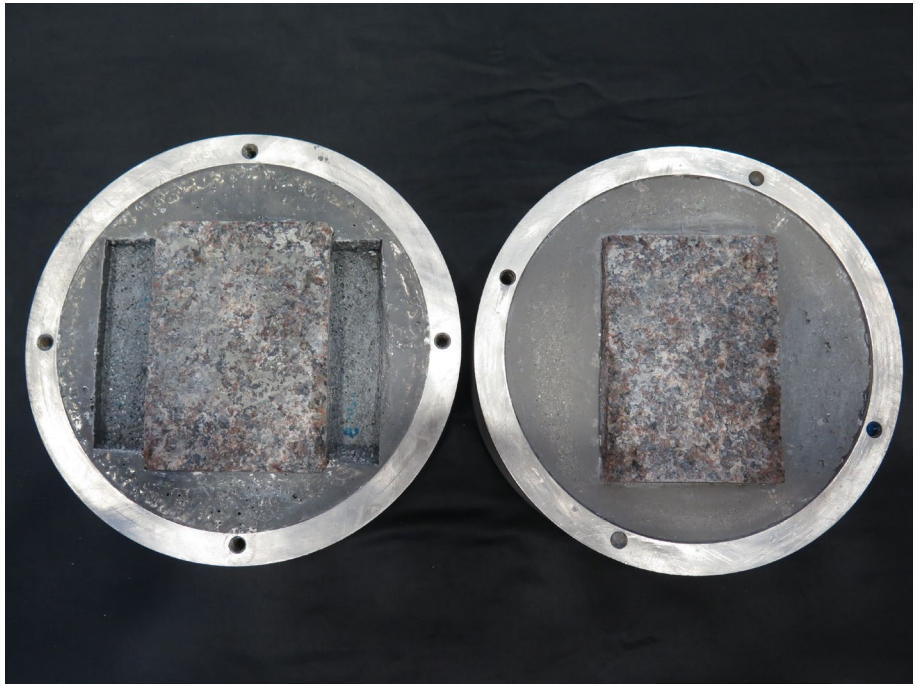
Jörgen Larsson

Research Institutes of Sweden

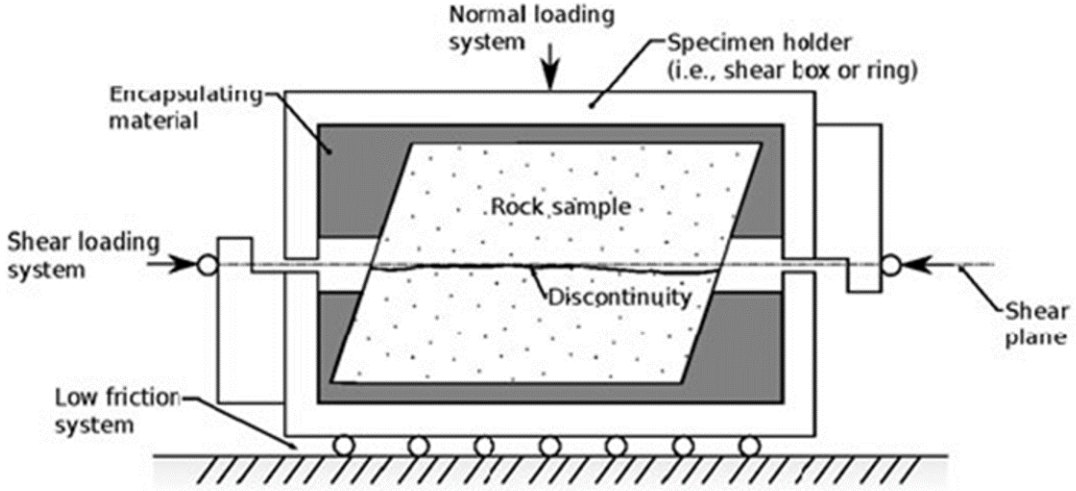
Material and Production
Chemistry and Applied Mechanics

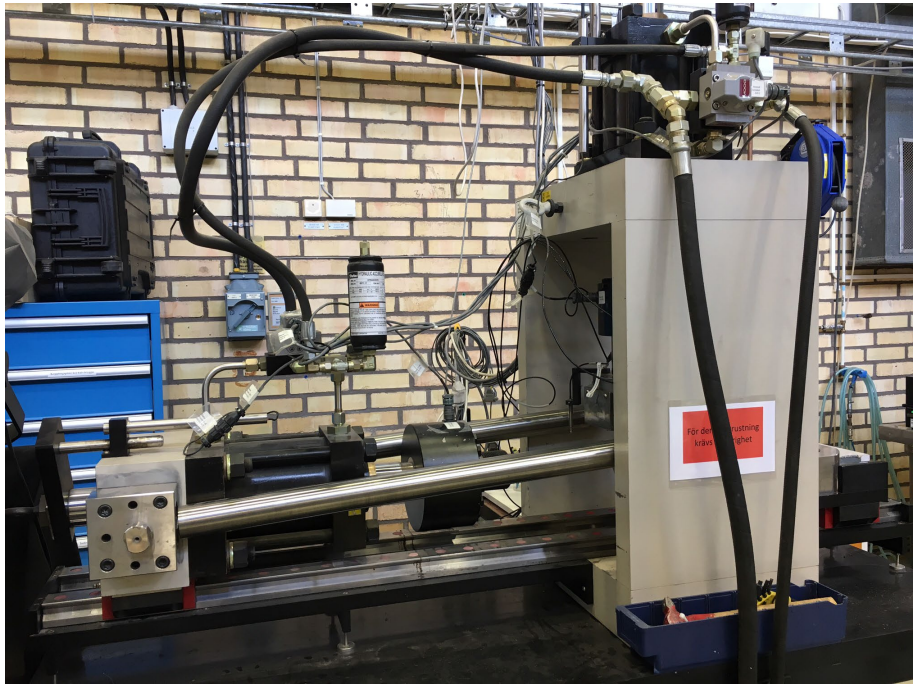
Bakgrund

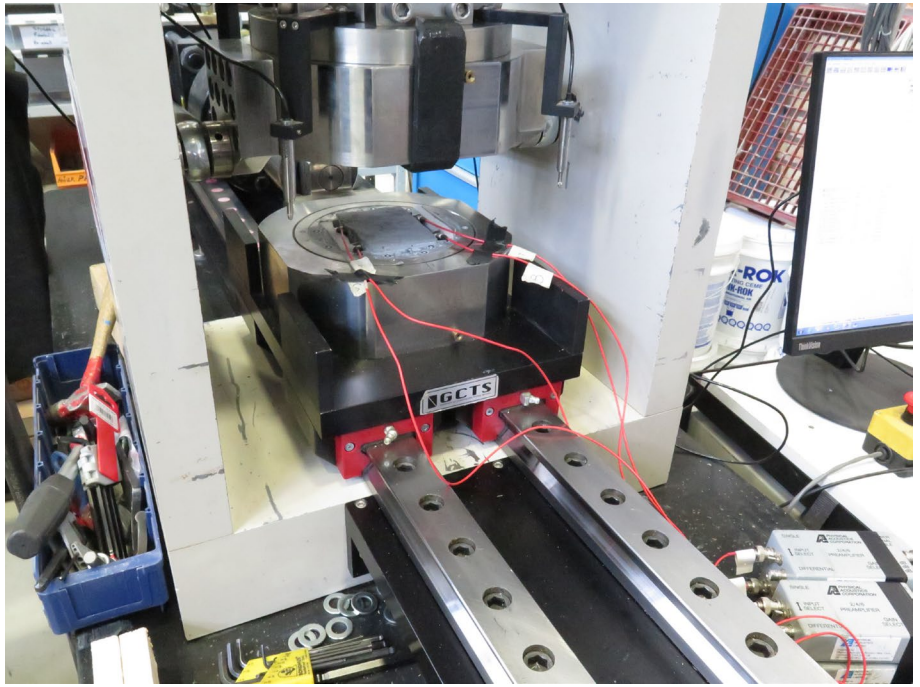




Bakgrund


Normal loading system
Specimen holder (i.e., shear box or ring)
Encapsulating material
Rock sample
Shear loading system
Discontinuity
Shear plane
Low friction system

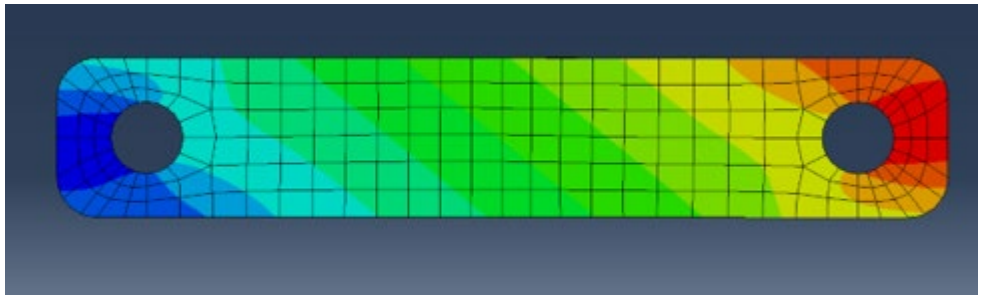


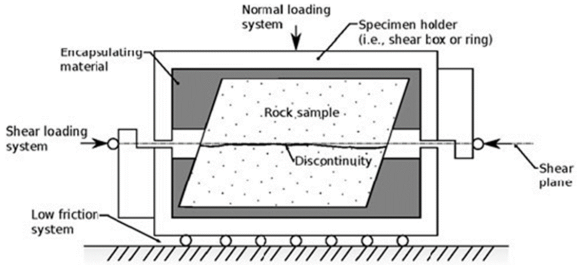

NGCTS

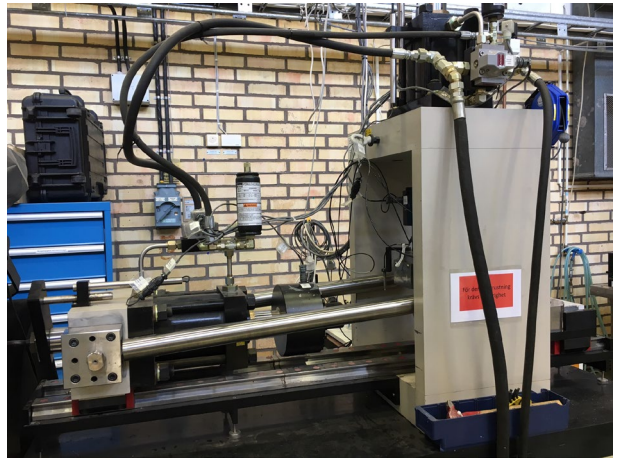
Konstruktionsspecifikation

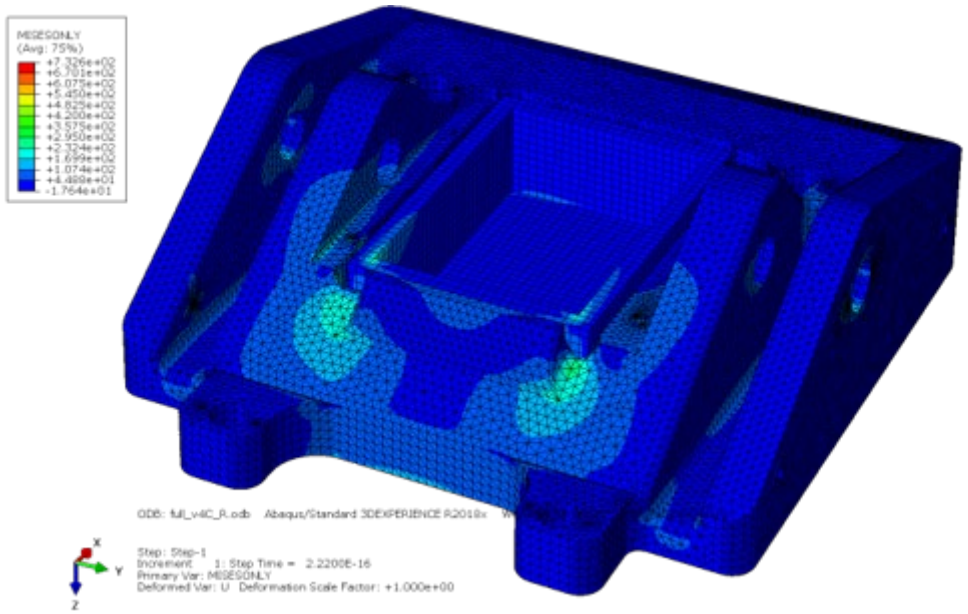
- Max. yttermått (m.a.p inbyggnadsmått i pressen) och maxvikt (m.a.p. traversens kapacitet)
- Dimensioner provkroppar: 200 – 600 (L), 200 – 400 (B), < 350 (H) [mm]
- Maximalt tillåtna förskjutningar: 70 mm i skjuvriktning, 50 mm i normalriktning
- Maxlast: 5 MN (skjuv- och normallast), 3.5 MN i skjuvriktningen vid minusrörelse
- Säkerhetsläge för arbete med provet med utrustningen riggad i pressen
- 20 mm justermån för variation av sprickans vertikala utbredning
- Utrymme för montering av AE-sensorer och DIC
- Transportsäkring
- Hål för lyftöglor i alla delar för all tänkbar hantering
- Positioneringssystem mellan skjuvtestutrustning och rullbord samt mellan rullbord och golv
- Distansblock för separation av undre och övre skjuvbox vid riggning och lagring

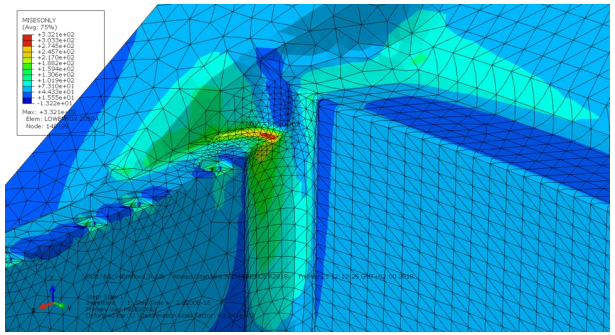
Finita elementberäkningar

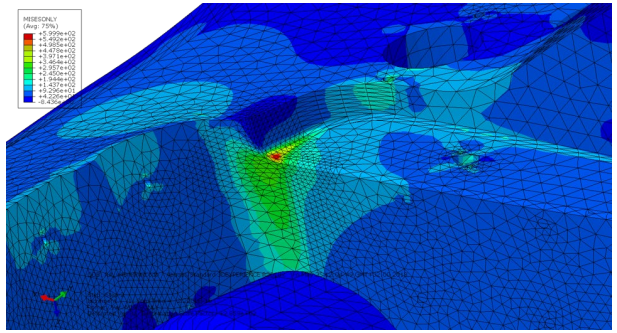


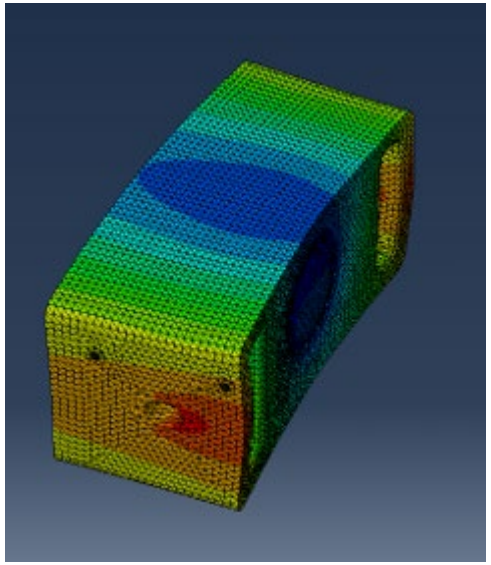




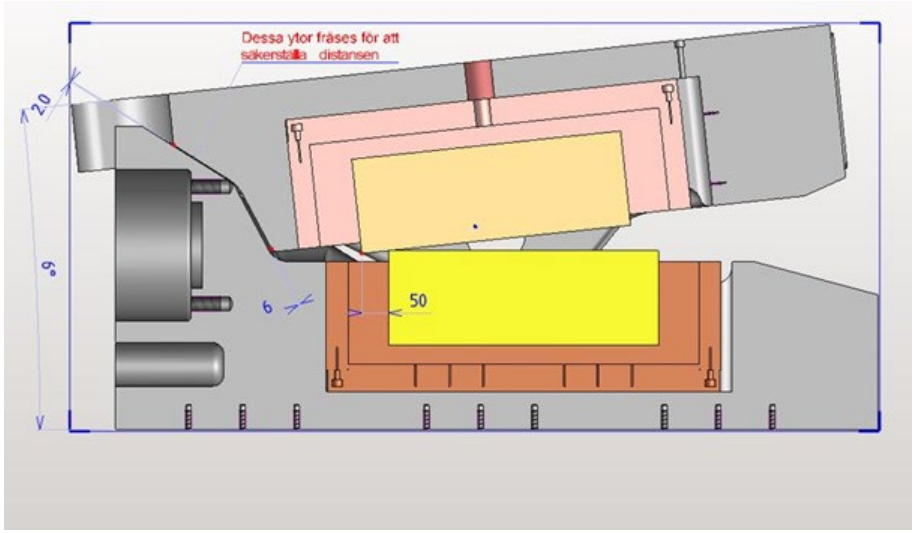


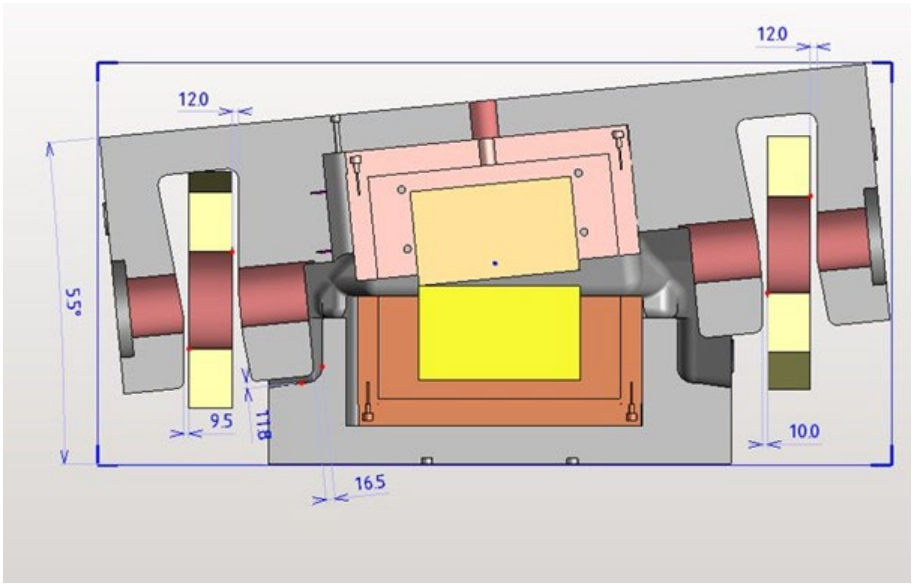


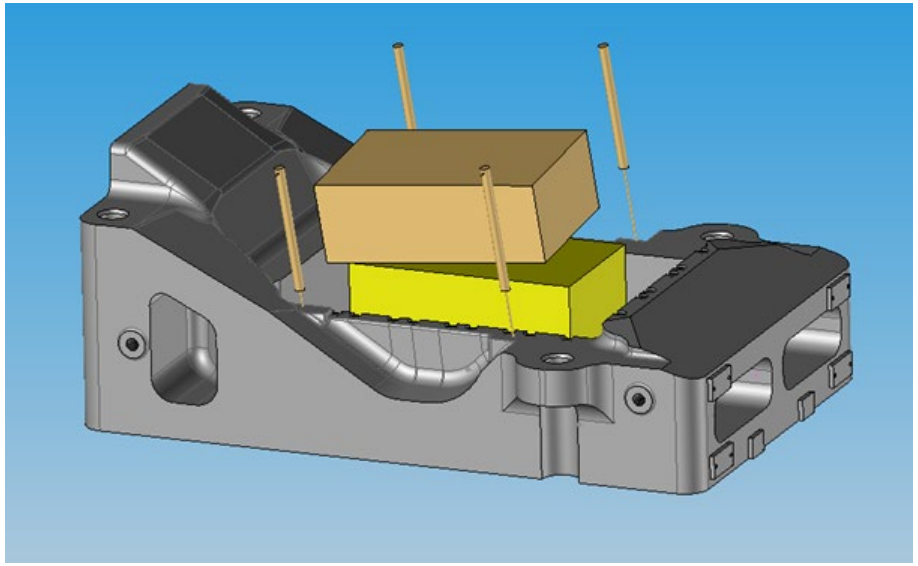


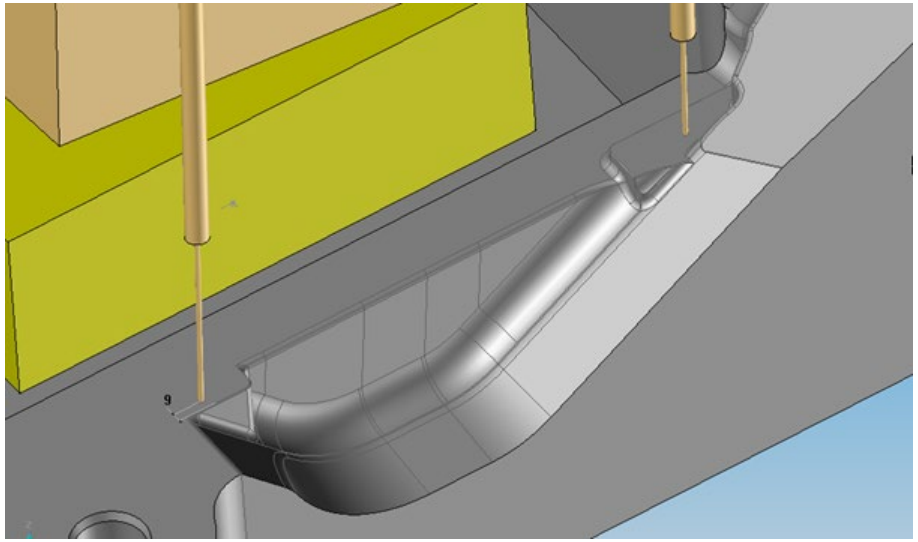


Tiltanalyser



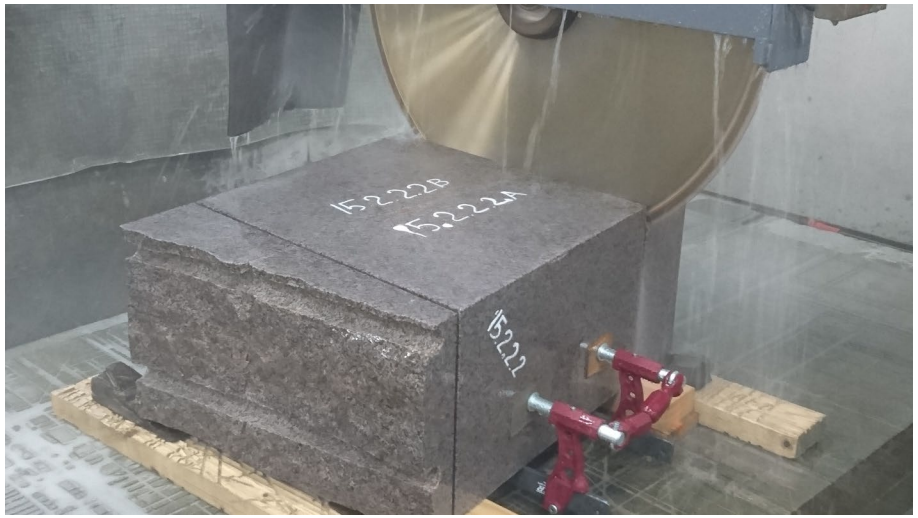




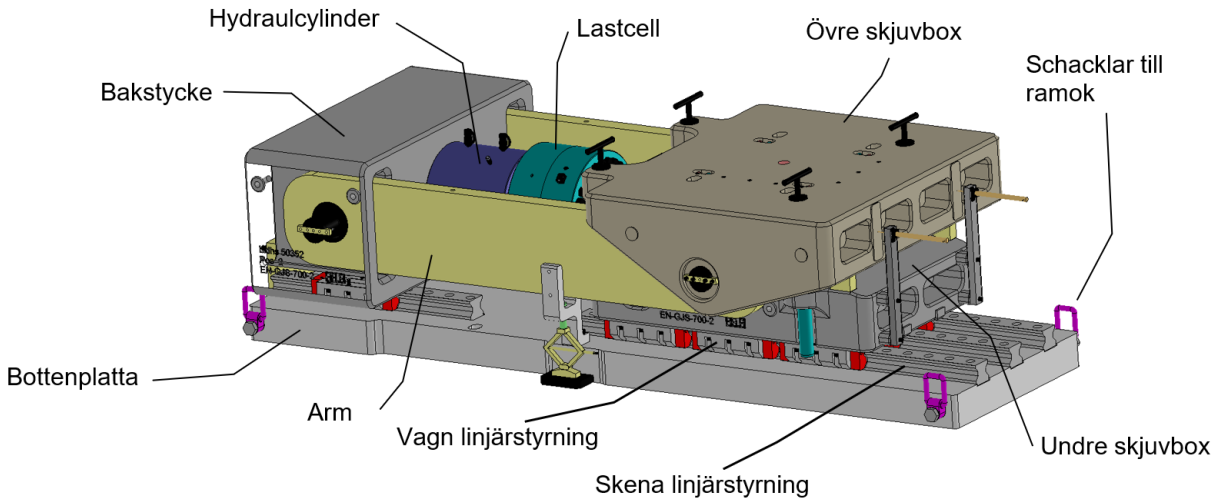


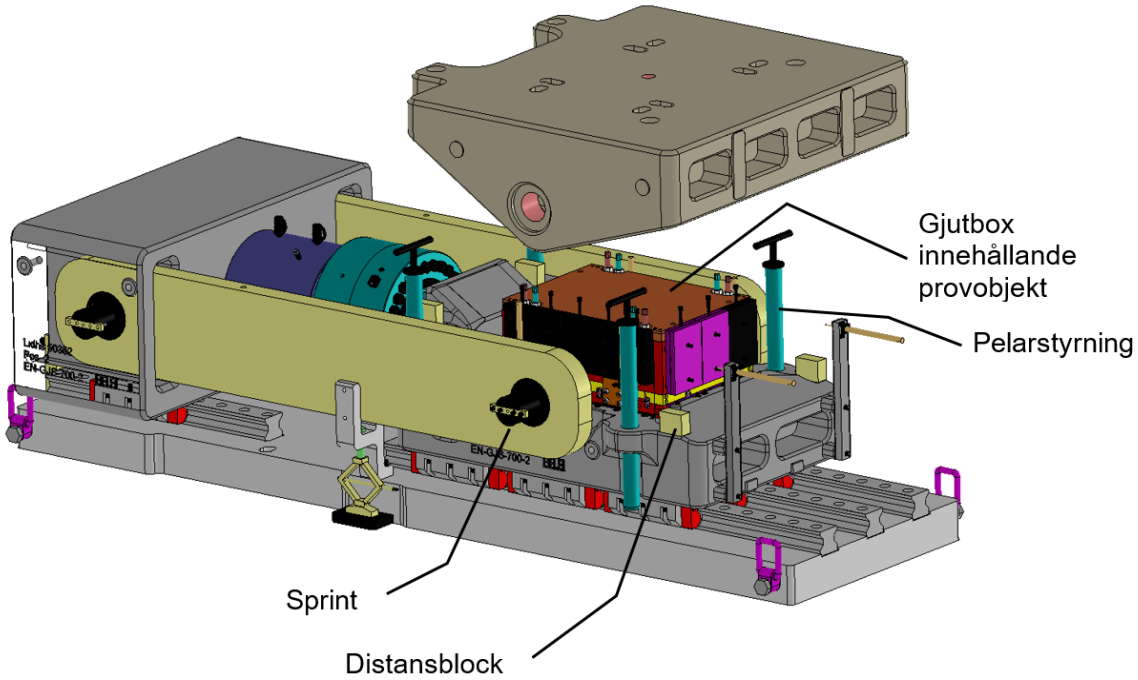
Inköpta komponenter

Sprickan måste hållas fixerad till start av skjuvtest

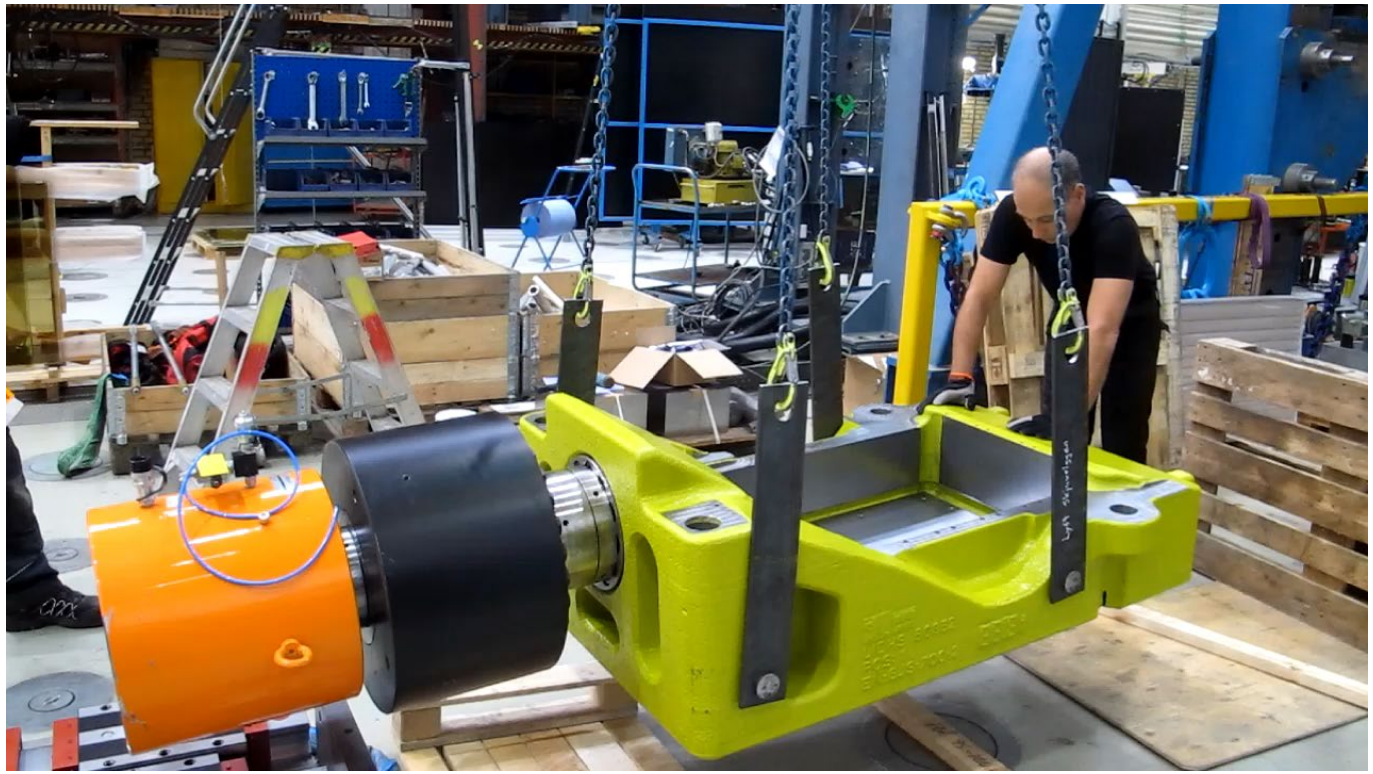


Slutlig konstruktionsutformning i mars 2019



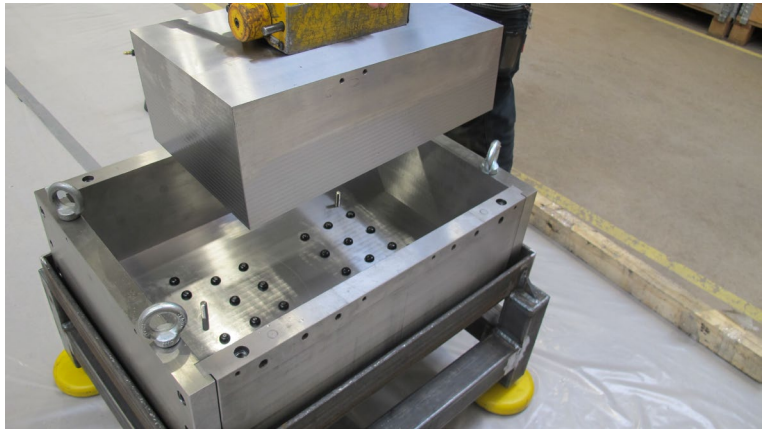


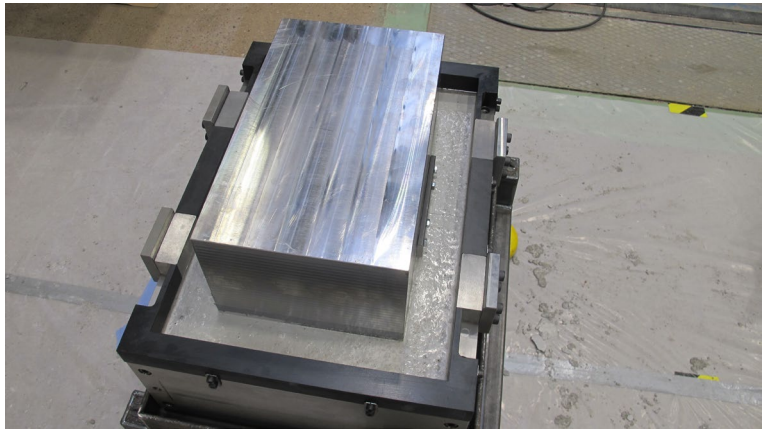
Leverans juli 2019

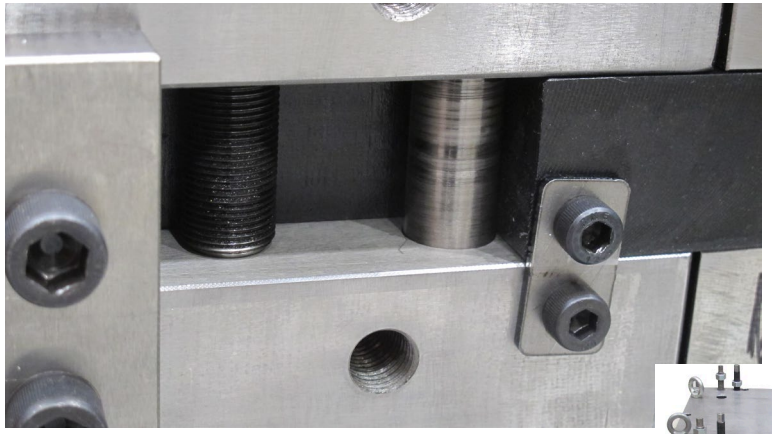


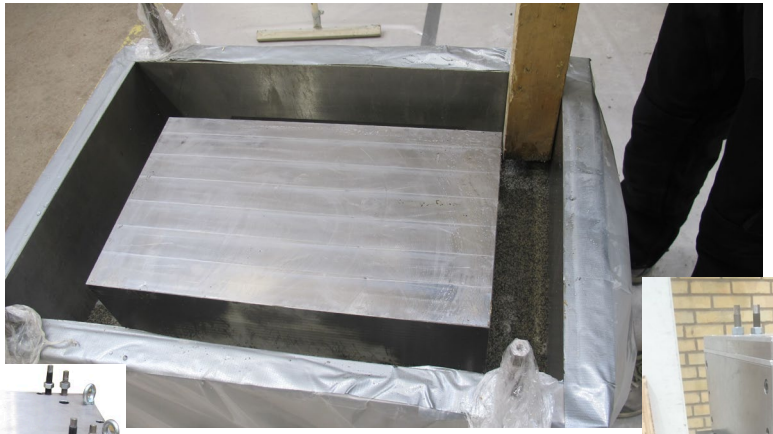
Styrsystem

Inprovning: Ingjutning stålprov

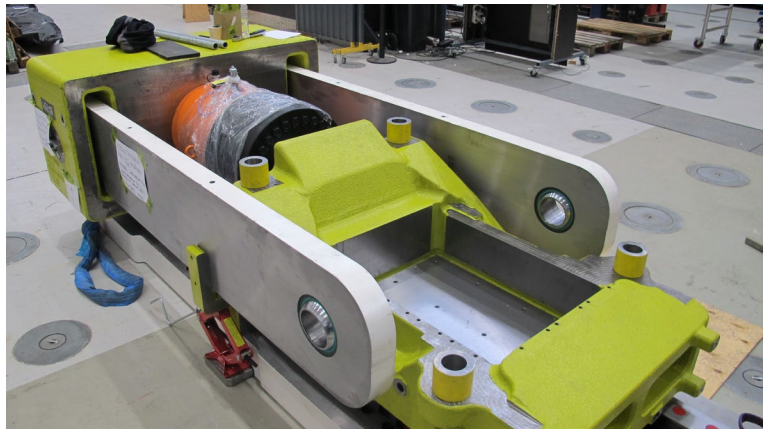


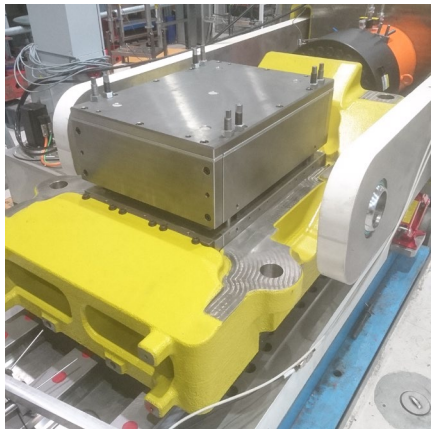


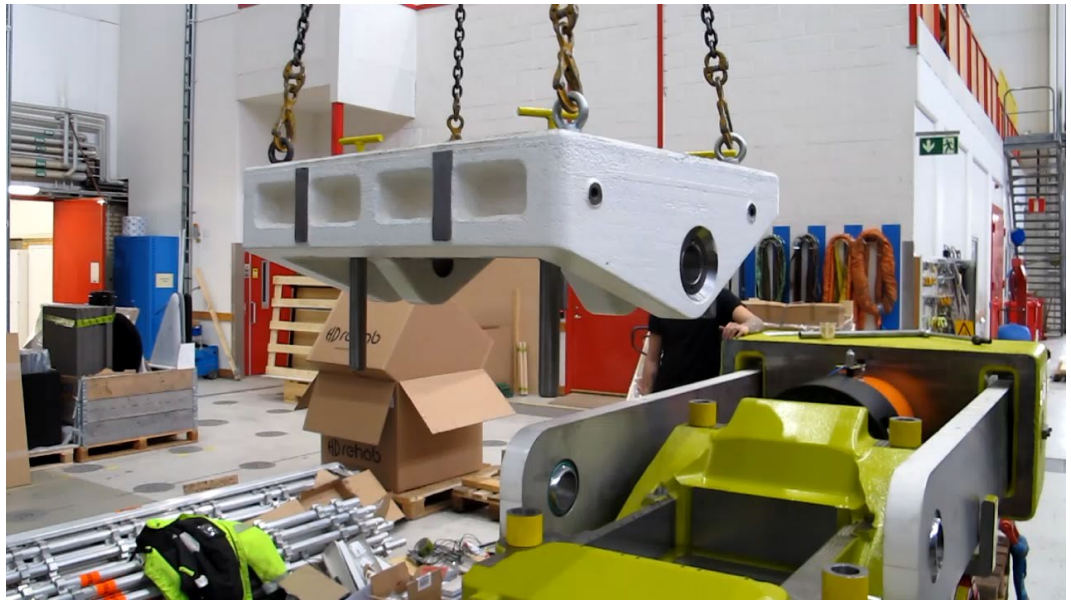


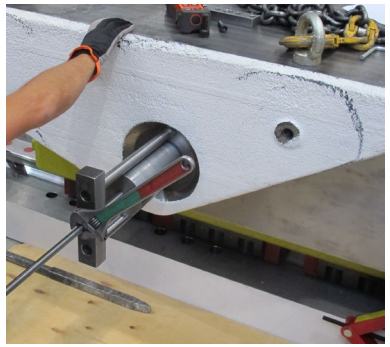


Inprovning: montering av provobjekt

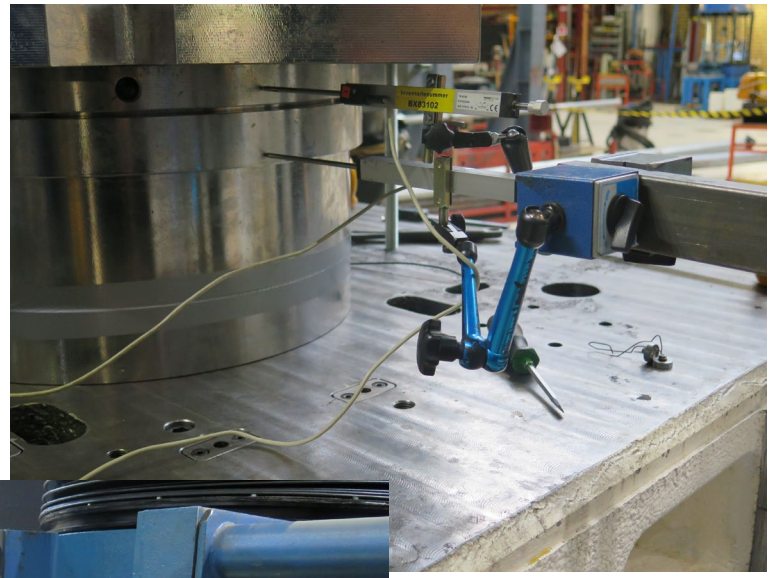


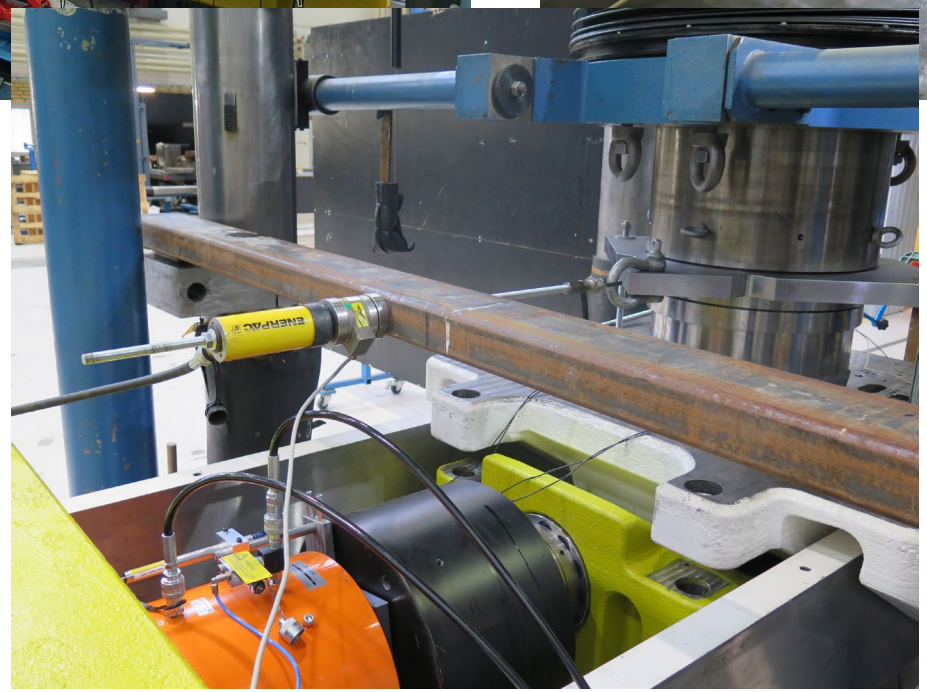




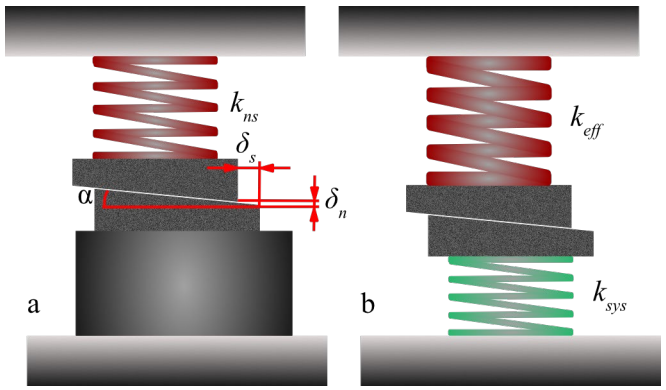


Inprovning: kontroll av kraftöverföring till pressen

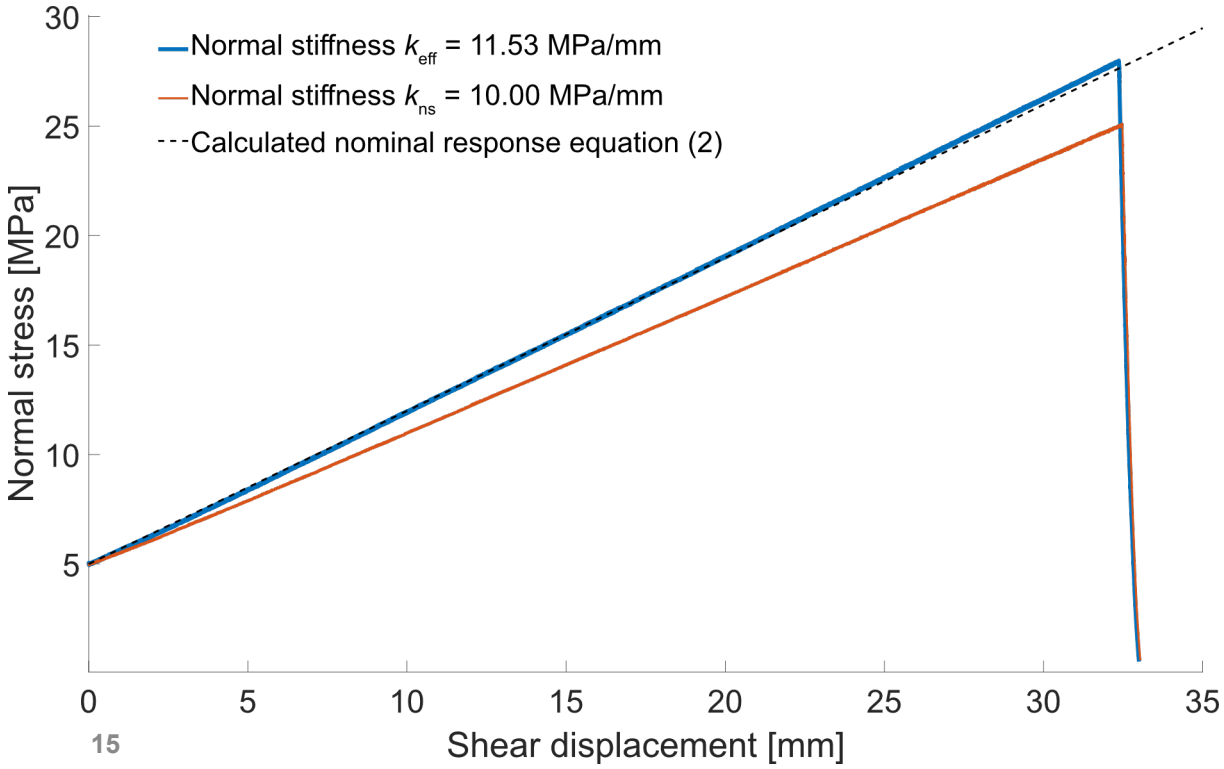


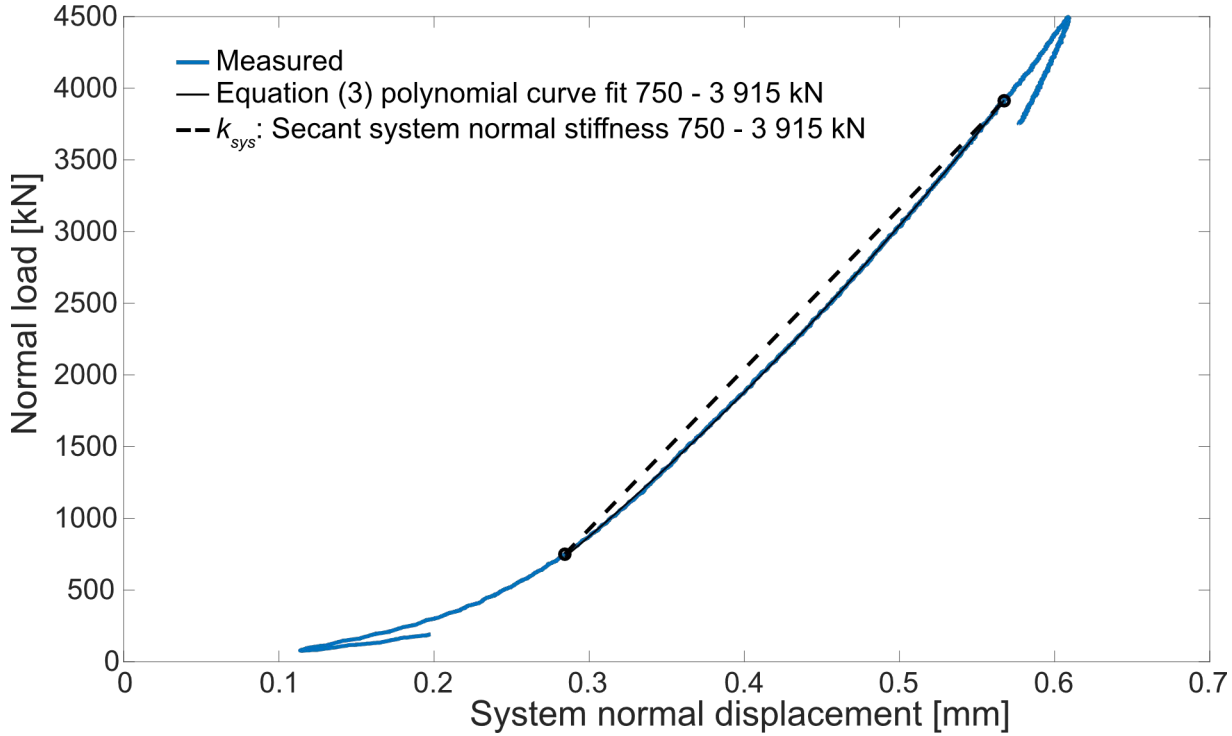


Inprovning: Intrimning styrsystem och styvhetsmätning



$$k_{eff} = k_{ns}\left(1 - \frac{k_{ns}}{k_{sys}}\right)^{-1}$$





Inprovning: Intrimning styrsystem och styvhetsmätning

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Original Paper | Open Access | Published: 08 February 2020

An Approach to Compensate for the Influence of the System Normal Stiffness in CNS Direct Shear Tests

J. Larsson & M. Flansbjer

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1998 Accesses | **5** Citations | Metrics

Abstract

Applying accurate normal load to a specimen in direct shear tests under constant normal stiffness (CNS) is of importance for the quality of the resulting data, which in turn influences the conclusions. However, deficiencies in the test system give rise to a normal stiffness, here designated as system normal stiffness, which results in deviations between the intended and actual applied normal loads. Aiming to reduce these deviations, this paper presents the

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Experimental investigation of the system normal stiffness of a 5 MN direct shear test setup and the compensation of it in CNS direct shear tests

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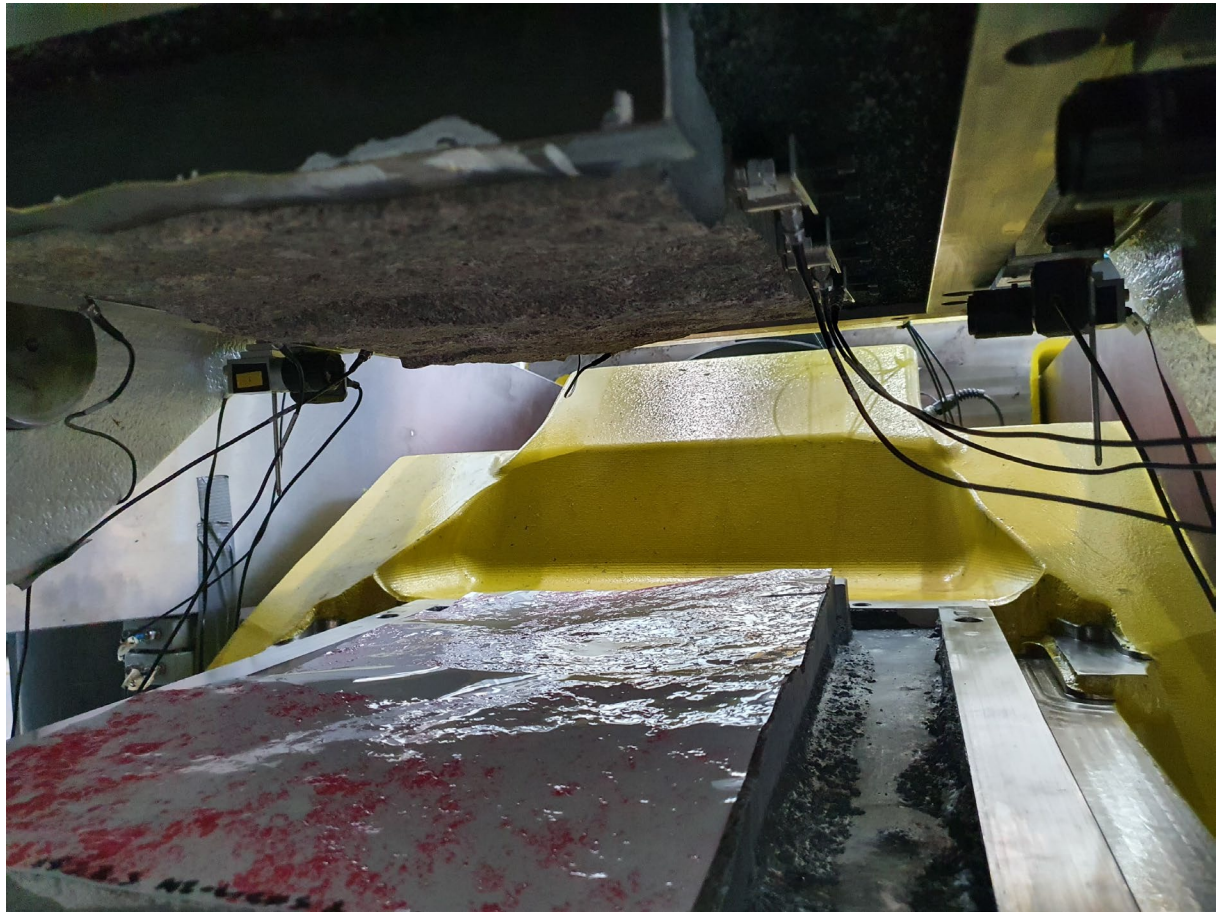
Abstract. Experiments at constant normal stiffness (CNS) are normally carried out to understand underground shear processes of rock joints. However, in many test setups the available space around the joint is limited implying it is not possible to measure the dilatancy directly over the joint. Therefore, the displacement transducers must be in locations where the risk is that additional displacements originating from deficiencies in the test system will be measured causing too low normal loads to be applied. Herein, this issue is investigated in a new 5 MN direct shear test setup. The system normal stiffness was found to be about 11 300 kN/mm derived from normal loading up to 4.5 MN using a steel specimen. The direct shear testing performance under the CNS configuration was evaluated using the steel specimen, which had a joint with a known angle of inclination. The normal load error at 3.9 MN (28 MPa) was 11%, but by application of the effective normal stiffness approach using the system normal stiffness as input the error basically could be eliminated. The results demonstrate the robustness of the setup designed for joint areas up to 400 x 600 mm with normal and shear loads up to 5 MN.

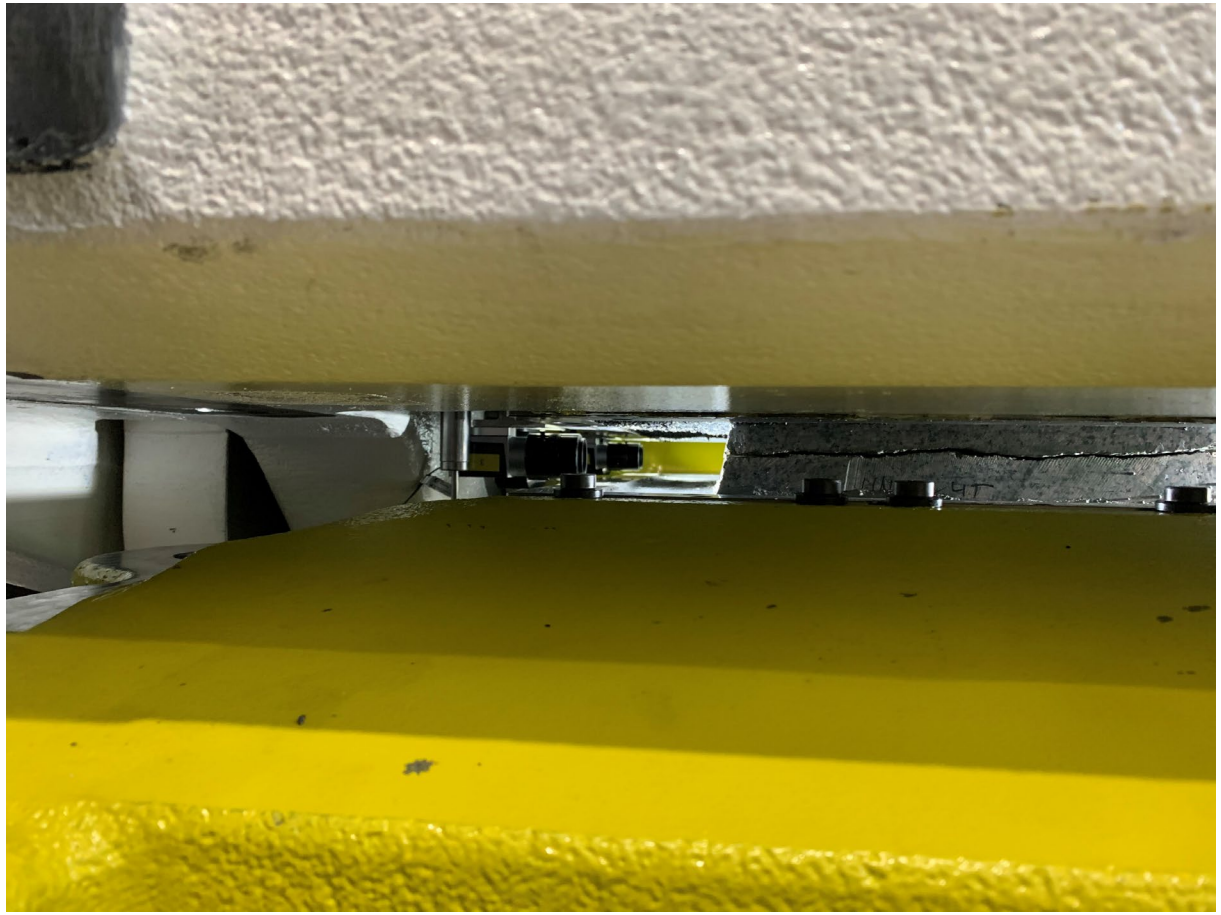
1. Introduction

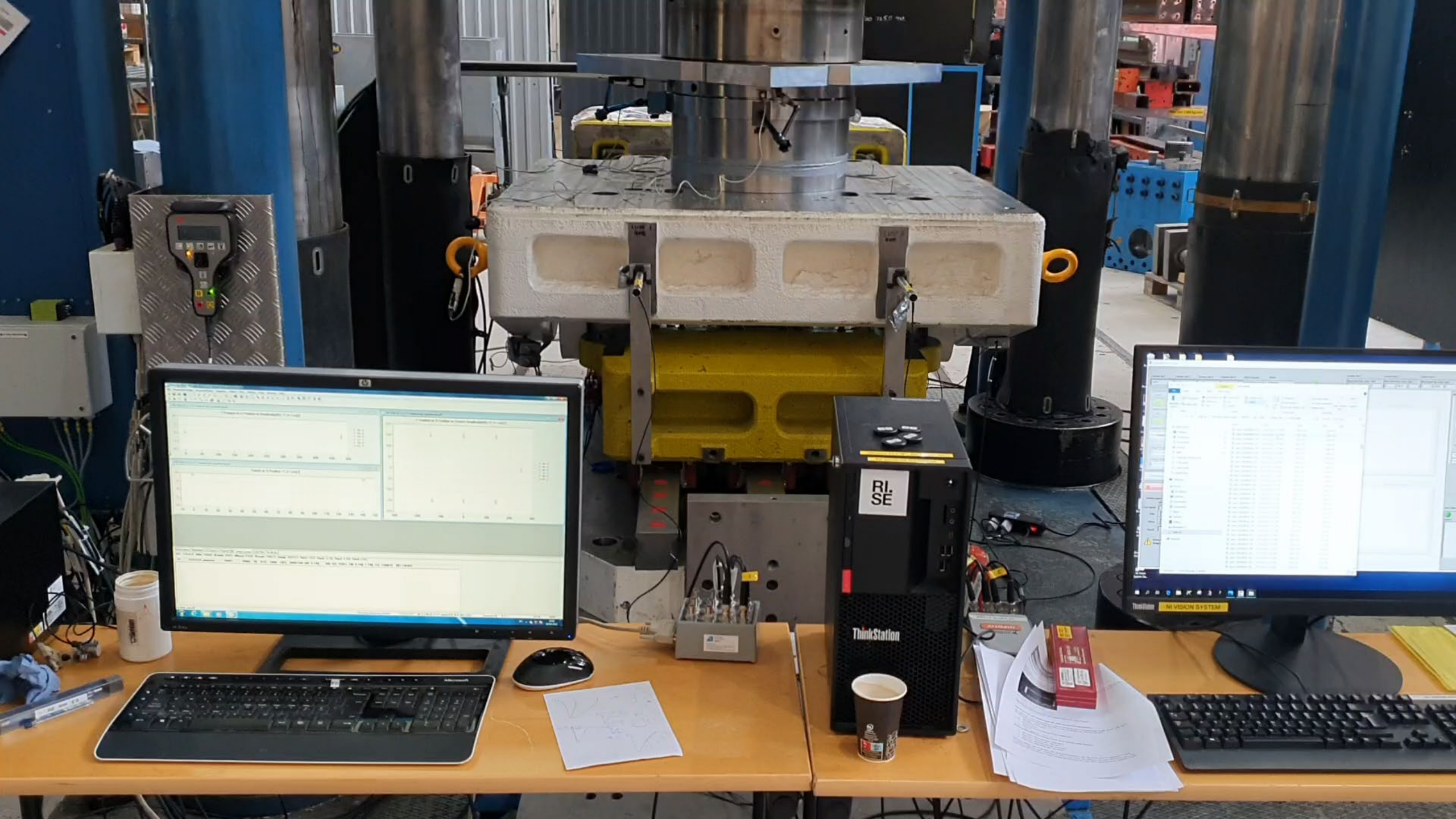
Joints influence the stability of rock masses and the structural integrity of geotechnical structures. Joint shearing is a critical failure mode having an impact on the structural integrity of geotechnical structures [1]. Examples of factors influencing the shear strength are normal stress, infilling materials, surface roughness, compressive strength of the joint surface, joint matching and possibly the scale of the joint surface. However, in situ investigations are for both technical and economic reasons not always feasible [2]. Much of the research work relies therefore on data from laboratory direct shear testing which covers a broad range of topics. Examples among several others are morphological characterization by [3] [4], replica studies by [5] [6], development of shear strength models by [7] [8], experimental studies on shear behavior by [9] [10] and investigation of the shear strength of the interface between the rock and surrounding materials by [11] [12].

Constant normal load (CNL) and constant normal stiffness (CNS) are two frequently applied boundary conditions in laboratory direct shear testing. Slope stability problems are simulated by application of CNL and the conditions in underground excavations are simulated by application of

Driftsatt skjuvtestutrustning



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Tack för ert deltagande

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