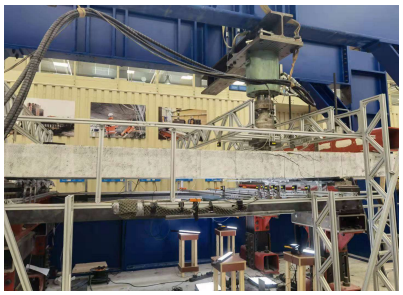
Modelling of the shear behaviour of reinforced concrete members without shear reinforcement under complex boundary conditions

Background

- **Using the Critical Shear Displacement Theory(CSDT) to evaluate the shear behavior of reinforced concrete members without shear reinforcement**

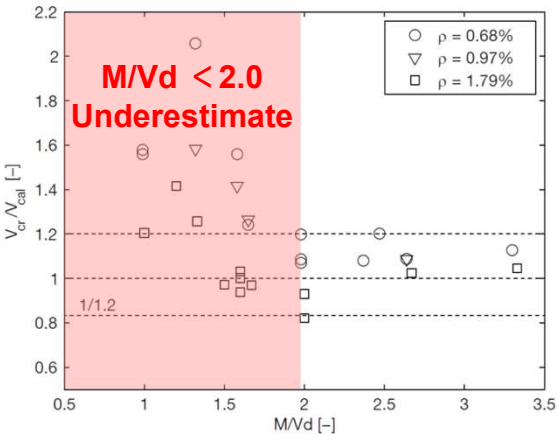
Simply supported bridge

Continuous supported bridge



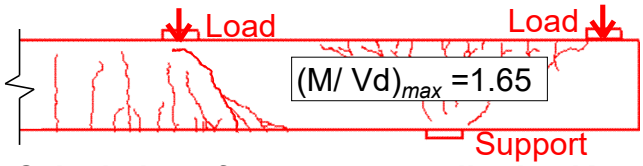
Continuous supported slab

Limitations & critical issues

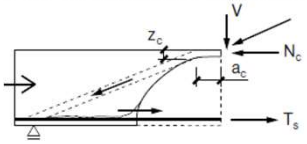


Relationship between V_{cr}/V_{cal} and M/Vd

- **The inclination of critical shear crack**



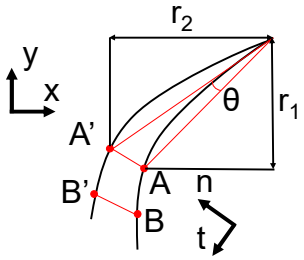
- **Calculation of concrete contribution V_c**



- **Mechanism of the formation of critical shear crack**

Methodology

- **Aggregate interlock force based on curved crack**



$$\Delta x = r_1 \times \theta$$
$$\Delta y = r_2 \times \theta$$

$$\Delta n = \Delta x sin\alpha - \Delta y cos\alpha$$
$$\Delta t = \Delta x cos\alpha + \Delta y sin\alpha$$

- **Concrete contribution based on differential equation**

$$\left(\frac{M}{E_c I}\right)' = \left(\frac{d^2 y}{dx^2}\right)'$$

Expected results

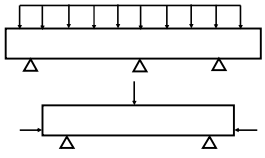
M/Vd ≥ 2 — Simply supported

M/Vd < 2 — Continuous supported

CSDT for a full range of M/Vd

Extension

- Distributed load
- Prestressed member
- Continuous supported slab



TU Delft concrete structures

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