Compression testing of concrete

Concrete is the most widely used material in modern construction, and its **compressive strength** is a key property that determines its ability to withstand applied loads. This property plays a crucial role in ensuring the **structural integrity and durability** of buildings, bridges, and other infrastructure. Compressive strength represents concrete's resistance to axial forces that apply pressure, making the material compress. Proper evaluation of this characteristic is essential to prevent failure and ensure long-term reliability.

Objective

The aim of this case study was to evaluate **full-field displacement and strain data** during a **compressive strength test** on concrete. Using **Digital Image Correlation (DIC),** the test provided detailed insights into **strain distribution and crack propagation** as the material was compressed until failure.

Description of the Case Study

A **block-shaped concrete specimen** was subjected to **compressive loading** until structural failure. The test was performed using **a single 5 MP iDS camera** capturing images at **75 fps** to track the deformation process. DIC technology was used to map **full-field strain distribution**, allowing for an in-depth understanding of how the material responds under pressure.

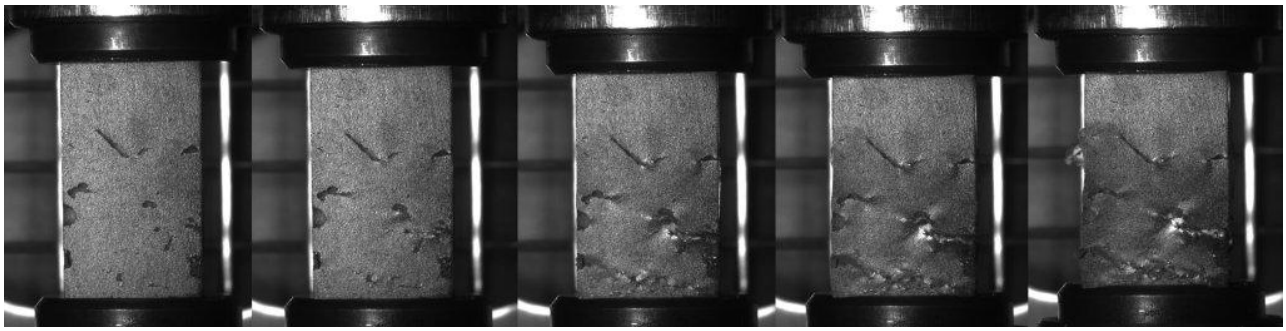

Fig 1: Sequence of loading phases, showing the concrete specimen under increasing compression.

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Visual Results

❖ **Full-field strain mapping** enabled the visualization of how stress was distributed across the surface of the specimen.

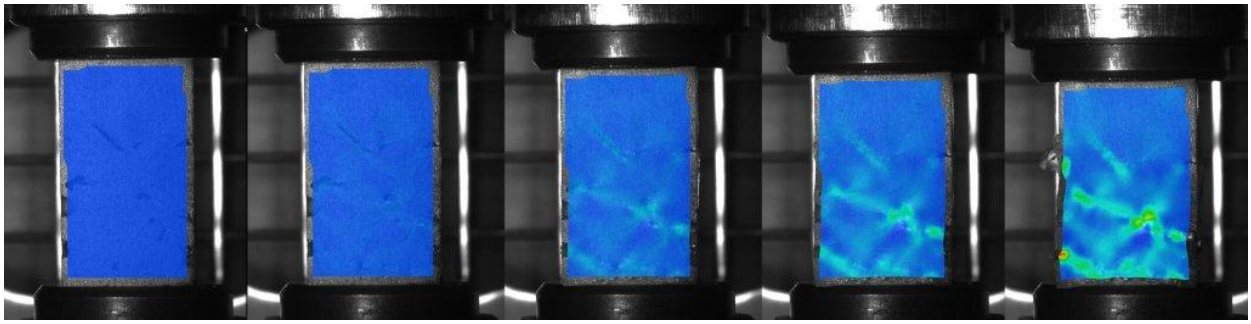

Fig 2: DIC-based full-field overlay, revealing displacement, strain concentration

Advantages of Using DIC for Compression Testing

❖ **Non-contact, full-field measurement** of strain and displacement.

❖ **High precision in detecting deformation** even before visible cracks appear.

❖ **Quantifiable strain distribution** that enhances understanding of material behavior.

❖ **Post-processing capabilities**, enabling further analysis and comparison.