

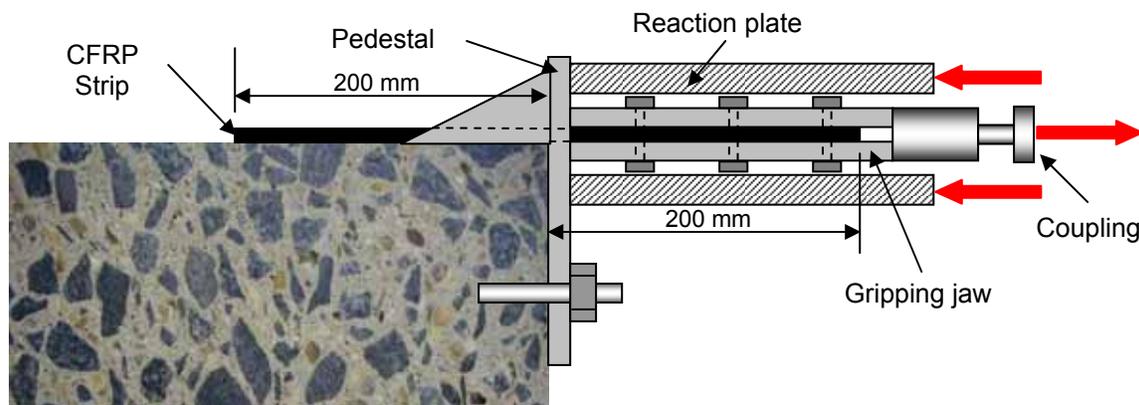
### Purpose

The **DSS-TEST** is used to measure the direct shear bond strength of a carbon fiber reinforced polymer (CFRP) laminate bonded to concrete.

### Principle

CFRP laminates are used as external reinforcement to strengthen existing concrete structural elements. The laminates are bonded to the concrete with epoxy adhesives. The effectiveness of the CFRP laminates to act as external reinforcement relies on adequate shear bond strength with the concrete. The **DSS-TEST (Direct Shear Strength-TEST)** measures the shear bond strength of 50-mm wide CFRP strips with a 200-mm bonded length to a concrete element *in-situ* or in the laboratory.

The CFRP strip is bonded to the concrete element using the manufacturer's recommended adhesive. The strip is bonded perpendicular to the edge of the concrete so that it extends 200 mm beyond the edge.



After the adhesive has cured, a pedestal is placed over the strip and made to rest against the edge of the concrete member.

The 200-mm length of the CFRP strip that extends beyond the member is bonded to a pair of gripping jaws using a fast-setting adhesive (GRA). The jaws are firmly tightened to the strip with transverse fasteners.

A pull assembly with an attached coupling device is connected to the jaws. The reaction to the applied tensile load is transferred to the pedestal through two reaction plates.

A hydraulic pull machine is attached to the coupling and rests against the reaction plates. The tensile load applied by the pull machine results in a shear stress at the CFRP/concrete bond line. The load is increased until rupture occurs between the CFRP strip and the substrate.

The ultimate load in kN is a direct measure of the anchorage force of the strip for the 200 mm bonded length.

Examples of test results have been published in:

Jensen, A.P., Petersen, C.G., Poulsen, E., Ottosen, C. and Thorsen, T., "On the Anchorage to Concrete of Sika CarboDur CFRP Strips: Free Anchorage, Anchorage Devices and Test Results," *International Congress, Creating with Concrete*, Dundee, Scotland, September 1999.

### Variability

The coefficient of variation of the ultimate load is about 5 % for replicate tests using the same concrete substrate.

## ***DSS-Test***

### Testing Example



**DSS-TEST** being performed to determine anchorage load of bonded CFRP strips (left) and typical failures (right)

### The **DDS-TEST** Equipment and Ordering Numbers DSS-500 Kit

Item	Order #
Jaw plates, 2 pcs	DSS-510
Transverse fasteners, 4 pcs	DSS-520
Pedestal	DSS-530
Counter pressure	DSS-540
Pull assembly	DSS-550
Pull cylinder, 19 mm diameter	DSS-560
Coupling	C-141
GRA glue, box	B-11060
Set of anchoring tools, 12 mm	DSS-570
12 mm anchors, 20 pcs	DSS-580
Manual	DSS-590
Attaché case	DSS-600



### **C-104 CAPO-TEST** Pull Machine Kit

As shown page 28, consisting of

Item	Order #
Hydraulic pull machine with electronic gauge, 0-100 kN, 0.1 kN digital division	L-11-1
AMIGAS printout software	L-13
Cable for printout	L-14
Oil refilling cup	L-24
Oil refilling bottle	L-25
Large screwdriver	C-149
Small screwdriver	C-157
Manual	L-33
Attaché case	C-104-1

