

Structures and construction materials "Reinforcement Systems" – Information about prestressing methods

The department of structures and construction materials of the Braunschweig Civil Engineering Materials Testing Institute (MPA) and the Institute for Building Materials, Concrete Structures and Fire Protection (ibmb) at the Braunschweig Technical University have for some 30 years been intensively involved with the research into, and the application of, prestressing methods.

Participation in committees

- Expert committee on prestressing methods and prestressing steel
- Various DIN standards committees
- Long-term member of *fédération internationale du béton (fib)*
- Other working groups of *Deutsches Institut für Bautechnik (DIBt)*
- Other working groups of *Deutscher Ausschuss für Stahlbeton (DAfStb)*

Approval procedures

- Planning and performance of type approval tests
- Comprehensive approach: pre-dimensioning, preparation of test programmes, coordination of tests, evaluation of test results (including inter- and extrapolation)
- Experience from research projects with tendons in cryogenic applications (LNG tanks)

Your contacts

- Dr.-Ing. Alex W. Gutsch (head of department) | A.Gutsch@ibmb.tu-bs.de | Tel. 0531-391-5446
- Dipl.-Ing. Tobias Nolte (reinforcement systems) | T.Nolte@ibmb.tu-bs.de | Tel. 0531-391-5404
- Frau Christine Brandes (secretariat) | C.Brandes@ibmb.tu-bs.de | Tel. 0531-391-5415

Test programme

At MPA Braunschweig, problems and questions relating to stay cables and prestressing methods are dealt with by a team of experienced experts and highly efficient test facilities.

- Determination of the static load capacity of stay cables and tendons (up to 30,000 kN)
- Determination of the fatigue behaviour and the load capacity of stay cables and tendons (up to 24,000 kN)
- Determination of load transmission to load-bearing structures (up to 30,000 kN)
- Accompanying tests for determining the material properties of system components



Testing in accordance with (shortlist):

ETAG 013
PTI Recommendations
TL Seile
FIB Bulletin 30

References (shortlist)

Atlas Copco MAI GmbH
DYWIDAG-SYSTEMS
INTERNATIONAL GmbH
SUSPA-DSI GmbH
Stahlwerk Annahütte Max
Aicher GmbH & Co. KG
Friedrich Ischebeck GmbH
Mekano 4 S.A.
VSL Systems GmbH
Enercon GmbH
VBT Systems
ASDO GmbH
Bridon International GmbH
and others



Status: 07/2016



Specimen preparation

As a general rule, staff of MPA Braunschweig install the single tensile elements and prepare them for testing. If tension systems have to be tested, the specimens are generally installed by the clients themselves, with the assistance of MPA staff. Reinforced-concrete prisms for load transmission and bond anchorage tests are prepared in the MPA concrete laboratory. Known strength developments as a function of the test period are taken into account.



Details of tensile element tests

Static and dynamic tension tests for determining the static strength and deformation properties of tensile elements and the resistance of tensile elements against cyclic tension stresses, can be performed in the MPA Braunschweig laboratory with different force levels. In this connection a distinction has to be made between tensile elements consisting of single elements, such as strands, wires, bars and cables, and prestressing systems, which include prestressing methods and cable stay systems.

The prestressing force of the different tensile elements that is transmitted into a structure is in this connection examined in cyclic compression tests. Depending on the examined anchorage system (mechanical or bonded), strain, crack width and force measurements can be made, and the relative displacement of tensile elements as well as fracture patterns can be measured.

Low-temperature tests

In addition, static tension tests can be performed at cryogenic temperatures, in order to determine the effect that low temperatures have on the behaviour of tensile elements or the anchorage. For this purpose, the members that have to be tested are cooled to the required minimum temperature with liquid nitrogen.

Accompanying tests

Additional chemical and mechanical tests can be performed for determining the properties of the system components as part of identification tests



New equipment!

Portrait of the 30 MN machine:

Chronology:
2008-2010 – planned
February 2011 – installed
March 2011 – 1st tests

Loads:
Static up to 30 MN
Dynamic up to 24 MN at 5 Hertz

Specimen dimensions:
Length max. 10 m

Applications:
Testing cables, for example
for cable-stayed bridges

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Test installation	Test parameter	Dimensions	Construction products
Static tests			
Up to 2500 kN	max. force: 2.500 kN max. force: 1.200 kN with hydraulic fixture max. piston stroke: 600 mm	up to 3.000 mm	Single tensile elements Prestressing systems Anchors Tension bar systems
Up to 10.000 KN	max. force: 10.000 kN max. piston stroke: 400 mm max. diameter: 220 mm	3.000 mm to 7.500 mm	Tension systems Cable bracing systems Anchors Tension bar systems
Up to 30.000 KN	max. force: 30.000 kN max. piston stroke: 400 mm max. diameter: 505 mm	3.500 mm to 10.000 mm	Tension systems Cable bracing systems Anchors Tension bar systems
Dynamic tests			
Up to 100 kN	High-frequency pulsator max. force: 100 kN Test frequency: up to 150 Hz	up to 440 mm	Single tensile elements (wires, strands)
Up to 300 kN	High-frequency pulsator max. force: 300 kN Prüffrequenz: bis 150 Hz	up to 500 mm	Single tensile elements (wires, strands)
Up to 500 kN	Servohydraulisch mit Pulsator max. force: 500 kN Test frequency: up to 8 Hz	up to 2.400 mm	Single tensile elements Prestressing systems Anchors Tension bar systems
Up to 1.000 kN	Servohydraulic with pulsator max. force: 1.000 kN Test frequency: up to 8 Hz	up to 3.000 mm	Tension systems Cable bracing systems Anchors Tension bar systems
Up to 5.000 KN	max. force: 5.000 kN max. elongation value: 5,5 mm Test frequency: up to 4,4 Hz max. diameter: 220 mm	3.000 mm to 7.500 mm	Tension systems Cable bracing systems Anchors Tension bar systems
Up to 24.000 KN	max. force: 24.000 kN max. elongation value: 400 mm Test frequency: up to 5 HzHz max. diameter: 500 mm Zug max. cross section: 1.160 x 1.160 mm	3.500 mm to 10.000 mm up to 5.000 mm	Tension systems Cable bracing systems Anchors Tension bar systems Compression specimens / columns
Load transmission tests			
Up to 10.000 KN	max. force: 10.000 kN	Length up to 6.500 mm 850 x 850 mm	Concreted anchorage for prestressing systems or tension bar systems
Up to 30.000 KN	max. force: 30.000 kN	Length up to 5.000 mm 1.160 x 1.160 mm	Concreted anchorage for prestressing systems or tension bar systems

* Please contact MPA Braunschweig for exact maximum specimen dimensions.