TEST METHOD FOR PERFORMANCE OF ANCHORAGES AND COUPLERS IN PRESTRESSED CONCRETE USING CONTINUOUS FIBER REINFORCING MATERIALS (JSCE-E 537-1995)

1. SCOPE

This specifications specifies mainly the test method for performance of anchorages and couplers used with CFRM used in place of steel reinforcement or prestressing tendon in concrete.

2. DEFINITIONS

The following terms are defined for general use in this Specifications, in addition to the terms used in the "Recommendation for Design and Construction for Concrete Structures using Continuous Fiber Reinforcing Materials" and the "Quality Specifications for Continuous Fiber Reinforcing Materials":

(1) CFRM tendon: CFRM used as tendons in prestressed concrete
(2) Anchorage: Device anchoring a CFRM tendon to the concrete, transmitting prestressing force to the members
(3) Anchorage reinforcement: Latticed or spiral reinforcing steel or CFRM connected with the anchorage and arranged behind it
(4) Anchoring section: The section around the anchorage and the anchorage reinforcement, including the surrounding concrete
(5) Coupler: Device coupling tendons

3. TEST METHOD FOR PERFORMANCE OF ANCHORAGES

3.1 Purpose of test

To determine the tensile capacity when anchorage are used in conjunction with CFRM tendons

3.2 Test pieces

3.2.1 Preparation of test pieces

Test pieces shall be prepared by attaching an anchorage to one or both ends of a CFRM tendon.

3.2.2 Dimensions of test piece

The specifications length of test pieces shall be 3 meters.

3.2.3 Number of test pieces

The number of test pieces shall be no less than three.

3.3 Test temperature

The test temperature shall generally be within the range 5~35°C. Testing of test pieces which are sensitive to temperature or are to be used at high temperatures shall if necessary be tested at the service temperature.

3.4 Test method

3.4.1 Mounting of test piece

Test pieces shall be mounted supported by a tensile loading testing machine. The area and geometry of the surface supporting the anchorage, the tension in the CFRM tendons, and the manner of application of forces shall approximate the actual conditions within the prestressed concrete structure as close as possible.

3.4.2 Loading rate

CFRM tendons shall in general be loaded at a rate of 100~500 N/ mm^2.

3.4.3 Scope of test

Loading shall be continued up to the tensile failure , as determined by either failure of the CFRM tendon or excessive deformation of the anchoring device.

3.5 Calculation and Expression of test results

The tensile capacity for each test piece and the average tensile capacity shall be calculated. Modes of failure shall also be recorded. In the expression of the loading test, any deformation, damage, caving in etc. of the anchorage shall be recorded.

4. TEST METHOD FOR PERFORMANCE OF COUPLERS

4.1 Purpose of test

To determine the tensile capacity when couplers are used in conjunction with CFRM or other tendons

4.2 Test pieces

4.2.1 Preparation of test pieces

Test pieces shall be prepared by attaching CFRM or other tendons to either end or both ends of a coupler. Any other tendons and their couplers must have adequate strength as compared to the CFRM tendons being tested.

4.2.2 Dimensions of test piece

The specifications length of test pieces shall be 3 meters.

4.2.3 Number of test pieces

The number of test pieces shall be no less than three.

4.3 Test temperature

The test temperature shall generally be within the range 5~35°C. Testing of test pieces which are sensitive to temperature or are to be used at high temperatures shall if necessary be tested at the service

temperature.

4.4 Test method

In accordance with 3.4, Test method for performance of anchorages

4.5 Calculation and expression of test results

The tensile capacity for each test piece and the average tensile capacity shall be calculated. Modes of failure shall also be recorded. In the expression of the loading test, any deformation, damage, caving in etc. of the couplers shall be recorded.

5. TEST METHOD FOR PERFORMANCE OF ANCHORING SECTIONS

5.1 Purpose of test

To determine the performance of the anchoring section, including the concrete in the vicinity of the anchorage and the anchorage reinforcement.

5.2 Test pieces

5.2.1 Preparation and dimensions of test pieces

The distance from the center of the anchorage to the edge of the concrete shall be the minimum allowable distance determined according to the design. The length of one side of the cross section of a concrete test piece shall be 2 times the minimum allowable distance, and the height of the section below the anchorage shall not be less than 2 times the length of the longer side.

5.2.2 Reinforcement of concrete

The section around the anchorage shall be uniformly reinforced using the anchorage reinforcement and additional bars prescribed for the anchorage. Sections other than that around the anchorage shall be reinforced with additional bars to prevent failure during the test. The material quality of the anchorage reinforcement and additional bars shall be determined according to the purpose of reinforcement.

5.2.3 Concrete quality

The concrete shall be made with normal aggregates, with coarse aggregates having a maximum dimension of 20 or 25 mm. The specifications concrete shall have a slump of 10±2 cm, and the compressive strength at 28 days shall be 30±3 N/ mm^2.

5.3 Test method

5.3.1 Loading test

Loading shall be continued up to the failure. The specifications loading method shall be application of compressive force to the anchorage, but methods applying tension to combinations of tendons may also be adopted.

5.3.2 Timing of test

Tests shall normally be performed when the compressive strength of the concrete has reached 24±3 N/ mm^2.

5.4 Calculation and Expression of test results

In the expression of the loading test, any deformation, damage, caving in etc. of the anchorage shall be recorded.

6. TEST REPORT

The test report shall include the following items:

(1) Name of CFRM

(2) Type of fiber and fiber binding material, volume ratio of fiber

(3) Numbers or identification marks of test pieces

(4) Designation, nominal diameter, maximum cross sectional area

(5) Date of test, test temperature, loading rate

(6) Dimensions of test pieces

(7) Concrete mix, slump, and compressive strength at time of testing

(8) (For anchorage and coupler performance tests:) tensile failure capacity for each test piece, average tensile failure capacity, and failure modes

(9) (For anchoring section performance test:) failure capacity

(10) Records of any deformation, damage, caving in etc. of anchorages, couplers, anchoring sections