

Technical Note 25

Post Tensioning Anchorage Approval

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1 METHOD OF APPROVAL

The method of post tensioning anchorage system is to demonstrate that each element of equipment (e.g. live end, coupler and dead end <slab system only>) conforms to the test requirements. Approval of a particular item is not acceptance of the entire range.

RMS, NSW approval of post tensioning elements are accepted as deemed to conform to Transport and Main Roads requirements.

2 SCOPE OF TESTING

Post tensioning anchorage systems shall conform to the following tests:

- a) Gripping Efficiency Test
 - live end anchor
 - barrel wedge anchor.
- b) Anchorage Efficiency Test
 - live end anchor
 - barrel and wedge
 - dead end anchor (slab system only)
- c) Coupler Test
 - coupler

3 DEAD END ANCHOR – SPECIAL CONDITIONS

Dead end anchors shall have positive restraint of the strand (e.g. swaged end or barrel and wedge). “Onion” ends are not acceptable.

4 ACCREDITATION OF TEST METHOD AND TEST EQUIPMENT

It is a mandatory requirement that:

- a) each item of test measuring equipment is NATA calibrated
- b) the test methods are to be NATA accredited and approved by Transport and Main Roads

5 GRIPPING EFFICIENCY TEST

5.1 General

All tests shall be carried out in accordance with Australian Standards AS 1314-2003, relevant sections of AS 3600 and the criteria laid down in this procedure.

Test data obtained shall be presented in a certified form and conform to the approved test procedures in this document.

All geometric and mechanical properties of the materials being used in the test shall be recorded and included in the test report (Anchorage, Tendon, Concrete and Reinforcement).

Details of the test rig showing relevant dimensions tendon deviations and method of loading shall be included in the test report.

Gripping Efficiency shall be defined as – the ratio of ‘failure load’ to the minimum breaking load of the tendons as specified in AS 4671. Gripping Efficiency of the anchorage calculated from the test data, shall not be less than 95% of the minimum breaking load of the tendon.

The ‘failure load’ shall be defined as the load at which the test specimen no longer supports any increase in load, or at which slippage commences, whichever is less. Wedge slippage is defined as a movement in excess of 2.0 mm.

Wedge slippage is to be measured by recording movements of the free end of the strand and the face of the wedge relative to a baseline. Measurements shall be made using a dial gauge.

Note: wedge slippage is not to be confused with wedge draw-in. Wedge slippage is defined as unintentional wedge movement under load, where the strand moves in relation to the wedge. Should individual wire to strand breakages occur during loading such breakages are to be reported on, giving cause of such breakage.

5.2 Testing

The test report for Gripping-Efficiency shall provide the following information:

1. Anchorage component dimensions and mechanical properties
2. Layout drawing detailing relevant dimensions and testing set-up
3. Certified NATA calibration information of test equipment
4. NATA accreditation of test method and transport Main Roads approval of test method.

Three identical tests are to be carried out as follows:

- a) The tests shall be recorded by a NATA accredited person and duly witnessed by Transport and Main Roads
- b) The load shall be applied in increments as follows:
Loading stage: 15% minimum breaking load (seating only)
25% minimum breaking load
50% minimum breaking load
75% minimum breaking load
85% minimum breaking load
90% minimum breaking load
95% minimum breaking load
- c) After each stage of loading has been applied, the load shall be held for a period of one minute and observations and measurements made, before proceeding to the next loading stage.
- d) On attainment of the final load of 95% and after the one minute pause the test shall be accepted as successfully completed, on the basis that the conditions relating to ‘failure load’ have not been breached.

6 ANCHORAGE EFFICIENCY TEST

6.1 General

All tests shall be carried out in accordance with Australian Standards AS 1314-2003, relevant sections of AS 3600 and the criteria laid down in the procedure.

Test data obtained shall be presented in a certified form and conform to the approved test procedures (as a minimum requirement) as laid down in this document.

All geometric and mechanical properties of the materials being used in the test shall be recorded and included in the test report (Anchorage, Tendon, Concrete and Reinforcement).

Anchorage Efficiency shall not be less than 95% of the minimum breaking load of the tendon.

The 'failure load' for Anchorage Efficiency is the lesser of:

1. The load at which the test prism no longer supports any increase in load, or
2. Any load less than 90% of the minimum breaking load of the tendon at which a crack of width greater than D.25 mm exists.

6.2 Testing

The test report for Anchorage-Efficiency shall provide the following information:

- Anchorage component dimensions and mechanical properties
- Layout drawing detailing relevant dimensions and testing set-up
- Certified NATA calibration information of loading equipment
- NATA accreditation and Transport and Main Roads approval of test method.

One static test shall be carried out in accordance with this procedure:

1. The test shall be recorded by a NATA accredited person and duly witnessed by Transport and Main Roads
2. The load shall be applied in increments as follows:
Loading stage: 15% minimum breaking load (seating only)
25% minimum breaking load
50% minimum breaking load
75% minimum breaking load
85% minimum breaking load
90% minimum breaking load
95% minimum breaking load (test load)

Continue loading until total crushing of the prism has occurred and record crushing load.

3. After each stage of loading has been applied, the load shall be held for a period of one minute and observations and measurements of crack width made, before proceeding to the next loading stage.
4. On attainment of the 90% of the minimum breaking load of the tendon, crack width shall be measured and recorded.
5. On attainment of 95% of the minimum load of the tendon, the load shall be held for a period of one minute. The test shall be accepted as successfully completed on the basis that the conditions relating to 'failure load' have not been breached.
6. Continue test until the failure condition is obtained, subject to not exceeding the ultimate capacity of the strand.

7 COUPLER TESTS

7.1 General

All tests shall be carried out in accordance with Australian Standards AS 1314-1972 as amended 1978, relevant sections of AS 3600 and the criteria laid down in this procedure.

Test data obtained shall be presented in a certified form and conform to the approved test procedures (as a minimum requirement) as laid down in this document.

All geometric and mechanical properties of the materials being used in the test shall be recorded and included in the test report (Coupler, Tendon, Concrete and Reinforcement).

Coupler Efficiency shall not be less than 95% of the minimum breaking load of the tendon.

The failure load of the coupling disc shall be the lesser of:

- The load at which the coupler no longer supports any increase in load
- Any load less than 95% of the minimum tensile strength of the tendon without the occurrence of “excessive deformation” or rupture in accordance with AS 1314.

Excessive deformation shall mean deflection which are equal or greater than the calculated bending deflection which are equal to or greater than the upper level of elastic deformation prior to plastic deformation or evidence of punching shear occurring at the annular shear perimeters between loading platens.

7.2 Testing

The test report for Anchorage-Efficiency shall provide the following information:

- Coupler component dimensions and mechanical properties
- Layout drawing detailing relevant dimensions and testing set-up
- Certified NATA calibration information of loading equipment
- NATA accreditation and Transport and Main Roads Approval of test method.

One test shall be carried out in accordance with this procedure:

1. The test shall be recorded by a NATA accredited person and duly witnessed by Transport and Main Roads
2. The load shall be applied in increments as follows:
Loading stage: 15% minimum breaking load (seating only)
25% minimum breaking load
50% minimum breaking load
75% minimum breaking load
85% minimum breaking load
95% minimum breaking load
3. After each stage of loading has been applied, the load shall be held for a period of one minute and observations and deformations measured, before proceeding to the next loading stage.
4. Release load to 0% and measure coupler deformation across machined face.
5. Loading stage: 15% minimum breaking load (seating only)
25% minimum breaking load

- 50% minimum breaking load
- 75% minimum breaking load
- 85% minimum breaking load
- 90% minimum breaking load
- 95% minimum breaking load (test load)

On attainment of 95% of the minimum breaking load of the tendon, release load and permanent deformation shall be measured and recorded.

6. On attainment of 95% of the minimum load of the tendon, the load shall be held for a period of one minute. The test shall be accepted as successfully completed on the basis that the conditions relating to 'failure load' have not been breached.