



# **CCL Post-Tensioning Systems and ETAG Approval**

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# CCL Post-Tensioning Systems and ETAG Approval



CCL is one of the first companies to gain ETAG (European Technical Approval Guide) and CE marking on its Post-Tensioning Systems. Gaining such approval on PT systems requires extensive load testing, major time and cost investments and requires the approved companies to engage in thorough manufacturing quality processes and continuous auditing.

European approvals have again raised the bar to provide construction markets with higher capacity and more durable PT systems. Regarding ETAG 013, approval is given to select companies which can demonstrate that they possess the knowledge and experience of design, manufacture, and installation of PT systems.

Approval of a PT system under the guidelines of ETAG 013 may only be achieved by:

- Carrying out stringent load testing of the anchorage components included in the PT system.
- Having a comprehensive quality management system in place to check the manufacturing process of all components supplied in their post-tensioning system.

## Load tests required to gain approval of PT systems under the guidelines of ETAG 013

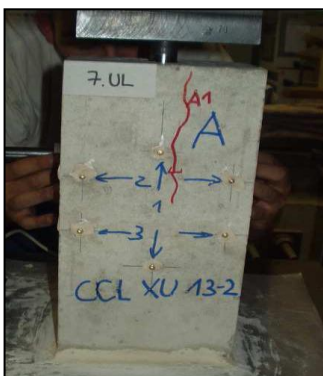
- **Resistance to Static Load** (of the tensile element/anchorage/coupling assembly): PT systems shall be able to develop a specified percentage of the tensile element ultimate strength with a minimum elongation, without premature failure of anchorage components, without undue deformations in the components, and without disproportionate relative movements between tensile elements and anchorage components.



- Resistance to Fatigue** (of the tensile element/ anchorage/ coupling assembly): PT systems shall be able to withstand specified fatigue loads (dynamic strength) without exceeding a specified percentage loss of tensile element cross section.



- Load Transfer to the Structure** (mechanical and bond anchorages): PT systems shall be able to transfer a specified percentage of the tensile element ultimate strength from the anchorage into the concrete structure, of a defined concrete strength, without undue cracking of the structure, and at deformations which stabilise within a given time frame.



## Key acceptance criteria for the load tests required by ETAG

### • Resistance to Static Load

- Measured maximum load shall not be less than 95% of the actual ultimate strength, i.e. an anchorage efficiency of 95% must be achieved.
- Total elongation of tensile elements on the free length at measured maximum load shall be at least 2%.
- Failure shall be by fracture of the tensile elements. Failure of the tendon shall not be induced by the failure of anchorage components.
- Residual deformations of anchorage components after testing shall confirm the reliability of the anchorage.
- Rate of the displacements between anchorage components as well as between tensile elements and anchorage components shall decrease with the increase of the tendon load up to 80% of the tensile element characteristic strength.
- With the load held at 80% of the tensile element characteristic strength the relative movements mentioned in the preceding clause, shall stabilise within the first 30 minutes.

### • Resistance to Fatigue

- No fatigue failure in anchorage components shall occur.
- 2 million load cycles with a minimum stress range of 80 MPa at maximum load of 65% of tensile element characteristic strength.
- No more than 5% of tensile element cross section shall be lost during fatigue testing.

### • Load Transfer to the Structure

- Maximum Crack width:
  - upon first attainment of upper load of 80% of tensile element characteristic strength not more than 0.15mm.
  - upon last attainment of lower load of 12% of tensile element characteristic strength not more than 0.15mm.
  - upon last attainment of upper load of 80% of tensile element characteristic strength not more than 0.25mm.
- Mechanical anchorages shall have a measured ultimate force  $\geq 1.1 \times$  tensile element characteristic strength.
- Bond anchorages shall have a measured ultimate force  $\geq 1.1 \times$  tensile element characteristic strength.

Test Type	Requirement
Resistance to Static Load	$F_{Tu}$ as % of $F_{pm} > 95\%$ Efficiency and Elongation of tendon at $F_{Tu} > 2\%$ .
Resistance to Fatigue	$< 5\%$ Tendon area lost due to wire breaks after $> 2 \times 10^6$ load cycles between $0.65 F_{pk} - 80\text{MPa}$ stress amplitude of tendon
Load Transfer to the Structure	$F_u > 1.1 F_{pk} (f_{cm,e}/f_{cm,0})$

- Where:**
- $F_{pk}$  (kN) : Characteristic ultimate resisting force of the tendon.
  - $F_{pm}$  (kN) : Actual ultimate resisting force of the tendon.
  - $F_{Tu}$  (kN) : Measured maximum force of the tendon in static load test.
  - $F_u$  (kN) : Measured maximum force in load transfer test.
  - $f_{cm,0}$  (MPa) : Mean compressive strength of concrete at which full prestressing is permitted.
  - $f_{cm,e}$  (MPa) : Mean compressive strength of concrete at final test to failure in load transfer.

### Number of tests required to gain ETAG approval per anchorage system

Test Type	Tendon Size			Total No. of Tests
	Small	Medium	Large	
Resistance to Static Load	2	1	2	5
Resistance to Fatigue	1	1	2	4
Load Transfer to the Structure for Lowest Declared Concrete Strength	1	1	2	4
Load Transfer to the Structure for Highest and Intermediate, if any, Declared Concrete Strength	1	1	2	4

### Relationship between an ETAG approved PT systems and CE marking

CE mark = Approved ETAG systems + Approval of Manufacturing Quality Process

- CE marking of a PT system is only attainable once ETAG approval is gained and the manufacturing quality process is approved.
- The CE mark provides assurance of testing and continuous manufacturing compliance.
- ETAG approved companies are independently audited by accredited approval bodies on their quality systems and products every year.



### Key benefits of an ETAG approved post-tensioning system

- European Structural Design: All structures designed to the latest European design code, Eurocode 2, must use PT systems which are ETAG approved (for load test compliance) and carry the CE mark (for manufacturing compliance).
- Constructability Requirement: Along with load testing, ETAG approval entails submitting detailed method statements and construction procedures.
- Service Life: Intended service life of 100 years provided that the PT system is subject to appropriate use and maintenance.
- Quality Control: Critical components of the PT system are fully traceable to their raw material (wedges, anchor heads, force transfer units).
- Load Tests: Acceptance criteria for ETAG exceed that of any other PT system test standards to-date. A minimum of 21 load tests are needed per anchorage system. CCL has undergone more than 70 tests on the "X" range system.
- Health and Safety: No hazardous material is allowed in ETAG PT systems.

## European Technical Assessment

## ETA 10/0107 of 02/07/2015

**Technical Assessment Body issuing the ETA:**

Cerema  
Direction technique infrastructures de transport  
et matériaux

**Trade name of the construction product**

CCL 'X' Range Post-Tensioning Systems  
CCL 'XF' & 'XU' Multistrand and Monostrand  
Bonded/Unbonded Systems

**Product family to which the construction  
product belongs**

16. Reinforcing and prestressing steel for  
concrete (and ancillaries). Post tensioning kits.

**Manufacturer**

CCL Stressing International Ltd  
Unit 8 Park 2000 Millennium Drive  
Leeds England  
LS11 5BP

**Manufacturing plant(s)**

CCL Stressing Systems Ltd  
Unit 8 Park 2000 Millennium Drive  
Leeds England  
LS11 5BP

**This European Technical Assessment  
contains**

48 pages including 26 Annexes (26 pages)  
which form an integral part of this assessment.

**This European Technical Assessment is  
issued in accordance with regulation (EU) No  
305/2011, on the basis of**

ETAG 013, edition June 2002, used as  
European Assessment Document (EAD)

**This ETA replaces**

ETA 10/0107, renewed on 06/08/2010

## European Technical Assessment

**ETA 07/0035**  
**of 22/09/2015**

**Technical Assessment Body  
issuing the ETA:**

Cerema  
Direction technique infrastructures de transport et  
matériaux

**Trade name of the construction product**

CCL 'X' Range Post-Tensioning Systems  
CCL 'XM' Multistrand Bonded/Unbonded System  
CCL 'XMC' Multistrand Bonded System

**Product family to which the construction  
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16. Reinforcing and prestressing steel for concrete  
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