Information sheet about the certification process / assessment of conformity of reinforcing steel acc. SIA 262:2013

1. General

The Empa certification section offers the evaluation, review and assessment of certain construction products according law and regulations in Switzerland. As an accredited lab Empa performs initial type tests as well as tests during the continuing surveillance.
The major focus of Empa CB is the assessment of conformity of prestressing steel.
According the working group decision Empa CB is involved in the assessment of conformity. That means the manufacturer provides the full and comprehensive documentation about the quality controls acc. prEN10138 to Empa CB. Test reports of accredited labs will be accepted. The evaluation will result in an Assessment of Conformity.

2. Basic informations according standards

Following standards and informations are applicable:

Standard SIA 262:2013 – concrete structures
- properties and requirements of prestressing steel are defined in article 3.3
- describes the quality assurance (article 3.3.3)
  - initial tests through an accredited testing lab
  - system of quality control through manufacturer (self-monitoring)
  - contractually regulated random testing by the manufacturers by an accredited conformity assessment body (external monitoring)

Standard SIA 262/1:2013 – concrete structures
- supplementary specifications

Standard prEN 10138-1* Prestressing steels - Part 1: General requirements
- defines requirements reg. self-control and external monitoring (kind of tests, number of tests, statistical evaluation)

Standard prEN 10138-2* Prestressing steels - Part 2: Wire
- defines the properties, labelling, tolerances and specific tests for wire

Standard prEN 10138-3* Prestressing steels - Part 3: Strand
- defines the properties, labelling, tolerances and specific tests for 3 and 7 wire strands

Standard prEN 10138-4* Prestressing steels - Part 4: Bar
- defines the properties, labelling, tolerances and specific tests for prestressing bars

Norm EN ISO 15630-3:2010 – Test methods prestressing steel products
- describes the test methods used for prestressing steel

* last draft is valid (at the moment FprEN 10138:2009)

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3. Requirements and properties

Table 7 of SIA262:2013 recommends steel classes defines minimum requirements for prestressing steel products.

Table 7, SIA262:2013: Properties of prestressing steel

Erzeugnis	Durchmesser Ø [mm]	Querschnittsfläche A_p [mm^2]	Zugfestigkeit f_{pk} [N/mm^2]	Fliessgrenze $f_{p0,1k}$ [N/mm^2]	Bezeichnung
Drähte	3,0	7,1	1860	1600	Y1860C-3,0
	4,0	12,6	1860	1600	Y1860C-4,0
	5,0	19,6	1860	1600	Y1860C-5,0
	6,0	28,3	1770	1520	Y1770C-6,0
	7,0	38,5	1670	1440	Y1670C-7,0
	8,0	50,3	1670	1440	Y1670C-8,0
	10,0	78,5	1570	1300	Y1570C-10,0
Litzen	12,9	100	1860	1600	Y1860S7-12,9
	15,3	140	1770	1520	Y1770S7-15,3
			1860	1600	Y1860S7-15,3
	15,7	150	1770	1520	Y1770S7-15,7
			1860	1600	Y1860S7-15,7
Stäbe (glatt oder gerippt)	20,0	314	1100	900	Y1100H-20,0
	26,0	531	1030	830	Y1030H-26,0
			1050	950	Y1050H-26,0
			1230	1080	Y1230H-26,0
	26,5	552	1030	830	Y1030H-26,5
			1050	950	Y1050H-26,5
			1230	1080	Y1230H-26,5
	32,0	804	1030	830	Y1030H-32,0
			1050	950	Y1050H-32,0
			1230	1080	Y1230H-32,0
	36,0	1018	1030	830	Y1030H-36,0
			1050	950	Y1050H-36,0
			1230	1080	Y1230H-36,0

Specific properties are defined in prEN10138. Requirements regarding relaxation, fatigue and corrosion tests are:
- class of relaxation R1
- Fatigue resistance class F1
- Stress corrosion resistance class C1

4. Certification process

The manufacturer must have experience in producing prestressing steel, must have an system of factory production quality control. The products must be known and not beyond the listed items in table 7 (in respect of strength class).
In order to apply the assessment of conformity it is required that the manufacturer is external controlled by an accepted institute or organisation (system 1+ is required).
Manufacturer that cannot show evidence according prEN10138 have to start a full certification program as foreseen in prEN10138.

5. Initial type testing

The manufacturer has to be prepared for initial type tests if assessment of conformity acc. 4. cannot applied. For that the requirements acc. prEN10138-1, chapt. 8.2, table 3 are valid.
STS053 of Empa will be involved in the type tests. Certain tests can be subcontracted.

Table 3 of prEN10138-1: Type and number of tests for the initial type testing

Type and number of tests					
Geometrical and mechanical properties	Special properties				
	Stress-relaxation	Fatigue resistance	Deflected tensile behaviour [a]	Stress-corrosion resistance solution A[b]	Stress-corrosion resistance solution B [c]
16 tests (2 samples × 4 units per heat)	2 tests (1 per heat)	4 tests (2 per heat)	2 tests series (1 per heat)	2 test series (1 per heat)	2 test series (1 per heat)

[a] Only for 7-wire strand and 7-wire compacted strand with a nominal diameter ≥ 12,5 mm.
[b] Stress corrosion resistance tested with solution A according to EN ISO 15630-3 (Reference test).
[c] See 8.2.

6. Factory production control (FPC)

Provisions of factory production control have to fulfil prEN10138-1, chapter 8.3. The mimimum frequency must be acc. table 5-7 of prEN10138-1 and has to presented to Empa CB.

7. External monitoring

The manufacturer must have an permanent external surveillance. Chapter 8.4 of prEN10138 applies. The minimum frequency must be according table 9.

Table 9 of prEN10138-1: Type and number of tests for the continuous surveillance

Frequency	Type and number of tests				
	Geometrical and mechanical properties	Special properties			
		Stress-relaxation	Fatigue resistance	Deflected tensile behaviour [a]	Stress-corrosion resistance solution A
Quarterly for each product type	8 tests	1 test	1 test	1 test series	1 test series
[a] Only for 7-wire strand and 7-wire compacted strand with nominal diameter ≥ 12,5 mm.					

The audit/inspection must take place at least twice a year (! ZA.2.2.2 of prEN10138, requires quarterly inspections !). The factory production is checked, samples for independent testing are taken. Empa accept external monitoring if all requirements of prEN10138 are met. The documentation for receiving an assessment of conformity must be clear and well organized to present it to Empa CB.

8. Assessment of conformity

The assessment of conformity is based on reporting the FPC to Empa CB and the verification of the external monitoring under the responsibility of the manufacturer.
Empa CB performs the assessment. Missing documents might be requested after 1st evaluation. The manufacturer is obliged to provide missing documents within 1 month after requesting. Otherwise the process will stop.
The institute responsible for the independent testing and inspections might be contacted during the process.
The letter of conformity close down the process of evaluation for the surveillance period (1 year). Once the letter is submitted clients (processors of prestressing steel) using the products do not have to show evidence to Empa CB in respect to the prestressing steel again.
If non-conformities are recognized Empa CB will not proceed with the process. In coordination with the manufacturer and the external inspector the non-conformities have to be eliminated first before proceeding the process.

9. Costs

Costs for the assessment and possibly tests are according Empa standard rates.
Invoices have to be paid within 30 days.
An cost estimation is being sent to the manufacturer before the assessment starts.

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Attachments

A1. Checklist about required tests and controls

A. Control of the factory production control

A1. Control, properties and verifications
- Chemical analysis (C, Mn, Si, P and S and other elements)
- Profile / rib surface / thread / lay length / straightness / bending
- Characteristic values from tensile test for each unit of manufacture

A2. Suitability and condition of the test equipment
- Suitability of the test equipment
- Calibrating protocols
- Adjust the reading of the instruments

A3. Assessment of the tests
- Personal, education and experience
- Test set up and compliance with the standards

A4. Storage and traceability
- Suitability and condition of the depot
- labelling (name of the manufacturer, amount, cross section, quality, …)
- Correct name of the prestressing steel / mistaken identity
- Traceability; heat and coil numbers

B. Check of the statically evaluation (longer period)

- Dimensions, sections and tolerances on sizes, characteristic values, min, max values
- 0.1% yield strength; min. values and 5% fractile
- Tensile strength, min, max, and 5% fractile
- Min. value A_{gt} (elongation at max load)

C. Sampling due external surveillance

- Scope according standards (with protocol)

D. Tests at the independent testing lab or at the manufacturer (witnessed)

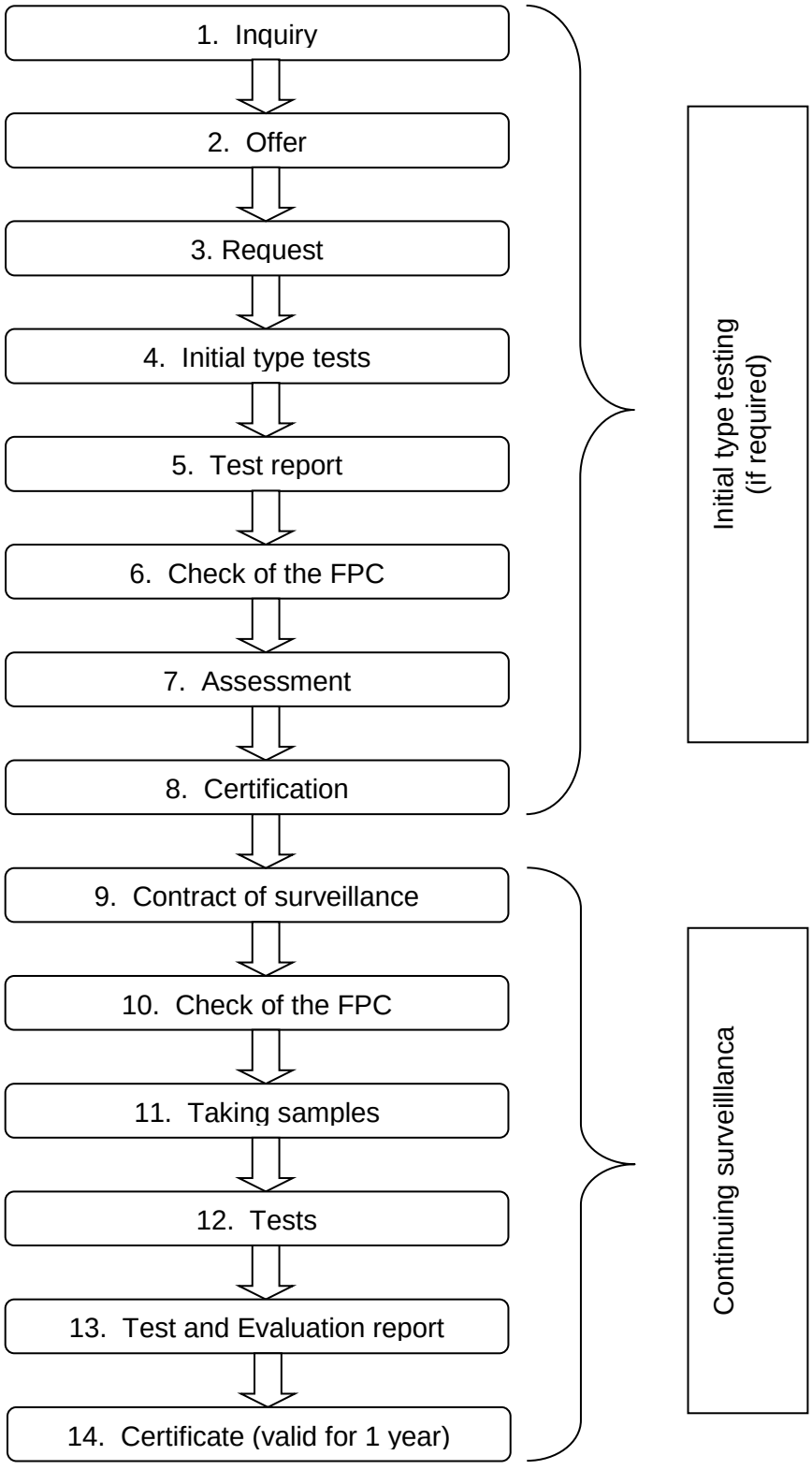
- Common properties and features
- Tensile tests with assessment of mechanical properties
- Deflected tensile strength at strands Ø ≥12.5 mm - max. D-value 28%
- Fatigue - class F1
- Relaxation - class R1
- Durability (corrosion) - class C1

5. Summary of the

- Factory production control
- Statistical evaluation
- Test results of external/independent testing
- Assessment of conformity

A2 Diagram of a certification process

Initial type testing and continuing surveillance



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Comments on the certification process

1. Request of a manufacturer for certifying
2. Quotation and information's supplied by the certification body (CB)
   - Information about the conditions (information sheet)
   - Information about the costs
   - CB checks which system has to be applied (initial type testing, continuing surveillance or assessment of conformity) and informs costumer
3. Application of certifying a certain type of prestressing steel product
   Signature of an representative of the manufacturer and following information's are requested:
   - Details about the plant
     • name of the manufacturer, addresses, organigram
   - Details about the importer
     • name of the manufacturer, addresses, responsible persons
   - Details about the quality management system
     • brief description about the QS-system
     • persons in charge
   - Scope of the applied certification
   - All relevant technical information's about the product
   - All relevant information about the manufacturing process
   - Agreement of the manufacturer to comply with all required processes regarding the certification
4. Initial type testing
   - The required amount of samples must be tested
   - Tests according valid standards
5. Test report
   - The results of the initial type testing must be reported
6. Factory production control
   - Check through the CB and check of the correct FPC
7. Evaluation of the CB
   - Evaluation of the initial type tests and the check of the FPC
   - Test and evaluation report
8. Certification
   - Issue of an certificate
   - Registering of the product
9. Contract about continuing surveillance
   - Manufacturer must have an continuing external surveillance
10. Checks of the FPC via inspections
    - Inspections must be according standard
11. Taking of samples
    - Random sampling
    - Scope acc. standard
12. External or independent testing
    - Scope acc. standard
13. Test report and evaluation reports for CB
    - The test and evaluation reports must be send to the CB
14. Certification
    - If the requirements are met a new certificate is issued