

TECHNICAL LETTER N°3



SEQUENCE OF TESTING AND REQUIREMENTS OF THE STANDARD NFC 17-102 (September 2011)

Introduction

The first standard of the lightning protection with Early Streamer Emission air terminal (ESE) was published in 1995. Maintenance of the standards and feedbacks have resulted in the harmonization of NFC 17-102 with the series of standards EN 62305 and a significant tightening of the protocol of qualification of ESE.

The new standard NFC 17-102 of September 2011 requires a sequence of 5 TESTS in order to evaluate and qualify the ESE device.

- General testing
- Mechanical tests
- Environmental tests
- Electrical tests
- Efficiency tests

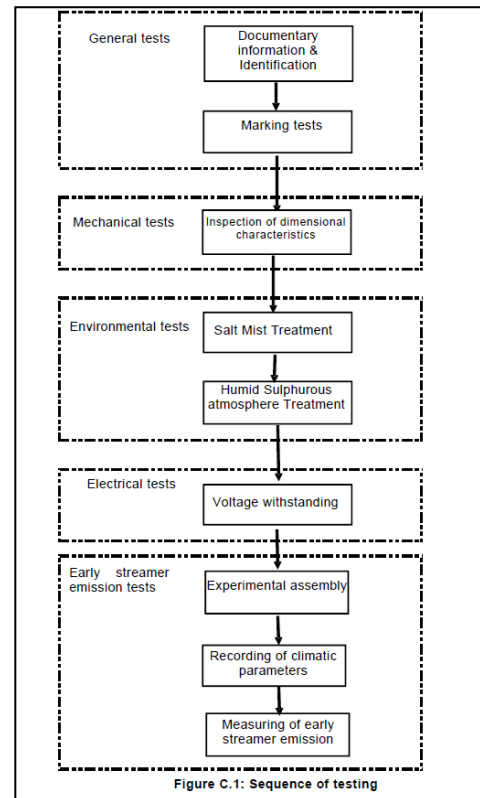
Below, the differences between the standard 1995 and 2011:

Annex C : Tests and Requirements process

July 1995		September 2011
×	↔	C2.1 Marking
C4 ESE Efficiency	↔	C2.2 Requirements for early streamer emission
×	↔	C2.3 Electrical requirements
×	↔	C2.4 Mechanical requirements
×	↔	C2.5 Environmental requirements
×	↔	C2.3 Electromagnetic compatibility

To be considered as an ESE, it has to be qualified in each of these five test sequence in order.

« The tests shall be carried out on a sample according to the flowchart in Figure C.1. » (Preview of NFC 17-102 standard of September 2011 p.69)



Marking

The ESE must be identified by the following information listed on the product:

- Name, logo or trade mark by the manufacturer;
- Product reference ;
- Serial number.

The marking shall be made legibly and indelibly completely, which was not previously required

The laser gravure on the IONIFLASH MACH shows all the warranties of performance over the time.

Efficiency requirements

The early streamer emission of the ESE shall be ranged between 10 μ s and 60 μ s.

During the test, the ESE should be compared under the same conditions than a simple lightning rod clearly defined.

The position accuracy of ESE and Lightning rod is \pm 1mm.

The simply rod (SR) used to determine the advanced time of an ESE was not clearly defined in the NFC 17-102 (1995) standard. The latest edition of the standard requires specific dimensions of the SR to be observed during the test.

The efficiency of an ESE is evaluated by comparing in high voltage laboratory the emission time of the upward leader with its emission time with the one of SR emission time.

The emission time of SR and ESE are assessed one by one under the same electrical and geometrical conditions in laboratory, and in particular atmospheric conditions.

For each configuration (SR then ESE), the first 50 usable impacts will be recorded. The standing time between impacts shall be equal to 2 minutes.

The standard NFC 17-102 (1995) requires 100 impacts and a standing time of 1 minute.

The results recorded on IONIFLASH MACH® ESE in CNRS laboratory (French Scientific National Center Research), under validation of BVQI VERITAS showed:

- **An advanced time recorded:**
MACH 60: **135µs**
MACH 45: **114µs**
MACH 30: **87µs**
MACH 25: **78µs**
MACH 15: **55µs**
- **A very narrow dispersion curve** demonstrating a constant behavior of IONIFLASH MACH® ESE

■ Electrical requirements

The ESE must sustain without a lack of its efficiency three impacts of 100 kA in wave 10/350 µs, while no electrical test in holding current was provided in the first edition of the NFC 17-102 standard (1995).

Tests conducted on IONIFLASH MACH® ESE by GERAC laboratory, approved COFRAC, were continued until 14 lightning shocks without alteration of efficiency of the ESE.

■ Mechanical requirements

Parts of the ESE in which the lightning current passes should have a section according to NF EN 50164-2 standard.

The minimum section of the capturing tip should be at least 200 mm² (diameter at least 16mm). Previously, no mechanical requirement was included in the first edition.

■ Environmental requirements

The ESE must withstand severe environmental conditions, like salt test and test in humid sulfurous atmosphere, characteristics from the seafront and industrial pollution.

- Salt test according to the NF EN 60068-2-52 standard with level 2 severity.
- Test in humid sulfurous atmosphere according to the NF EN ISO 6988 standard with seven cycles and a sulfur dioxide concentration of 667 ppm (in volume).

Climatic tests defined in the latest edition of the NFC 17-102 standard are severe and thus, allow to validate the efficiency of the ESE.

■ Insulation test in rain condition

NFC 17-102 standard does not require this test from the international standard IEC 60060-1. With the necessary operation of the product in rain condition, IONIFLASH MACH® was subjected to these tests:

Qualification requires isolation > 95%
Tests conducted on IONIFLASH MACH® showed isolation greater than 97%.

■ Electromagnetic compatibility (EMC)

No requirement of EMC was provided in the in the first edition of the NFC 17-102 standard (1995).

ESE with electronic should comply with the emission standard for residual environmental NF EN 61000-6-3. This standard aims to limit pollution and interferences from electronics devices.

The full range IONIFLASH MACH® is free electronics and therefore eliminates any nuisance to the human environment, and any interference networks.

Carbon report : The ESE IONIFLASH show the lowest carbon footprint 33 kg eq CO₂.