

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 26 05 00 - Common Work Results for Electrical.

**1.2                REFERENCES**

- .1        French Standards:
  - .1        NF C17-102 (2011), *Systèmes de protection contre la foudre à dispositif d'amorçage.*
  - .2        NF EN 50164 (2006), *Composants de protection contre la foudre (CPF).*

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Plans of the lightning protection system:
  - .1        Submit drawings stamped and signed by a professional engineer member of the Ordre des ingénieurs du Québec.
  - .2        Drawings must indicate, among others, materials and methods of attachment of conductors to early streamer emission air terminal and electrodes.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2        Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3        Storage and Handling Requirements:
  - .1        Store materials off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect lighting protection system components from nicks, scratches, and blemishes.
  - .3        Replace defective or damaged materials with new.
- .4        Packaging Waste Management: remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2            Products**

**2.1                SYSTEM DESCRIPTION**

- .1        Early streamer emission air terminal (ESE) system with:
  - .1        One ESE installed on chimney no 7 of the Former Officers' Barracks, with two down conductors;
  - .2        One grounding electrode with three triangular grounding rods, for each of the two down conductors;

- .3 One underground loop conductor connecting the four grounding electrodes, to be connected to the building grounding electrode;
- .4 One lightning strike counter per system.

## 2.2 EARLY STREAMER EMISSION AIR TERMINAL

- .1 Early streamer emission air terminal (ESE), provided with a piezo-electric system and a double electronic excitation device, tested in accordance to standard NF C17-102, and having the following properties:
  - .1 Equipped with a lightning strike counter and solar panels (requiring no external power supply).
  - .2 Protection radius of 79 m for an effective height of 2 m in Level I and T = 60 microseconds.
  - .3 That can withstand a discharge current of at least 100 KA (providing the test report is mandatory).
  - .4 Electronically controlled using a tester or a remote testing device with a minimum range of 50 m.
  - .5 Tested by a high voltage laboratory independent from the manufacturer in accordance with standard NF C 17-102 *Annexe C- Procédure d'évaluation d'un PDA* (providing the integral test report is mandatory, as well as identifying, among others, the forward value at initiation for each proposed model).
  - .6 With a mast having a length of 3.75 m, excluding the air terminal itself, and with all required brackets (of sufficient length to clear the projecting chimney coping) and hooks (for anchoring into masonry).
  - .7 All metal components must be made of stainless steel to resist corrosion and avoid any galvanic reaction with the copper roof below.
  - .8 Acceptable Products:
    - .1 Model Active 2D Solar, AFB 1060 2D from Franklin.

## 2.3 CONDUCTORS

- .1 The ESE must be equipped with two down conductors: in flat strips (flat), of a minimum section of 50 mm<sup>2</sup>, size 27 x 2 mm.
  - .1 Conductors located on the copper roof: copper
  - .2 Conductors located along the stone façades: tinned copper.
  - .3 Preformed elbows, copper, section 30 x 2 mm.
  - .4 Acceptable Products:
    - .1 AFG series from Franklin.
- .2 Grounding conductors and loop conductor: stranded tinned copper conductor, 8 mm in diameter (section > 50 mm<sup>2</sup>).
  - .1 Acceptable Products:
    - .1 Model AFG 0008 CR of Franklin.
- .3 Equipotential bonding conductors: braided tinned copper conductors, section according to NF C17-102.

## 2.4 LIGHTNING STRIKE COUNTER

- .1 Impact controller or lightning strike counter for detecting and counting lightning strikes received by structures equipped with lightning rods, and having the following properties:
  - .1 Lightning strike counter to NF EN 50164-6 and to guide UTE C 17-106, installed on the down conductor, as indicated;
  - .2 Completely autonomous device, requiring no external power supply.
  - .3 Digital display with at least 2 digits.
  - .4 Minimum detection threshold value of 1 KA and maximum threshold value of 100 KA, with a protection rating of at least IP53.
  - .5 Service temperature: -30°C to +80°C
  - .6 Connecting clamps.
  - .7 Acceptable Products:
    - .1 Model AVF 0907 CF of Franklin.

## 2.5 ACCESSORIES

- .1 Control junction on each down conductor, tinned copper-aluminum alloy, in accordance with standard NF 50164-1.
  - .1 Acceptable Products:
    - .1 Model AFK 0080 BC from Franklin.
- .2 Nameplate on each down conductor, indicating "Lightning ground rod", aluminum.
  - .1 Acceptable Products:
    - .1 Model AFH 8000 PS from Franklin.
- .3 Protective sleeves to protect down conductors against any mechanical shocks, stainless steel, of a sufficient length to be installed up to 2 m high above ground level.
  - .1 Acceptable Products:
    - .1 Model AFK 4204 FP from Franklin.
- .4 Conductor couplings: flat-flat or flat-round coupling as needed, stainless steel.
  - .1 Acceptable Products:
    - .1 Model AFJ 0819 RL from Franklin.
- .5 Roof clip for fixing the flat conductor on the copper roof by welding, brass or copper, size 50 x 16 x 8 mm, with 3 fasteners per meter.
  - .1 Copper nails as needed.
  - .2 Acceptable Products:
    - .1 Model AFH 0030 BF of Franklin.
    - .2 Modèle AFH 6500 CL de Franklin.
- .6 Clamps, clips and cleats for other use: tinned copper.
- .7 Cadweld connections for ground rods.
  - .1 Acceptable Products:
    - .1 Model AFK 5300 AC from Franklin.

## 2.6 GROUNDING

- .1 Grounding rods: minimum length of 2 m and diameter of 19 mm, copper-clad steel.

- .2 Observation well, diameter of 230 mm, cast iron, to connect and disconnect the down conductor, grounding rod and equipotential link.
  - .1 Acceptable Products:
    - .1 Model AFK 8001 RV from Franklin.

## **2.7 REGULATORY REQUIREMENTS**

- .1 The installation of the lightning protection system will have to be certified in accordance applicable European standards, as well as to the manufacturer's requirements.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lightning protection installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 INSTALLATION**

- .1 Install lightning protection system in accordance with the most recent version of standards CEI 62-305 and NF C17-102.
- .2 All material to be installed by a lightning protection specialist, with the exception of welding the roof clips onto the new copper roofing (to be done by the roofer), and the masonry cleats (to be done by the mason).
  - .1 Coordinate and provide all required materials to each building trade, including ESE, mounting accessories, down conductors, clamps and copper nails.
  - .2 Do not install ESE before completing the installation of down conductors and grounding, and connect the PDA to the down conductors immediately after installation.
- .3 Install down conductors, lightning strike counter, control junctions, protective sleeves, grounding electrodes and inspection pits, as indicated.
  - .1 Make all mechanical connections.
  - .2 On the roof, all fastenings and attachment straps shall placed along battens (never on the flat surface of the roof), and be screwed and soldered.
  - .3 Curvature radius of down conductors must be at least 20 cm.
  - .4 Avoid running down conductors along electrical conduits or across.
  - .5 Attach down conductors with 3 fasteners per meter.

- .6 Install the lightning strike counter on the down conductor with the most direct route, just above the control junction.
- .7 Connect each down conductor to three grounding rods inserted into drillings having a diameter of 150 mm and the same length as the rods.
- .4 Connect non-current-carrying electrical metal parts to the down conductors with braided wires, according to NF C17-102.
- .5 Connect the loop conductor to the building ground system.
- .6 Connect the ESE to the down conductors.
- .7 Inspect the work carried out and ensure compliance.

### **3.3 INSPECTION**

- .1 Obtain inspection certificate from Departmental Representative for discharge conductor passing through any fire supporting membrane.

### **3.4 FIELD QUALITY CONTROL**

- .1 Perform resistance measurement for each grounding electrode in the presence of the Departmental Representative.
  - .1 Disconnect the grounding electrode from the loop and down conductors before measurement.
  - .2 If the value of the ground resistance of a ground is greater than 10 Ohm, install additional ground rods or coal boxes until a value below 10 Ohm is reached.
- .2 Submit to the Departmental Representative a test report and a certificate of compliance of the installation with NF C17-102.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by lightning protection installation.

**END OF SECTION**