



XIX INTERNATIONAL ELECTRICAL ENGINEERING SYMPOSIUM

Title

Lightning Protection in Cuba. Facilities under the protection of Cuban Laws and control and ordering processes.

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Abstract

Cuba, due to its geographical location as a subtropical country, has one of the highest incidences of lightning strikes (ceraunic level) in the world, which causes high economic losses (buildings, installations and sensitive electronic systems) and placing it as the natural phenomenon that causes the greatest number of deaths, a figure that is around 70 each year.

The work that follows addresses the actions that the country has been carrying out for many years in ordering and consequent legislation on lightning protection systems, an activity governed by the nation's Fire Department.

Keywords: Lightning rod; Lightning Protection; Standardization

1. Introduction

The incorporation of Fire Security Requirements in Cuba Republic's Investor Process is established in the Law [1], which articles detail well defined faculties and actions. As, for example, the following:

ARTICLE 1 – empowers the Ministry of Interior for leading the application of fire protection policy,

ARTICLE 2 – establishes that fire protection comprises, among others, the prevention activities, which consist of knowing the possible causes or risks of fires, as well as the measures that must be adopted to eliminate them,



ARTICLE 5 – demands Central Organisms and Ministries to include fire protection requirements in projects of new constructions, reconstructions and capital modifications of its facilities,

ARTICLE 8 – lays on the Public Organisms the responsibility of planning and acquiring all the means, equipment and fire protection systems, according to de given provisions and fire protection measures.

Considering all above, in 1995 the Ministry of Interior created the Fire Protection Agency, with a well-defined Company Objective taking into account the following criteria:

- ✓ Exclusivity of certification during the investment process, related to fire protection,
- ✓ Decide on the requirements for Fire Protection,
- ✓ Certify projects,
- ✓ On-site verification and commissioning certification,
- ✓ Homologation and Certification of Fire Protection means and equipment that are manufactured, imported and/or commercialized in the country,
- ✓ Certification of knowledge and abilities related to Fire Protection,
- ✓ Training and updates in this subject,
- ✓ Certification and/or homologation of entities that provide Fire Protection services in the execution of projects, supplies of equipment, assembly and installation of equipment and systems and their maintenance.

All criteria apply to the specialty of Lightning Protection as a system for Fire Protection, as per Resolution No. 5 of the Ministry of the Interior [2].

2. Background

Due to the role that direct lightning strikes and their secondary effects play in the occurrence of fires and explosions, considering that they are the first cause of death due to natural phenomena, the country has been obliged to give the maximum importance to lightning protection integral security.



The number of thunderstorm days per year was already high up to 2011 (between 60 and 120). Yet the map that was published on April 2020 gives numbers between 110 and 170 stormy days, proving an increase of approximately 40 days per year, distributed all along the Cuban geographical area, which makes us one of the countries with a highest ceraunic level [3].

3. Control and Monitoring process for Lightning Protection in Cuba

In order to achieve efficient lightning protection systems in Cuba, two important principles should be considered:

1st. The State recognizes the Fire Protection Agency as the competent entity for the Certification of Products, Means, Systems, Entities, Persons, Projects and Installations related with the activity and

2nd. The Regulation of the Investor Process [4], which defines in its ARTICLE 75 that “During the different phases of the process, the investor will be obliged to process before the competent bodies, in this case the Ministry of Interior and within it the Fire Brigade and the Fire Protection Agency (APCI), those permits that are mandatory for the approval and execution of the investment.”

Taking that into account, APCI has designed, within its Business Management System Manual [5], four instructions that include all the actions of the control and monitoring processes of the activities related to lightning protection. The instructions are the following:

1. Instruction I-03-01 CERTIFICATION, APPROVAL AND HOMOLOGATION OF PRODUCTS see 05 mod.00, which scope establishes:

To proceed with the homologation and approval of means, equipment, materials, substances, products and systems in the design (onwards Products) in order to guarantee the security and fire protection installations, with two categories:



Homologation, that is emitted when it is determined that the fire protection requirements have been achieved, given in the relevant national or international standards and/or the recognition of certificates, as well as evaluations issued by recognized institutions

Approval, where there are 2 especial cases:

Case 1: No elements or documents that are needed for the homologation have been presented, and only some practical and theoretical checks are made in order to assure the quality of the Product

Case 2: A Product is presented by a user who acquired it only for installation, therefore, an approval is given only for that user and specific installation. In this case, the certificate will not have validity time, nor will be in the List of Products Homologation and Approval. With this process, Licenses or Certificates are obtained

Such certificates:

- ✓ Will be a document certifying the Product, for its use and commercialization in the country and only by the Supplier who submits the request.
- ✓ Are officially validated by the Governing Body for Fire Protection (Fire Brigade)
- ✓ Every Homologated or Approved product will be submitted to monitoring during the Certificate validity process

In case APCI cannot perform the monitoring process due to unjustified reasons attributable to the product presenter, this will automatically imply the loss of the Certificate of that product, which will be immediately communicated to its presenter. When the period for which the product was Homologated or Approved finishes, then the product will be re-evaluated if the manufacturer or the presenter wishes to do so, then with the results of the certificate can be extended to another 5 years period if the established evaluation conditions are satisfied. This procedure can be followed if it is the same product, with no modification of the original.

2. Instruction I-03-02 CERTIFICATION FOR THE APPROVAL AND
HOMOLOGATION OF ENTITIES see 05 mod.00, which scope establishes:

General instructions to be followed in the Certification process for the Homologation and Approval of entities offering services of: Project, installation, repair and maintenance of



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lightning protection systems (LPS), which general requirements are that the certification for the Homologation and Approval of entities will be done through audits to the service system provided by the client and has two categories of Certification:

The Homologation: the Social Object of the entity authorizes to make technical services for fire protection permanently,

The Approval: The Entity will make technical services for fire protection at the request of a State Agency only for one time, in addition to three (3) months before the expiration of the certificate, the client will be contacted for the renewal of the certificate. If there is no interest in the renewal, the suspension will be notified. When the entity requesting a certification has a parent company with branches, they will have to certify each of these branches (workshops, installation groups, etc.) as part of the certification of the entity and the certified companies must have the work procedures for the services they perform. Within the control and monitoring process, at least one follow-up audit will be carried out during the validity period of the certificate. This period will never be later than 30 months from the certification emission day of the homologated or approved entity.

The aim of the monitoring procedure will be to confirm the sustainability of the certification requirements, thus being background sources for the behavior of the certified services, the official information of the Fire Brigade Inspectors about the detected problems during the daily work of inspection the objectives, the control about projects and assemblies, etc.

The certificates issued will be an accrediting document that endorse the entity for the provision of the LPS service.

The certificate is officially validated by the Fire Protection Governing body (Fire Brigade).

The certified entities can use the APCI logo with the corresponding Certification number in their business management. In case of a misuse of the certificate, with implications for third parties, deception of customers, the use of APCI mark for services that have not been certified, etc., the Certification could be withdrawn, with prior communication to the Fire Brigade.



3. Instruction I-03-03 CERTIFICATION FOR PERSONS see 05 mod.00, which scope establishes:

General instructions to be followed in the qualification and Certification for people executing services of: Projects, installation, repair and maintenance of lightning protection systems (LPS). Candidates should fulfill the following general requirements:

Designers: Higher education or medium technical level in technical specialties related to the one chosen for Certification (LPS), endorsed by the corresponding certificate,

Installers and maintenance workers: Upper secondary level or skilled worker in specialties related to the one chosen for Certification (LPS). The certification can be removed in case of detecting any kind of violations or technical behaviors that do not correspond to compliance with the rules and regulations in force in the country. Three months before the end of the certification, the need of renewing it will be communicated to the client. The certificates issued will be an accrediting document that endorse the person for the execution of services and activities related to lightning protection (LPS) and the certificate is officially validated by the Fire Protection Governing body (Fire Brigade).

4. Instruction I-03-04 FIRE PROTECTION SERVICES TO SOCIO ECONOMIC FACILITIES, see 05 mod.00, which scope establishes:

General instructions to be followed in the assembly and development of the security and fire protection services that is carried out to the investment processes during the project stages, and includes:

- ✓ The determination of need and type of lightning protection, based on the Risk Analysis [6], where foreseeing the requirements needed to avoid possible sources for fire triggering, physical damage to structures and human beings, as well as the protection of electric and electronic systema following the Cuban standards [7 y 8],
- ✓ Technical assistance for elaborating the documentation of the LPS project, where all the elements of the lightning protection system should be specified in detail, adapting it to the particularities and variations that occur in the project execution process,



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- ✓ Assistance in the selection of the most appropriate equipment, means and system, review of sketches, pre-projects, basic engineering projects among others
- ✓ LPS project technical certification,
- ✓ The review and assessment of compliance with the technical requirements issued,
- ✓ The review and assessment of compliance with requirements and recommendations issued by the technical assistance during the project and also during the stage of the LPS assembly.
- ✓ Technical assistance during the assembly (LPS), taking care of the revision and technical quality control of each element of the LPS, giving the recommendations and technical solutions for the variants that may be introduced.
- ✓ The certification of reception and operation of the LPS as a whole of theoretical-practical evaluative actions that will allow to determine the accomplishment of the protection requirements given in the national or international LPS technical standards, of the installed LPS. The Verification Model should be delivered.
- ✓ The revision and verification of the already installed LPS can be made as a complement of the Fire Security Audits services, Fire Security Level Certification or as independent service. All installations provided with them will evaluate the LPS in situ, checking practically its correct working and according to the requirements to be followed in the relevant standard, providing then the proposal for the system conformity (or not) to continue its operation. The Verification Model should be delivered.



4. Conclusions

The hereby presented documents make evident how important the effort that is made in Cuba to be provided with a harmonized system, with entities and institutions correctly selected and particular aims, all together with the corresponding institutional support.

The result of all this arrangement leads, no doubt, to a significant decrease in damages and effects of lightning, not only to persons but also to goods and installations.

All that is exposed above would not be possible if there were not an adequate regulation, therefore we can point out that the Cuban Regulation:

1. Gives the highest importance to the ordering and control of Lightning Protection as a part of the Fire Protection Systems.
2. Clearly establishes and recognizes the role of the Organism Responsible for the Fire Security in Cuba, the Fire Brigade and the Fire Protection Agency, giving enough faculties to establish the Processes of Certification and Homologation of Products, Means, Systems, Entities, People, Projects and Lightning Protection Installations.
3. Clearly establishes and recognizes the role of the Organism Responsible for the Fire Security in Cuba, the Fire Brigade and the Fire Protection Agency, giving enough faculties to establish the Processes for Certification and Technical Assistance to inversions in Lightning Protection Systems that are already installed, as a part of the Certification and the Technical Assistance to operative objectives.



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