

Part C5

Mechanical and Electrical Design Guidelines

1 Guidelines

1.1 The electromechanical installations (services / systems / equipment) should offer solutions that are proven, reliable, have flexible capacity adjustment and future expansion.

They should provide safety of persons, museum contents and exhibits, equipment and building assets.

They should have the ability to easily access and to ensure energy saving and easy and cost effective maintenance.

1.2 The whole approach of the study and design should be based on the use of the latest technology applied systems and equipment in order to:

1. Limit the size of installations.
2. To reduce energy consumption.
3. Achieve the desired results with minimum costs in operation and maintenance.
4. Be complied with relevant standards, laws and regulations.

1.3 The materials, equipment and machinery should fully satisfy the purpose for which they will be used.

The technical specifications and the selection of the electromechanical equipment, should take into account the quality, energy consumption, economic maintenance and their behavior at the temperatures, humidity as well as their resistance to fire, damage, corrosion and vandalism.

2 Standards and Regulations

The electromechanical installations (design, equipment, installation, maintenance) should comply with the relevant Cypriot and European Standards (CYS, EN), the Laws and Regulations of the Republic and all applicable EU directives. All materials for which there is provision in the legislation, they must bear the CE marking. If there is no relevant Cypriot or European standard, then it applies the international standard (ISO, IEC) or the corresponding British Standard (BS) and the respective codes of good practice (Code of Practice) and instructions.

3 Requirements at Study stage

3.1 Technical Proposal (Preliminary design)

These preliminary studies will have such a degree of accuracy so that a complete picture is given for:

- the expected electromechanical installations,
- the basis of regulations and standards which studies are complied with,
- the quality of the installations,
- the proposed solutions for each system,
- the contractors obligations and responsibilities of electromechanical installations,

- the critical points of the installations, machinery, control rooms, distribution nodes, etc..

The following should be submitted, for each system:

- Schematic diagrams and charts that illustrate the most important facts and figures of the machinery and equipment, as well as configuration of systems' controls,
- Detailed report with the design philosophy, installation and operation, with reference to specific regulations and standards,
- General technical specifications, of the proposed materials, machinery, parts and equipment, in the form of technology framework, capabilities, organization and operation. At this stage the submittance of detailed technical specifications is not required.
- Preliminary calculations and estimates for each system / equipment.

3.2 Final design

The following should be submitted, in the order listed below:

1. Detailed final design and detailed plans for the implementation of the technical proposal, analytical calculations for all services for full documentation of the technical design selections, regarding sizes , capacity, machinery type, apparatus, equipment, electrical loads and dimensioning networks .

As for the air conditioning, hot and cold water services, electrical installations and lighting, the calculations should be drawn up by authorized software (hevacomp, amtech, carrier, 4M, Dialux, Relux, etc.), and be submitted on paper and in electronic form of the software that was used.

2. Detailed calculations and results of the Energy Performance of Building, including isbem-cy file in .nct form.
3. Final plans, which should include among others, the following:
 - Full dimensioning networks ,
 - Actual dimensions of equipment (actual size duct work drawings, dimensions of proposed machinery, etc.)
 - Air and water flow and speed on air ducts, pipes, registers, diffusers, air nozzles, etc.,
 - Coordinating drawings with various services,
4. Detailed installation technical specifications, start-up and commissioning requirements, and specifications of the proposed materials, machinery, parts and equipment.

3.3 Drawings - Studies

All studies and all plans will be submitted in two (2) copies and in **digital format (CD)**.

The documents will be in Microsoft Office format and drawings in dwg or dxf format.

The drawings in the electronic form will be organized into levels (layers) in a model system. It is emphasized that all projects submitted will only be printed on paper A1.

There should be submitted of plans, by each type of system, in scale 1:100 of the building floor levels, which will reflect and cover, as a minimum, all the details, instructions, notes, reports, charts, logistics and installation spaces of all systems, machines and equipment, their components types, cables, pipes, appliances, etc., depictions of course, endings and destination of piping and wiring, and their identification and list of wiring and piping and technical data and specifications of the materials, equipment and machinery to be used, as well as points, stations and control systems.

3.4 Energy Performance of Building

The Building Energy Performance Certificate (EPC) should be at least class "A", in accordance with the provisions of the relevant legislation.

The Qualified Expert (QE) should be registered by the competent authority (Ministry of Energy) in the relevant register and have good understanding of the electromechanical services of the building.

The QE should be part of the design team from the initial stages of the building design and through his feedback improve the energy efficiency of the building.

The QE is expected to develop through the relevant software (isbem-cy), several studies for the selection of the optimal solution of different systems, materials and / or equipment.

It is the QE's responsibility to be informed by the designers of the project, for any changes that will occur with respect to systems or material specifications and equipment and to inform the Employer about the possible impact that may have on the EPC of the building.

In the final stage of the study, and after the approval and the competent authority, the following shall be submitted:

1. The EPC of the building with recommendations accompanied by relevant study,
2. Final figures and documents relating to the technical characteristics of the materials and equipment used in the calculations,
3. The building energy performance calculations,
4. The isbem-cy file in ".nct" form.

There should be installed **renewable energy** to the building, in order to cover at least 3% of total primary energy consumption, as determined by the energy building performance calculation methodology, to the satisfaction of the Regulation of the Energy Performance of Buildings, Ordinance 2013 (K. .D.P.432 / 2013)

3.5 Networking Service

Where necessary, the design documents, should include the Contractor's responsibility to ensure at its own actions, responsibility and expense, the conditions of supply and the connection of the building with the service provider (Electricity, Telecommunications, Sewer and Water).

3.6 Testing

The design documents, should include the Contractor's responsibility and expenses including electricity costs and fuel, to make all the required commission tests according to the Standards, Laws, Regulations and Directives and / or good practice of engineering science and the relevant instructions of the Employer.

There should be specified careful measurements and verification of measurements based on standards and / or codes of good practice (eg IEE Regulations, TIA / EIT, CIBSE, BSRIA commissioning codes, performance test sheets, etc.), for the entire installed equipment and systems. The results must satisfy the design parameters and shall be recorded and used as references in subsequent Readjustments and will qualify for the final approval of the employer. There should be specified that the Contractor will submit detailed reports of the results of the above commissioning checks and measurements.

The instruments used should have a recent calibration certification of at least 12 months prior to measurements.

3.7 Operation and Maintenance Manuals, Impression Plans

The design documents, should include the Contractor's responsibility to prepare and submit to the Employer operation and maintenance manuals in accordance to the following requirements:

- a) Full range of technical operation manuals and maintenance of installed systems and equipment.
- b) Range of certificates of materials, assemblies and installation systems.
- c) As fitted design drawings.

All manuals and drawings should be submitted in three (3) copies in print and in digital format (CD).

The documents will be in doc or pdf format and drawings in dwg or dxf format. Where no manufacturer technical manuals are available in electronic form, shall be scanned and submitted in pdf format.

3.8 Training

The design documents, should include the Contractor's responsibility to train the staff of at least 5 people, and other personnel who will advise the Employer (10 people) to use the systems. The training will last at least 2 working days. The training will be done on the site and the Contractor will issue a certificate of training for each trainee.

3.9 Installations Delivery to the Employer for Use

With the completion of works, the consultants should give the assurance in writing that the systems / installations:

- I. Meet the employer's requirements specifications,
- II. Are installed and meet the installation instructions,

- III. They have been tested and are fully operational efficient, as described in the specifications and design documents.

3.10 Operation of Systems / Equipment

The design documents, should include the Contractor's responsibility to execute all the necessary maintenance and regulation of the systems / equipment taking into account the facilities' working timetables and seasonal changes.

The Contractor shall not be liable for the payment of electricity consumption or the fuels supply and water. But it must promptly notify the user of the need to supply fuel and water.

3.11 Electrical Maintenance and Systems

The design documents, should include the Contractor's responsibility for the implementation of both preventive and corrective maintenance of all electrical and mechanical systems, appliances and machines of the building according to the maintenance terms.

The tender documents should include the cost for preventive and corrective maintenance of all systems in reference, appliances and machinery and supply of consumables, components and spare parts.