

Preliminary European Guide on HVAC design

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Synopsis

Air conditioned building surfaces are increasing in Europe. The guide - collaborative book of french, italian and british experts- gives recommendations to obtain efficient HVAC plants.

Abstract

Air conditioned building surfaces are increasing all over Europe. HVAC plant have important energy consumptions. As a consequence, HVAC field can be a source of important energy saving.

The preliminary guide is the result of a two years collaboration between french, italian and british experts members of REHVA. REHVA is the Federation of 17 European Heating and Air Conditioning Associations (including non EU countries - AICVF in France, AICARR in Italy and CIBSE in United Kingdom. The recommendations of associations aim at a design quality level higher than the minimum level required by standards and regulations.

The main goals of the Preliminary European guide on HVAC design are to :

- compare and exhibit methods, data and tools used in France, Italy and U.K in HVAC systems design - focusing on associations published documents ;
- have a manual useful for HVAC designers and beginner engineers in order to reduce the energy consumption and to improve the energy efficiency of HVAC plants ;
- initiate a concerted technical approach within REHVA associations, confronting methods. The preliminary guide is a starting point of future collaborations between european HVAC associations leading to a greater european HVAC field.

The poster focuses on general aims of the preliminary guide and develop examples about technical contents. It presents the national point of view on those aspects and mentions some recommendations provided by designers in order to obtain efficient HVAC plants.

Introduction

Air conditioned building surfaces are actually increasing all over Europe because of thermal comfort and air quality demand. HVAC plants have important energy consumption. As a consequence, HVAC field can be a source of important energy saving based on 30 millions of m² built per year just for France, consuming an average of 150 kWh/m²/year.

The preliminary guide on HVAC design in non residential buildings is the result of a two years collaboration between french, italian and british experts members of REHVA. REHVA is the Federation of 17 European Heating and Air Conditioning Associations (80 000 members) including non EU countries - AICVF in France, AICARR in Italy and CIBSE in United Kingdom.

The main goals of the Preliminary European guide are to :

- compare and exhibit methods, data and tools used in France, Italy and U.K in HVAC systems design - focusing on associations published documents ;

- have a manual useful for HVAC designers and beginner engineers in order to reduce the energy consumption and to improve the energy efficiency of HVAC plants ;
- initiate a concerted technical approach within REHVA associations, confronting methods. The preliminary guide is a starting point of future collaborations between european HVAC associations leading to a greater european HVAC field. It will allow a better circulation of information.

The guide is situated between the non published professional good practices and the national standards (see figure 1). In this sense, it demonstrates that the goals of the national associations are to help the designers and to contribute to a better design of the plant. The recommendations they make aim at a design quality level higher than the minimum level required by standards and regulations. Those recommendations come from the informations available in engineering or consulting companies members of the associations.

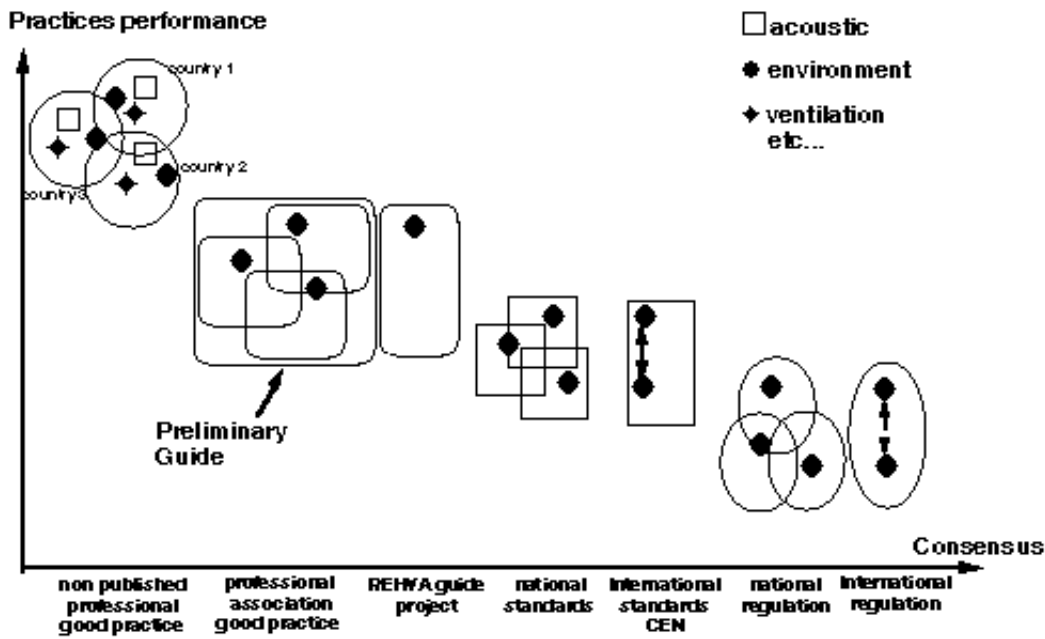


Fig. 1: Place of the preliminary guide in the consensus forming process

Structure of the guide

The structure of the Preliminary guide is based on the flow chart design process (see figure 2)

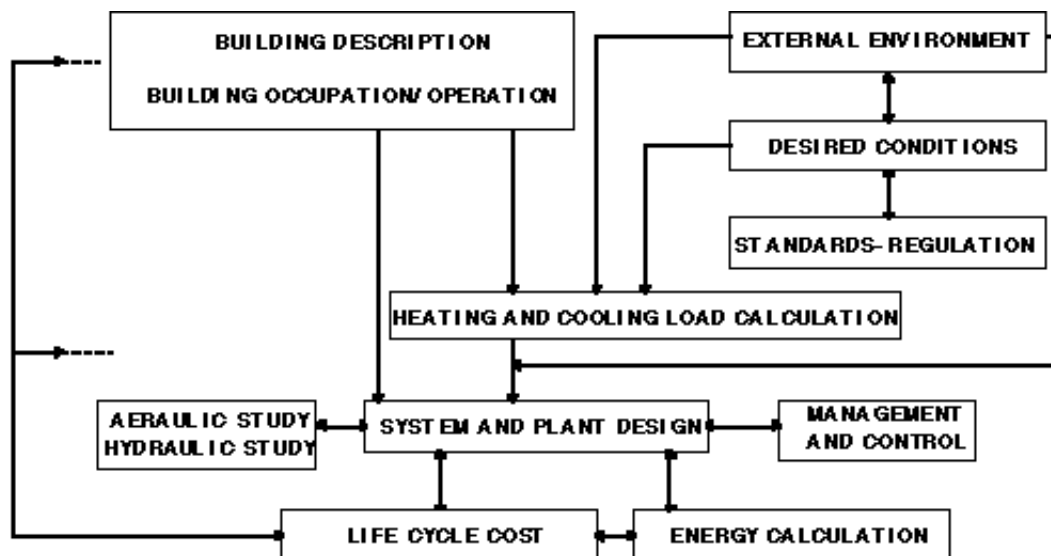


Fig. 2: Flow chart of HVAC system design

This chart summarizes different stages. At each stage, the designer has to consider requirements for health, safety, comfort and energy. He also must remember that building layout, installation and commissioning interact with the design process.

Exemple of contents : Standards and regulations

Thermal plant design, operation and maintenance shall be performed according to Technical Standards and other applicable legal requirements concerning: health, environmental protection, safety, energy conservation. We only detail hereafter two examples.

Environmental protection

Concerning the environmental protection, relevant questions are related to: Greenhouse Effect, Ozone Layer Depletion (ODP), Acid rains, Dismantlement of the plant. If we chose the example of ozone layer depletion, many countries have adopted legal ordinances to reduce and to control the CFC emissions. International agreements have been underwritten starting from 1987 (Montreal Protocol). The Vienna Agreement (revision of the Montreal Protocol of the 7th of December 1995) confirmed that the HCFC Production will end in 2030.

The EC Regulation 3093/94 (15/12/1994) is the European enactment of the Montreal Protocol. It establishes the schedule for the elimination : CFC : 31/12/94, HCFC : 31/12/2014

Associations are especially investigating solutions for R22 replacement because it is the most commonly used in HVAC plant. They recommend some suggestions to be taken into account during this phase : refrigeration fluid charge reduction; adequate choice of the materials; attention during welding; limitation of vibrations; choice of materials compatible with refrigerant and lubricant, minimisation of mechanical joints. During the operation and maintenance, special care should be paid to the CFC recovery, to their handling and to their storage especially during the charge and discharge operations of the plant. CFC recovery, handling and storage are included in the EEC Regulation, and adequate training of the technical operators is very opportune.

Energy conservation

The reduction of the energy consumption is the main purpose of the political efforts of the developed countries.

- In Italy the Energy Act (n° 9/ 1991 and n° 10/ 1991) carry into effect the National Energy Project. Other technical standards and administrative ordinances provide design criteria, requirements and information in order to test the thermal plant operating.
- In France exist the "Thermal regulation":
Law of 29/10/1974 concerns energy conservation (heating energy) for dwellings. This law is included in the "Code de la construction et de l'habitation" (Rules for building construction and for dwelling). Bill of 12/04/1988 and 13/04/1988 concerns other places (no dwelling places).

Concerning the thermal plant, Associations recommend to pay a special attention to the following questions: thermal insulation of buildings; piping (air and water); high efficiency heater; possibility to use cogeneration plant; lighting sources with high efficiency,

- In France, „Guides sectoriels de l'AICVF“ provide data and suggestions (or recommendations) concerning occupancy scenarios, occupation rate, acoustic level, lighting needs, warm water needs, air renewal, unoccupancy time conditions for the main following situations to obtain high efficient energy buildings : Offices, Education, Hotels, restaurants, Health buildings, Sport buildings, Commercial buildings.

Prospects

The contributors to this preliminary guide are hoping for a second phase of the projects which objectives are :

- to initiate the REHVA endorsement; at the moment, no procedure exists to endorse a technical document and to give the REHVA label. The modalities are under definition
- to establish a common methodologic frame for HVAC system design, open to national specific habits, the working group will be opened and extended to other countries

The second phase of the project will lead to changes in this preliminary guide in order to be validated in every Technical Committee (CIBSE, AICARR, AICVF) and also in REHVA Cooperation Group to obtain a REHVA Guide. This explains the qualificative „preliminary“ for the guide.

References

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- AICARR Guide
- Guide pratique „Diffusion de l'air en climatisation individuelle“ COSTIC (1995)
- ASHRAE Handbook HVAC Applications - SI Edition - 1995
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- Vade-mecum de la réglementation des CFC - PYC Edition

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