

## ENVIRONMENTAL MANAGEMENT IN DENMARK

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### ABSTRACT

In the Danish building sector, environmental management is currently being introduced in three areas: design, construction and operation of buildings.

This innovation is based on development programmes, some of which are in progress, while others have been completed in the last few years. Dissemination and incorporation of the results of these programmes are being closely monitored.

Common to all the development programmes is a requirement that employers and companies formulate an environmental policy describing attitudes, goals, priorities and organisation.

The next step is an environmental review to map environmental factors. This is followed by an environmental action plan as the basis for start-up of environmental management.

Lastly, an environmental audit is carried out to check that the environmental management system works properly and that the goals are being achieved.

Environmental management in the three areas in question: design, construction and operation, is based on these elements. In practice, environmental management differs in the three phases because the content and the parties differ from phase to phase.

Key words: sustainability, environmental management, design, construction, operation.

### ENVIRONMENTAL MANAGEMENT - WHY?

The move towards sustainable building has long been characterised by a major effort to save resources - energy, electricity and water - during use of buildings.

However, the possibilities for environmental measures have grown and there are probably now between 100 and 200 available to use - a veritable

ecological supermarket.

To get a better and more complete picture in each building project there is a need for systematised, interdisciplinary analysis of the various options.

For this reason, three development programmes have been used to develop new methods of management and control of the design, construction and operation of buildings. The methods in question give greater priority to integrated assessment of environmental impacts from new buildings and from the operation of existing buildings.

Environmental management is built up around four basic elements, which appear in all three programmes.

Employers and companies must formulate an environmental policy aimed at continuous improvement of environmental performance, firmly placing responsibility and authority and laying down goals and guidelines for monitoring of the results.

An environmental review maps the environmental factors, measured - for example - by impacts on resources, the surrounding environment and people. The next step is an environmental action plan, containing an activity schedule and time schedule for the actual environmental work, with responsibility, authority and environmental tasks assigned in accordance with the environmental policy.

An environmental audit is the means by which it is checked that the environmental management system is working satisfactorily and that the targets set have been achieved. The audit can be used as the basis for an environmental performance report, making the results achieved public.

#### **DESIGN - THE FIRST STEP**

The first step towards better environmental management is new design methods.

In Denmark, a development programme for "Environmental management in project design" will end in 1997.

Every building project should start with mapping of the relevant environmental factors. The most appropriate and financially advantageous measures will naturally depend on the local situation.

It is important to carry out an integrated assessment of the possible areas for action.

We differentiate between impacts on our resources (what is removed), impacts on the surrounding environment (what is added) and impacts on people (during construction and later operation). The impacts can be reduced by various means, such as choice of materials, ensuring replaceability, reuse/recycling and substitution.

The employer must therefore ensure that an integrated interdisciplinary analysis is carried out to pinpoint the main - say 10-15 - environmental

factors to which particular attention must be paid in the performance of the project.

The design work must be based on the chosen areas for action. In other words, an environmental policy must be drawn up and environmental objectives specified for the building project in question. This must be followed by an assessment of the consequences for the design of the building, including the choice of structures and installations.

The new design practice is thus based on cooperation between the employer, the architect and the consulting engineers on the formulation of an environmental programme based on the environmental objectives.

The next step is to draw up an environmental plan showing how the programme is to be fulfilled in practice. Lastly, the environmental action is documented in an environmental balance sheet.

The environmental objectives may, for example, include the building's relationship with its surroundings, its resource consumption, lifetime, maintenance, reuse/recycling potential, working environment, energy consumption and indoor climate.

For example, special solutions may be chosen - form of ventilation, materials, surface treatments and sun-screening - that fulfil the requirements with respect to indoor climate. Quality assurance and environmental management go hand in hand here - quality assurance ensures that the environmental objectives are achieved.

In connection with the development programme a database is being established with general environmental information on all main building materials and a guide to gathering specific information from manufacturers.

#### **ENVIRONMENTAL MANAGEMENT AT THE BUILDING SITE - SECOND STEP**

In the construction phase, too, there is a need for systematic monitoring - for example, of the consumption of energy and water, handling of waste, noise, odour problems and dust.

A couple of examples will suffice to show the importance of such monitoring: transport in connection with building and civil engineering work accounts for about 45% of Denmark's total transport of goods by lorry, and the building industry accounts for 3% of Denmark's total energy consumption.

There are at present three main standards for environmental management: the British Standard BS 7750, the EU's EMAS Regulation and the international standard ISO 14001.

In a Danish development project called "The Contractor's Environmental Guide", a compendium of information material has been put together as support for the introduction of environmental management at contracting firms. The material, in the form of booklets, guide, eco-file and a video, is

addressed to different levels within the contractor's organisation.

During the performance of a project, quality assurance and environmental management can be integrated and taken care of in two ways. Firstly, the employer must ensure that the agreed quality is achieved in the chosen areas - cf. above on indoor climate - and, secondly, the contractor must monitor the work at the building site with respect to its environmental consequences - waste, noise, odour problems, dust, etc. - as mentioned above.

### **ENVIRONMENTAL MANAGEMENT DURING OPERATION - THE THIRD STEP**

The basis for the operating plan is the owner's aims with respect to the exterior appearance of the building, the building's indoor climate and other utility functions, its energy consumption, and its state of maintenance.

It is natural to integrate environmental factors with the operating plan. In the above-mentioned example concerning indoor climate, the points mentioned - ventilation, materials, surface treatments and sun-screening - must thus be included in the operating plan.

It may be appropriate to go one step further, since studies of resource consumption during operation of buildings show big differences from one housing unit to another, and experience with reduction of energy consumption indicates clearly that awareness and motivation on the part of the occupants are absolutely essential for achievement of a lower consumption.

Mapping the actual consumption in a housing unit or an apartment building, for example, and information about what other households use - possibly what the best 30% use - enable the occupants to opt for a given consumption - low or high.

In the Danish programme "Environmentally Managed Building Operation", a new approach to operation has been developed. The consumption is mapped, the occupants choose an objective for the building's future consumption, and an action plan is drawn up for achievement of the objective.

The most obvious areas for action are consumption of energy, water and electricity and handling of waste. In these areas it is relatively easy to record the consumption. In the longer term, it may become relevant to include other areas, such as indoor climate and noise level.

In other words, integration of quality assurance and environmental management in this area means both achievement of the objectives set up in the design phase and continuous assessment of the operation of the building, with the possibility of improvements.

## CONCLUSION

The new methods for environmental management make it possible to work with environmental factors in a more planned and systematic way.

Experience from the Danish development projects show:

- that environmental management should be integrated with the normal work processes
- that environmental management should be carried out in a close cooperation between all the parties involved in a building project
- that environmental management should be planned so that the work follows the normal, progressive decision-making process in a building project
- that environmental management should start as early as possible and be both interdisciplinary and long-term
- that prioritisation is essential and that the most serious problems must be kept in focus
- that environmental management should be visible all the way through - from the design phase, through the construction phase, to and including the operating phase

In the years ahead, Danish building firms are going to have to incorporate the principles for environmental management. In the long term, this will result in a shift in the way employers and firms work in the direction of sustainability and will also bring financial advantages.

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