5 WHAT ARE YOU ALLOWED TO DO YOURSELF?

If you are a property owner, then there is a great deal that you can do yourself. Just how much you can and want to do is, of course, completely up to you. If you are an experienced property owner with your own management team, you could do practically all the work within your own organization, while a private property owner would normally require help for most of the work.

A property owner with an in-house management team normally owns a number of buildings, quite often with advanced features such as technically complex control systems and building services installations. Buildings of this type require much more work when it comes to energy certification. From an energy use point of view, single-family dwellings are normally quite simple structures and only require a minimum of assessment to be able to issue an energy certificate. Here, we can see a balance between the work required to complete the certification process and the extent to which the property owner is required to become involved in the process.

The energy certification process comprises a number of stages. How many and what they entail can, to a certain extent, be determined by the property owner. Nevertheless, what can be regulated by the property owner to the greatest extent is how the results of the certification process are used. And a property owner can also take advantage of the actual occasion on which the certification work is carried out, to a smaller or greater degree.

On the one hand, the owner can choose to carry out only what is required by law and try to reduce certification costs as much as possible. This type of action is prevalent when property owners regard an energy certificate as a necessary evil, the only result being proof that a building has been certified. On the other hand, the owner could use the opportunity to assess the condition of a building and, based on the certificate values, draw up plans for improvements to reduce its energy use. In this latter case, more extensive inspections than the very simplest can be carried out. These two very different ways in which property owners can

carry out certification work can be described as passive and active exploitation of the situation.

Passive property owners act solely by asking for tenders from companies or individuals who are qualified to offer energy certification services. The quotes must include everything connected to the certification process, and all work is to be carried out as cheaply as possible.

Active property owners can carry out a great deal themselves. Primarily, however, it must be decided in which way the energy certificates are going to be used. Are they going to be used as a tool in a larger scheme to improve energy use or is the energy improvement scheme going to be coupled to the energy certification process?

5.1 Procurement and execution of energy certification services

A property owner is responsible for ensuring that the necessary energy certification work is carried out. Information regarding when certification work must be carried out is available from the appointed authority or institution in every member state. In order to find detailed information, it is recommended to visit the websites run by these authorities or institutions. A joint website has been set up on the Commission's initiative and can be found at *www.buildingsplatform.org*

If a building is to be inspected, there are a number of details that the property owner can produce to simplify the process when inviting tenders for the certification work. The number and type of details vary, depending on whether the inspections are required for simple or more complex buildings. A reasonably complete list for a complex building would include the following:

- Heating and electrical energy statistics.
- The heated floor area of the building.
- The proportions of the floor area put to different uses (percentage office space, percentage shop space etc).
- Descriptions of the building services (number of air-conditioning systems, heating systems, cooling systems, etc).

– Mandatory ventilation inspection certificates (OVK certificates in Sweden), previous energy and/or environmental inspections.
– Operating instructions, flow charts (primarily for ventilation, piping, heating), up-to-date architectural drawings showing plans, sections and facade elevations as well as general details, for example, descriptions of different types of energy and indoor environment problems in the building.

When it comes to simple buildings the same list can be used as a starting point, and shortened as required. In Sweden, for example, single-family dwellings are not subject to mandatory ventilation inspections (OVK) or required to have operating instructions for the different building services.

Additionally, other data might be required for the tendering process, if the property owner wants to include other assessments than those connected purely with energy certification, for example, cost-efficiency calculations customized to meet specific needs.

5.2 Checklists and improvement recommendations

Different checklists and recommendations for improvements will be important instruments for energy experts when certifying buildings. This section discusses points that could be important to look at during the certification work. When property owners evaluate different tenders for energy certification work it is important for them to have a general understanding of what will be included.

The lists presented here are relatively general, making it easy to see how they have been drawn up and what they should include. Lists and improvement recommendations can become very extensive and detailed. Both the checklists and the recommended improvements must keep step with technological advances and the on-going build-up of knowledge in these fields.

In order to provide a building with a desired indoor climate and a sufficiently high level of air quality, different systems are required. Depending on the type of building and what it is used for, the technical

and building services systems can be more or less extensive and complex. The list compiled below is for buildings with relatively complex systems, though it can also be used for buildings with less complex systems, simply by excluding the parts that do not apply.

The building services systems can be divided into solutions for:
– Heating
– Comfort cooling
– Ventilation and air conditioning

Each of these systems can then be divided into the following subsystems:
– Production
– Distribution
– Room appliances
– Control and monitoring systems

Control and monitoring systems are those via which all the other service systems in a building are linked together and made to function in the prescribed manner.

In addition to the systems used for providing the correct indoor climate, there are often other installations and systems that are used for the activities/operations carried out in the building. Normally, there are also systems for lighting and hot water and there might even be other special systems for specific activities/operations. Examples of special systems include:
– Emergency power systems, stand-by systems etc
– Compressed air plant
– Vacuum extraction plant
– Electric motors and appliances for special purposes
– Lighting systems
– Process ventilation, fume cupboards and ventilated workstations
– Transportation systems, for example, lifts and escalators
– Large kitchen facilities and staff canteens

– Refrigerated and frozen food displays in shops and supermarkets
– Steam generating plant
– Wastewater treatment plant
– Water systems, including domestic hot water systems

The building envelope must protect the activities/operations taking place in a building from varying outdoor climates. The envelope is normally passive, i.e. it does not change its properties with outdoor seasonal changes in climate or when the use of the building changes. In addition to the passive building envelope, there are, in most non-residential buildings, systems for manual or automatic active solar shading. In buildings like these, the windows used differ from those used in homes and often have a protective layer that minimizes heating due to incident solar radiation.

Certification inspections are normally carried out as functional inspections, in which every system and sub-system is checked with regard to:
– The suitability of the system structure and whether the correct technical plant has been installed.
– The correct technical functions being maintained.
– Being operational when needed.
– Providing the required quantities.
– Providing the required quality.

The checklists are given as tables, in which the functions or components of the different systems and sub-systems are described and which would be advisable to check when carrying out an inspection. The column 'Recommended checks and measures' includes recommendations that might be appropriate to carry out, depending on the use of the building and the type of installations. The descriptions of the measures are expressed in general terms, without ranking them or detailing how they should be assessed. More details can be found in handbooks, manuals etc.

5.2.1 HEATING SYSTEMS

System or sub-system	Function	To be investigated/ measured	Recommended checks and measures
Heat production	General	Status of production unit	Assess whether change to more efficient unit required.
		Heating need	(Improve the efficiency of the ventilation system. Improve the efficiency of the hot water system. Improve the efficiency of the building envelope. Reduce the room temperature during the heating season.)*
		Maximum output when measuring power output	Remove night temperature reduction function.
	District heating	Tariff, return temperature, cooling in the heat exchanger unit	Maintenance of heat exchanger. Clean, replace parts or whole.
	Fired boiler	Combustion efficiency, flue gas temperature	Adjust and adapt the burner and operational temperature. Sweep. Install flue gas cooler.
	Heat pump	Type, heating factor, peak heat, operating temperature	Ensure correct function. Maximize operating time of heat pump.
	Solar heating	Type, size, energy coverage, operating temperature	Ensure correct function.
	Electric boiler	Peak power limits	Adapt according to needs.
	Accumulator, hot water heater	Size, insulation, temperature level	Ensure correct function. Improve thermal insulation.

* These checks and measures apply to other systems or functions in the building that can also affect the heating need.

System or sub-system	Function	To be investigated/ measured	Recommended checks and measures
Heat distribution	Flow/pumps	Water flows	Adjust, change size of pumps/change to pressure activated pumps. Installation of demand-controlled pumps
	Flow distribution	Settings, stability, return temperature	Adjust settings Change to smaller valves. Venting.
	Temperature regulation	Temperature levels, desired value curves	Consider need for shunts. Adjust desired value curves.
	Piping system	Thermal insulation	Improve insulation.
		Sectionalization	Sectionalize the piping system as required.
Room appliances	Flows	Type of apparatus, sizing, adjustments, room temperature	Adjust room appliances. Replace valves. Replace or adapt undersized units. Venting.
	Adjustments to actual needs, thermostats	Type of regulation, standard of thermostats, maximum limitations	Ensure correct function. Replace thermostats or change to other regulation system.
Control and monitoring, etc		Night and weekend reduction	Adjust to needs. Adjust timing and temperature levels.
		Forecast control (equivalent temperature)	Adapt/improve calculation models supplied by meteorological institutes or consultants.
		Mass of building, thermal inertia, heat retention properties	Take into consideration when reducing night temperatures and setting times for increasing temperature.

5.2.2 COMFORT COOLING SYSTEMS

System or sub-system	Function	To be investigated/ measured	Recommended checks and measures
Cooling production	General	Status of production unit	Consider changing unit to more efficient alternative.
		Cooling need	Use night cooling. Use free cooling. (Reduce internal heat generation. Increase room temperature during cooling period.)*
	District cooling	Heating of return water, temperature in the heat exchanger unit	Maintenance of heat exchanger. Clean, replace parts or whole.
	Cooler	Power rating, cooling efficiency factor, temperature levels	Adjust the operating temperatures and operating times according to need. Improve efficiency of coolant cooler.
		Heat recovery	Consider recovery of condenser heat
Cooling distribution	Flows/pumps (coolant systems)	Water flows	Adjust, change size of pumps/change to pressure regulated pumps. Installation of demand-controlled pumps.
	Flow distribution	Settings, return temperatures	Adjust distribution of cooling.
	Temperature regulation	Temperature levels. Desired value curves	Consider need for shunts. Adjust desired value curves.
	Piping systems	Thermal insulation	Improve the insulation.
		Sectionalization	Sectionalize the piping system as required.

* These checks and measures apply to other systems or functions in the building that can also affect the cooling need.

System or sub-system	Function	To be investigated/ measured	Recommended checks and measures
Room appliances	Flows	Type of appliances, sizes, settings, return temperatures, room temperatures	Adjust settings of room coolers.
	Adjustment to needs, thermostats	Standard of thermostats	Replace thermostats.
	Joint operation with room heaters	Simultaneous heating and cooling of rooms	Change to common thermostats for heating and cooling.
Control and monitoring		Time schedules, in general	Adjust to needs. Set timing and temperature levels.
		Forecast control (cooling production and storage)	Optimization of the system. Review conditions for cooling operations.

5.2.3 VENTILATION AND AIR-CONDITIONING SYSTEMS

System or sub-system	Function	To be investigated/ measured	Recommended checks and measures
Production	Air filtration	Filter class, pressure drop	Change filter class. Check replacement intervals.
	Heat recovery	Type, temperature efficiency, temperatures	Clean, replace. Install heat recovery unit. Assess cooling recovery.
	Heating and cooling functions	Function and interaction between functions.	Check regulation functions, separately and sequentially. Adjust liquid flows. Clean heating/cooling batteries. Adjust supply air temperature.
	Humidification of the air	Is it required and is humidification carried out in a suitable way	Retrofit the system.
	Return air	Heat, cooling or moisture recovery	Adjust/install return air function.
Distribution	Flows and pressure levels/fans	Air flows, pressures	Adjust operating times, air flows and pressure levels. Install demand-controlled regulation.
		Power ratings, SFP	Increase efficiency of fans, transmissions and motors. Clean. Change to better fans, apparatuses, ducting systems, terminal devices
	Flow distribution	Settings	Reset the air flows.
	Ducting system, sectionalization constant-pressure terminal devices, flow devices and pressure boxes.	Is the system a suitable one, is this equipment required and is it used correctly?	Check the settings/assess need for retrofitting. Check the sealing of the system. Check the thermal insulation. Clean.

System or sub-system	Function	To be investigated/ measured	Recommended checks and measures
Distribution	Additional terminal device for heating and cooling	Is this equipment required and is it used correctly?	Check the settings/assess need for retrofitting. Adjust desired values.
Room appliance	General	Correct type of terminal device, ventilation principle	Adjust supply air temperatures. Clean air terminal devices.
		Integration with liquid-borne heating and cooling	Ensure correct functioning (do not allow heating and cooling at same time).
	Flows	Settings	Adjust air flows.
	Adjustment to needs (VAV/DCV)	Function	Adjust/replace VAV boxes. Install demand-controlled regulation.
Control and monitoring		Night and weekend reductions, time schedules	Adjust to needs. Adjust times, flows and temperature levels.
		Forecast control (equivalent temperature)	Adapt/improve calculation models supplied by meteorological institutes or consultants.
		Seasonally adjusted ventilation	Adjust temperature-pressure/ flow curves.

5.2.4 CONTROL AND MONITORING SYSTEMS

Where control and monitoring equipment is concerned, it is best to start with a checklist to determine the status of the system and how system data can help the inspector.

System or sub-system	Function
Regulation and monitoring	Capacity (measuring points, storage, speeds).
	Time intervals (5 min, hour, day, week, month, year).
	Statistics going back a number of years/energy signatures (day/night).
	Saved sequences for different operating conditions.
	Separate measurements of heat, electricity and cooling.
	Separate measurements from different buildings.
	Alarm functions (what, how, visualization, logs).
	Support for automatic fault detection and diagnosis.
	Measurement accuracy (type of sensor, location, calibration).
	Report generation (weekly, monthly, yearly).
	Raw data and normal year corrected data.
	Accessibility/manageability/user-friendliness.
	Visualization (schematic drawings and other diagrams).
	Automatic logging of changed settings.
	Data compatibility/export of data to Excel and similar programs.
	Integration of and coordination between different sub-systems.

5.2.5 SYSTEMS USED BY TENANTS

System or sub-system	Aspect	Recommended checks and measures
Emergency power system	General	Reliability requirements regarding load levels. Change battery capacity needs. Emergency power system, load levels. Emergency power system, activation time.
	Saving electricity	Efficiency improvements.
	Saving heat	Installation of heat recovery unit.
Compressed air plant	General	Maintenance of the plant.
	Saving electricity	Reduction of operating times. Speed control. Reduction of pressure conditions. Change of extraction conditions. Minimization of power requirement in connection with leakages. Sectionalization and part closure of the piping system. Replacement of compressed air.
	Saving heat	Installation of heat recovery unit.
Vacuum extraction plant	General	Maintenance of the plant.
	Saving electricity	Reduction of operating times. Minimization of power requirement in connection with leakages. Sectionalization and part closure of the piping system. Replacement of vacuum system.
	Saving heat	Installation of heat recovery unit.
Electric motors and apparatuses	Saving electricity	Reduction of operating times. Optimization of motor efficiency. Speed adjustment. Improved insulation standards. Minimization of stand-by losses.

5.2.5 SYSTEMS USED BY TENANTS

System or sub-system	Aspect	Recommended checks and measures
Lighting systems	General	Maintenance of the system.
	Saving electricity	Reduction of operating times. Sectionalization of the lighting system. Reduction of lighting strength. Use of reflectors in fittings with strip lighting. Use of colours in the building. Inspection of light sources. Use of energy-efficient HF lighting. Use of daylight.
Process ventilation (fume cupboards, ventilated workstations, etc)	General	Maintenance of the system.
	Saving electricity and heat	Reduction of operating times. Reduction of air flows. Changes in relative humidity, pressure and temperature conditions. Change of usage. Investigation of user behaviour.
	Saving heat	Installation of heat recovery unit.
Transportation systems (lifts and escalators)	General	Age and condition of the plant.
	Saving electricity	Installation of frequency converter. Inspection of light sources. Installation of operation-on-demand function.
	Saving heat	Installation of heat recovery unit.
Large kitchen facilities, staff canteens	General	Maintenance of the equipment
	Saving electricity and heat	Reduction of operating times. User behaviour. Minimization of passive operating times and stand-by losses. Local extraction.
	Saving electricity	Insulation of ovens, warming cupboards and dishwashing machines.
	Saving heat	Installation of heat recovery unit.

System or sub-system	Aspect	Recommended checks and measures
Refrigerated and frozen food displays	General	Maintenance of the equipment.
	Saving electricity	Storage temperature of goods. Cover refrigerated and frozen food displays/boxes. Installation of glass fronts/protection of open refrigeration and frozen zones. Location of goods in cold and frozen stores and in cabinets and boxes. Stop/start intervals for compressors. Evaporation and condensation temperatures. Heat transferring surfaces in evaporators and condensers. Insulation of ducts, pipes, containers and rooms. Assess cooling needs.
	Saving heat	Installation of heat recovery unit.
Steam generation plants	General	Plant maintenance
	Saving heat	Re-use of condensate. Replacement of central units with local steam generators. Changed pressure and temperature conditions. Air-tightness of the system. Insulation of distribution system and boilers. Installation of heat recovery unit.
Wastewater treatment plant	General	Plant maintenance.
	Saving heat	Insulation of sewage water sterilizers. Heat recovery from wastewater system.
Water systems	General	Plant maintenance. Temperature of hot water. Temperature of the circulating hot water.
	Saving water	Toilets – minimize leakages. Urinals – minimize leakages, flushing needs. Use of rainwater. Reduce water wastage due to long waits for hot water at tap.
	Saving water and heat	Taps – reduced flows.
	Saving heat	Improve thermal insulation. Heat recovery (from wastewater etc).

5.2.6 THE BUILDING ENVELOPE

System or sub-system	Aspect	Recommended measures
General	Air tightness	Seal leakages.
Lofts, roofs	Heat insulation	Consider extra external insulation. Consider extra internal insulation.
	Solar protection	Ventilation of ceilings and roofs.
Facades, cellar walls	Heat insulation	Consider extra external insulation. Consider extra internal insulation.
Floors	Heat insulation	Consider extra external insulation. Consider extra internal insulation.
Windows	Heat insulation	Install additional panes. Replace panes. Replace windows.
	Solar shading	Consider fixed external shading or manual/ automatic awnings. Installation of protective film on windows. Use windows with solar protection when replacing old windows.