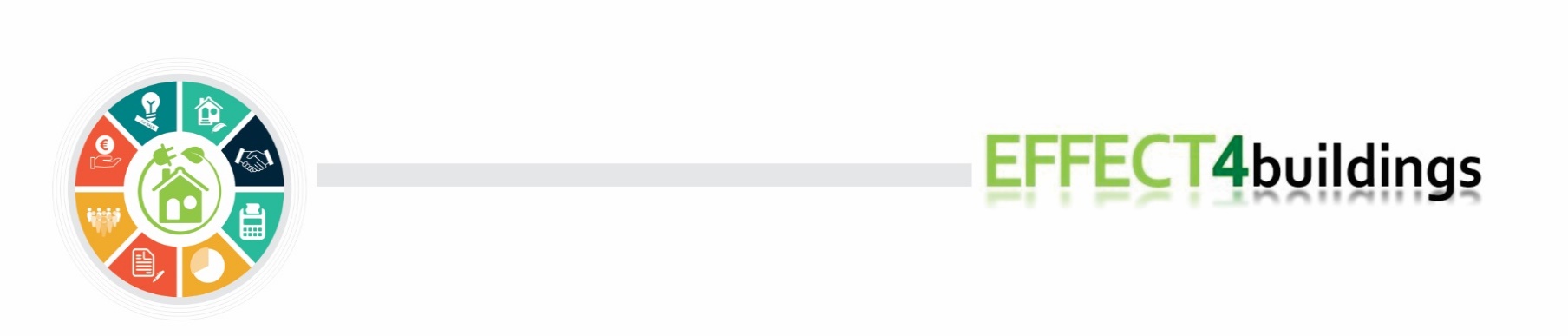
# 



**Energy Performance Maintenance Contracts, EPMC**

**Basis for purchase of Performance-based services regarding**

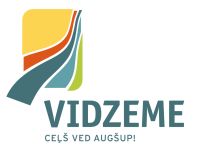
**ventilation, heating, cooling and controls in buildings**



The project “Effective Financing Tools for implementing Energy Efficiency in Buildings” (EFFECT4buildings) develops in collaboration with public building managers a comprehensive decision-making support toolbox with a set of financial instruments: Financial calculation tools; Bundling; Funding; Convincing decision makers; Energy Performance Contract; Multi Service Contract; Green Leasing Contract; Prosumerism. The tools and instruments chosen by the project has the biggest potential to help building managers to overcome financial barriers, based on nearly 40 interviews with the target group. The project improves these tools through different real cases.

This document is a version of Energy Performance Contracting, but for maintaining instead of investments. The focus is how to procure this kind of services and that’s part of the toolbox for technology solutions. Tools for Energy Performance Contracts for investments is presented in a separate toolbox.

EFFECT4buildings project is implemented with the support from the EU funding Programme Interreg Baltic Sea Region (European Regional Development Fund) and Norwegian national funding. The aim of the project is to improve the capacity of public building managers in the Baltic Sea Region by providing them a comprehensive decision-making support toolbox with a set of financial instruments to unlock the investments and lower the risks of implementing energy efficiency measures in buildings owned by public stakeholders. More information: <http://www.effect4buildings.se/>



**Partners**

# Energy Performance Maintenance Contracts, EPMC Basis for purchase of Performance-based services regarding ventilation, heating, cooling and controls in buildings

The document   
The purpose of this document is to serve as a basis or foundation for purchasing of services regarding ventilation, heating, cooling and controls in buildings, with the purpose of achieving best possible energy efficiency and system function. The document contains suggestions for contents in both RFP:s (request for proposals) and final contracts.

The model that has been chosen, is based on a contract where the two parties - building owner and provider of services - agree which functions shall be maintained and how the service provider can prove success. For results above or below agreed level of performance there will be a bonus or a fine. The contract can thereby be denoted as an “Energy Performance Maintenance Contract, EPMC” (compare EPC for investments).

This appendix to the RFP aims to highlight the need for routines and accompanying documents that will lead to continuous improvements regarding the use of energy and it is intended to be used for every new service contract that is signed.

By establishing this comprehensive document, we ensure that our investments, buildings and systems are regarded in long term and that also the energy costs for these buildings and systems are taken into account over a given period of time. Furthermore, we also put certain demands on our service providers; we make it clear that we valuate energy efficient solutions and systems of good quality (although such solutions initially may be more expensive) and we also encourage them, through these demands, to develop more efficient systems and units, to train their personnel and to take part of the responsibility for our energy costs.

GENERAL PART   
This general part can be used as a part of the RFP in the purchasing of services, in addition to specification of other terms and demands.

## PURPOSE OF THE PURCHASING, ECONOMY AND ENVIRONMENT

The purpose is to increase the focus on the function and energy efficiency of equipment and systems. Energy is a scarce resource globally. The world´s reserves of fossil fuels are diminishing fast. The costs related to the extraction of these energy resources are rising as it is harder and harder to reach them. For the users of energy this means increasing prices. The price increase on energy is faster than general cost escalation.

*The Customer AA* purchases large volumes of energy every year for ventilation, heating and cooling of buildings.

Common for all purchased energy, purchased for the benefit of our personnel, alternatively our tenants, and our business, is that there are always commodities like coal, oil, uranium, or renewable fuels etc. as the sources of this energy. Every used unit of energy thereby leads to the use of fuels somewhere in the global or local energy supply system so that our needs of energy can be satisfied. Therefore, all use of energy also affects the local and the global environment. The connection between energy and environment is a reality that always must be considered.

The primary purpose of the purchased services that this document describes is to form a basis for a structured way of working by the chosen supplier of services that leads to:

* More efficient equipment and buildings.
* Lower operational costs regarding energy, thereby also better profitability.
* Reduced environmental impact from our buildings and businesses.
* Minimised need for future investments since equipment and systems are serviced, maintained and operated is such a way that their span of life is prolonged.
* The maintaining of functions in existing equipment.

By showing that we take our responsibility towards an efficient use of energy with as little environmental impact as possible, we also can gain valuable goodwill.

The following charts show the importance in working actively to reduce the use of energy for ventilation. The numbers are based on the climate conditions in the center of Sweden and a cost of heating energy of 1 SEK/kWh.

This means that e.g. in one of our buildings, where we have a total ventilation air flow of 5 m3/s, it costs us 21 000 SEK extra per year if we heat the supply air 1 degree Celsius too much, for nothing.

Heating 5 m3/s of air all year round to 20 oC costs 282 000 SEK. With a functioning heat recovery, the cost is half of that or less. So, that the service provider keep systems operating and operating well has a large economic value.

DEMANDS FOR QUALIFICATION  
The suppliers of the requested services shall have the following competences and experiences:  
- Certificate for mandatory ventilation control (OVK in Sweden) regarding services of ventilation systems.  
- Certificate for cooling according to Swedac or similar international certification body if the purchased services are related to cooling systems.

DESCRTIPTION OF THE TASK  
*The customer AA* operates as follows:

* Renting commercial spaces and/or apartments
* Office work in office spaces in own building
* Industrial manufacturing in own building   
  *(Cross over non-relevant or type in something else)*

**Buildings that are included in this purchasing** *(Type data relevant for the buildings that are included in this purchasing of services…)*

**Priority order for facility management and maintenance**The service of the building´s systems shall be done with the use of a minimum of scarce and environmentally bad resources as possible. This can, however, not be overdone so that other demands and valuations are jeopardised. Therefore it is important to establish the following ***priority order, that shall not be overlooked***:

1. The demands by Authorities on the business of *the customer AA*

2. The health, the safety and the working conditions for personnel

3. Norms for various activities and technical systems

4. External environmental impact, locally and globally

The demands by the authorities on building owners do include control over energy use and that implemented measures to reduce energy use and if possible, to use only renewable energy.

**Focus**We want the suppliers of services addressed and asked for proposals to focus on the following important factors:

* Trimming of equipment for best possible performance
* Continuously maintain good operation of equipment and systems
* Control of the energy efficiency of systems
* Identification of potential for improvement of performance
* The education, training and development of the personnel of the service provider that can be of good use for *The customer AA*

**Performance of service**How we expect that the service provider performs services agreed upon in the final contract are describes in an appendix that accompanies the RFP.

EVALUATION OF OFFERS  
Received proposals/offers will be evaluated based on price, competence and experience and the following criteria:

*(Specify which evaluation criteria that will be used.)*

TERMS FOR CONTRACT  
*The customer AA intends to sign the following contract with the service provider:*

**Parties**

Xxx

**Contract period**

Xxx

**Contract documents**

The contract documents complement each other. If the contractual documents in some aspect are contradictory it will be specified that they are valid according to the following order:

1. The description in the RFP with the headlines; ”Purpose of the purchasing, Economy and Environment” and ”Description of the task”.
2. Potential changes and amendments to the contract.
3. The contract and the description of buildings and systems.
4. Other parts of the RFP.
5. ABFF15 (Swedish regulations, choose what is applicable for building related services and maintenance in your respective country)
6. The proposal from the Provider of services

**How to perform the task**

This general description of the task in the RFP will be used for all applicable equipment and systems in the participating buildings. In the appendices 1 – 4 we have included detailed check lists for services related to operation and maintenance of systems for ventilation, heating, cooling and controls. Controls are naturally also part of the other 3 systems and do not always have to be treated separately.

These check lists are suggested for the selected service provider to use at every service visit within the framework of the signed service contract. If the service provider has equal check list that will give the same good result as the once provided here it is possible that *The customer AA* can agree to use the check lists of the service provider.

At every visit by personnel from the service provider for service or other work according to the contract within a building or system it is of outmost importance that the visit is acknowledged by authorised personnel within the organisation of *The customer AA*. During the acknowledgment a verbal report will be given, later on followed by a written report, such as updated check lists.

Suggestions regarding potential performance improvement is supported and shall be reported to the customer after every visit, if such improvements have been identified. See also respective appendixes.

In the case of faults or mistakes that lead to emergency visits it is essential that the cause of the fault is established and that measures are taken to avoid future similar faults.

**Follow-up**The purchasers want confirmation that all planned service visits have been performed and that systems are operated as efficiently as possible. This means including the following parameters in the contract. The service provider will be given the opportunity to verify the parameters before the contract period starts, with the purpose of reaching a mutual agreement on what levels that are to be reached.

Temperature  
Indoor temperature shall be \_\_\_\_\_\_\_oC, plus/minus 1 degree C.

Supply air  
Total supply air flow within the building/buildings shall be \_\_\_\_\_\_\_\_\_\_\_m3/s and is not allowed to diminish by more than 20 % before an exchange of filters is done.

Heat recovery:  
The temperature efficiency regarding heat recovery in Air handling unit \_\_\_\_\_\_shall be at least \_\_\_\_\_%.

The temperature efficiency regarding heat recovery in Air handling unit \_\_\_\_\_\_shall be at least \_\_\_\_\_%.

The temperature efficiency regarding heat recovery in Air handling unit \_\_\_\_\_\_shall be at least \_\_\_\_\_%.

and so on.......................................

*Further parameters that are agreed upon*

Xxx

Energy use  
By keeping the levels agreed above we conclude that the energy use of the building(s) during a normal year should be kept at \_\_\_\_\_\_\_\_ kWh/m2/år (start value). Specify individually for every building.

**Compensation, bonus and penalty**

*Compensation for the provided services are paid as a fixed annual amount in accordance with the accepted offer.*

If the agreed upon energy efficiency is not maintained there will be a penalty of 0,5 SEK/kWh \* building area \* specific energy use based on the buildings area of \_\_\_\_\_\_\_m2 unless the service provider can prove that the increased energy use is a result of circumstances that are beyond what the service provider can control.

The penalty is paid as a lump sum for the actual year and is based on an energy cost for heating that is *1 SEK per kWh.*  
If the energy use is lower than the start value there will be a bonus paid to the service provider, likewise based on an energy cost for heating that is *1 SEK per kWh.*  
*After the end of every year of the contract the annual energy use for heat is calculated. The calculated energy use is adjusted according to the degree days of the year in question. Compare with the start value.*

Example for a building, 1 000 m2 with a specific energy use of 140 kWh/m2/år (heating)  
Normal energy use: 140 000 kWh/year (start value)  
If the measured and adjusted energy use is 145 000 kWh/year or above there will be a penalty of *2 500 SEK.*

If the measured and adjusted energy use is 135 000 kWh/year or below there will be a bonus of *2 500 SEK.*

**Invoicing and terms of payment**Specify how invoices are handled, terms of payment etc.

**Responsibility**

Demands regarding insurances for liability

**Termination and transfer of the contract**

Specify terms on how the contract can be terminated or transferred to another party.

**ANNEXES**Control report of demands according to the contract

Check list heating

Check list cooling

Check list ventilation

Check list controls

*For customer AA* *Service provider*  
  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date Date

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name Name

# Control report for ”Contract for purchase of Performance-based services regarding ventilation, heating, cooling and controls in buildings”

This control report will be presented to the customer at every service visit.

Today a control has been performed showing the following demands and parameters are within the boundaries of the service contract:

Temperature  
Indoor temperature is \_\_\_\_\_\_\_oC (demand \_\_\_\_\_\_\_\_\_ oC plus/minus 1 degree C)

Supply air  
Total supply air flow within the building/buildings is measured to be \_\_\_\_\_\_\_\_\_\_\_m3/s (demand \_\_\_\_\_\_\_\_m3/s +/- 20 %)

Heat recovery:  
The temperature efficiency regarding heat recovery in Air handling unit \_\_\_\_\_\_is \_\_\_\_\_% (demand\_\_\_\_\_\_\_\_\_%)

The temperature efficiency regarding heat recovery in Air handling unit \_\_\_\_\_\_is \_\_\_\_\_% (demand\_\_\_\_\_\_\_\_\_%)

The temperature efficiency regarding heat recovery in Air handling unit \_\_\_\_\_\_is \_\_\_\_\_% (demand\_\_\_\_\_\_\_\_\_%)

and so on.......................................

*Further parameters that are agreed upon*

Xxx

Energy use  
By maintaining the parameters above we conclude that the enery use of the building(s) during a normal year can remain at \_\_\_\_\_\_\_\_ kWh/m2/år (start value).

City and date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Typed name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ANNEX**

**Checklist for services regarding   
heating systems in buildings**

**Facility: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Address/premises/building: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Meter number for district heating: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

# BASIC DATA

|  |  |
| --- | --- |
| Agreed temperature levels |  |
| Potential reduction of temperatures during night and weekend |  |
| Pump stop, based on 3 day average outdoor temperature, at oC |  |
| Set point for temperature difference ΔT in district heating oC (e.g. > 45 oC) |  |

# CONTROL REPORT

|  |  |
| --- | --- |
| Control set points for temperatures, off-sets, curves and break points of curves. Is the supply temperature control correct and efficient? |  |
| If there is night or weekend temperature reductions, is this done correctly? |  |
| Control that pump stop works as intended and at the right outdoor temperature |  |
| Control that the weekly motioning of pumps works (summer time) |  |

# Meter readings and follow-up of energy use

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Month** | **Energy (MWh)** | **Flow (m3)** | Degree days | **m3/MWh** | **MWh/degreeday** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **4** |  |  |  |  |  |
| **5** |  |  |  |  |  |
| **6** |  |  |  |  |  |
| **7** |  |  |  |  |  |
| **8** |  |  |  |  |  |
| **9** |  |  |  |  |  |
| **10** |  |  |  |  |  |
| **11** |  |  |  |  |  |
| **12** |  |  |  |  |  |

# Meter readings and follow-up of temperatures

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Month** | **Outdoor****temp.** | **Temp room 1** | **Temp room 2** | **Temp room 3** | **Temp room 4** | **Domestic hot water** | **Complaints** |
| **1** |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |
| **4** |  |  |  |  |  |  |  |
| **5** |  |  |  |  |  |  |  |
| **6** |  |  |  |  |  |  |  |
| **7** |  |  |  |  |  |  |  |
| **8** |  |  |  |  |  |  |  |
| **9** |  |  |  |  |  |  |  |
| **10** |  |  |  |  |  |  |  |
| **11** |  |  |  |  |  |  |  |
| **12** |  |  |  |  |  |  |  |

# Control and follow-up of temperature differences in district heating

|  |  |  |  |
| --- | --- | --- | --- |
| ΔT |  | Deviation/ notes |  |

# GENERAL

# Is the supply water temperature controlled with respect to the outdoor temperature? Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Leaking heat exchangers, valves, pumps Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Noise from valves and pumps**  
**Proposed measures**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Pump stop function exists and is in use? At which outdoor temperature is the circulation pumps stopped?**   
  
**Proposed measures**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**“Pump motioning” (are pumps run for short periods regularly also when there is no need for heat?)**   
  
**Proposed measures**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

City and date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Typed name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ANNEX**Checklist for services regarding   
cooling systems in buildings

**Facility:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Date:** \_\_\_\_\_\_\_\_\_\_\_\_

**Address/building:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Refrigerant:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Quantity:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Cooling objects (rooms, air handling units, cooling baffles):**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# BASIC DATA

|  |  |
| --- | --- |
| Temperature set point for cooling |  |
| If increased temperatures during night and weekend, to which temperature? |  |
| Pump stop, based on 3-day average outdoor temperature, at oC |  |
| Set point for temperature difference ΔT, cooling oC (e.g. > 8 oC) |  |

# CONTROL REPORT

|  |  |
| --- | --- |
| Control set points |  |
| Control pump stop operation and at the correct temperature |  |
| Control pump motioning operation |  |
| Control that dew point regulation works (cooling baffles) |  |
| Control that cooling is blocked if nighttime cooling is done by air handling units |  |

# CONTROL REPORT FOR FACILITIES OVER 3 KG OF REFRIGERANT

For facilities with more than 3 kg of refrigerant an annual control must be done and the observations denoted in the appropriate journal according to the recommendations by e.g. The Swedish Cooling and Heat pump Association.

**Last previous control, date:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Report number:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Notes in the report:** (Inspection passed, leakages, dirt etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# CONTROL REPORT FOR FACILITIES UNDER 3 KG OF REFRIGERANT

For facilities with less than 3 kg of refrigerant an annual control must be done, and the observations denoted in the appropriate journal according to the recommendations by e.g. The Swedish Cooling and Heat pump Association.

**Last previous control, date:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Report number:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Notes in the report:** (Inspection passed, leakages, dirt etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**GENERAL**

**What signal controls the chiller?** (External control, e.g. ventilation unit, room thermostat or internal controls)  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Other** Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

City and date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Typed name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# ANNEX Checklist for services regarding ventilation systems in buildings

**Facility:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Date:** \_\_\_\_\_\_\_\_\_\_\_\_

**Address/building:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Location in buildning:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Serves (room, building, department):**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
**Heat recovery (type):** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# BASIC DATA

|  |  |
| --- | --- |
| **Weekday** | **Operating hours** |
| Monday |  |
| Tuesday |  |
| Wednesday |  |
| Thursday |  |
| Friday |  |
| Saturday |  |
| Sunday |  |

# CONTROL REPORT

**Control of temperatures and efficiency of heat recovery**

|  |  |
| --- | --- |
| Outdoor air, oC (A) |  |
| Supply air after heat recovery, oC (B) |  |
| Supply air after heating coil, oC |  |
| Exhaust air, oC (C) |  |
| Exhaust air after heat recovery, oC |  |
|  |  |
| Initial efficiency, according to main document |  |
| Controlled efficiency, % \* (B-A) / (C-A) x 100 |  |

\* The efficiency can only be controlled when there are substantial heating needs.

**Follow-up of efficiency**

|  |  |  |
| --- | --- | --- |
| **Quarter** | **Efficiency** | **Nominal values, efficiency**  Cross-flow heat exch, 60 % Battery heat exch, 50 % Heat recovery wheel 80 % |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |

**Control of pressure drop**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Before filter replacement Pa |  | After filter replacement Pa |  | Deviations/ notes |  |

**Other controls**

|  |  |
| --- | --- |
| Set point for supply air temperature or exhaust air temperature (depending on whether space temperature is controlled with respect to supply or exhaust air temperature). Are temperatures in accordance with contracted temperatures? |  |
| Check that operating hours are set as agreed. |  |
| Dirty coils, fan housing and air intake? |  |
| Check that cooling recovery works. |  |
| Check that programmed night time cooling works. |  |
| Leaking valves and pumps |  |
| Noise from belts and other components |  |

## GENERAL

**Are operating hours in accordance with production / office hours?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Is there a timer for over-time work?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Are there different operational modes (full speed, half speed, low speed, frequency control)?**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Start-up sequence gives a safe and non-freezing operation?**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Cooling recovery possible and/or in operation?**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
  
**Night time cooling installed?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Other:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

City and date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Typed name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# ANNEX Checklist for energy saving measures regarding control systems in buildings

**Facility:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Date:** \_\_\_\_\_\_\_\_\_\_\_  
This check list is intended to be used to check that the control systems and its components work optimised.

# CONTROL REPORT

|  |  |
| --- | --- |
| **Check** | **Deviations and needs for action** |
| Check and adjust regulators, actuators, valves and sensors. |  |
| The calibration of sensors is of importance and should be done at least every third year.  Date of last calibration: |  |
| Check that heating is blocked during and after finished nighttime cooling |  |

## GENERAL

The heating and cooling regulation loops include regulators as well as the controlled object. In an optimised unit or facility, the regulation is based on a PI(D) regulator. Stable and non-oscillating regulation is achieved after a maximum of 4 periods, at a change of load corresponding to 25 % of the set point. No self-oscillating circuits are tolerated.

Systems for cooling and heating shall co-exist and not work against each other.

**Other:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Proposed measures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

City and date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Typed name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_





