

# Annex A. Specification of Requirements

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# 1 Objectives

The purpose of this technology procurement is to make available and introduce onto the market an installable combination unit for heating, hot tap water and ventilation for energy-efficient detached houses. In this document, this installation will be referred to as the *unit*. The unit must be applicable for use in new, energy-efficient, detached houses in the Nordic climate. It is an advantage if the new unit can also be used in the renovation of existing detached houses.

# 2 Conditions

This technology procurement includes all systems that combine heating, hot tap water and ventilation of houses. The system must be usable in a Nordic climate and manage outdoor air temperatures down to  $-15^{\circ}\text{C}$ . In order to constitute a valid entry, not only must be all mandatory requirements specified in be met, but all applicable standards required for a complete and well-functioning operation of the heating and ventilation system for detached houses must also be met.

# 3 General

The requirements and requests proposed here are designated as either *mandatory requirements* or *desired features*. The *mandatory requirements* are minimum requirements that must be met for the tender to be accepted. Compliance with the *desired features* is not mandatory, but is scored positively during the evaluation. Desired features that exceed the specifications are also rewarded. In the annex named the Tender Review Checklist, the tenderer shall tick the appropriate box for each *mandatory requirement* and *desired feature* that the tender meets.

## 3.1 General requirements

The following general requirements and requested features have been established:

- a) The unit shall include a supply and extract air module with heat recovery
- b) The unit shall include a heat pump
- c) At an outdoor temperature of  $-15^{\circ}\text{C}$ :
  - The mandatory supply air temperature is at least  $13^{\circ}\text{C}$
  - The desired supply air temperature is at least  $16.5^{\circ}\text{C}$
- d) Compliance with all of the Swedish Building Regulation's (BBR current version) functional requirements relating to the heating and ventilation is mandatory
- e) The materials used must have good durability. For the purpose of this procurement, this means that the materials should be assessed with reference to either the *Sunda Hus* [Healthy House] or *Byggvarubedömningen* [Building Materials Assessment] assessment systems.
- f) The unit should be built so that it is easy to install, maintain and replace.
- g) The unit should be a plug-in device.
- h) Requirements regarding the size of the unit:
  - Mandatory requirement:

- Width: maximum of 1.2 m
- Depth: maximum of 0.6 m
- Height: maximum of 2.0 m
- Desired feature:
  - Width: maximum of 0.6 m

If additional space is required behind or beside what stated above, this should also be reported.

- i) The unit must have a setting for adjustable, balanced ventilation flows.
- j) The guaranteed maximum price for the next two years must be specified and begin from the tender submission deadline date

The following tables specify the purchasers group's requirements in the left column. Use columns 2 and 3 to indicate your device's compliance with the mandatory requirement (must be met) or desired features (considered favourably if it met or exceeded). The two right columns indicate how compliance will be verified at each stage 1) bid evaluation and 2) after installation of the unit.

### 3.2 Energy efficiency

Parameter	Requirements		Verification	
	Mandatory	Desired	Evaluation, Step 1	Evaluation, Step 2
<b>Electrical power</b>				
Specific electrical power of the ventilation system (SFP). <u>Prerequisites:</u> Balanced flow of 52.5 L/s and 100 Pa external pressure drop for supply and extract air. Equipped with air filters corresponding to filter class ePM2.5 50% (alternatively M6) or better on both the supply and exhaust air side.	SFP: < 2.0 W/(L/s)	SFP: < 1.6 W/(L/s)	Energy calculation in accordance with Annex B and laboratory measurements	Measurements in the demonstration house
	<input type="checkbox"/>	<input type="checkbox"/>		
Energy classification of filters in exhaust and supply air	A/A	A+/A+	Document review scrutiny	In-field review
	<input type="checkbox"/>	<input type="checkbox"/>		
<b>Thermal efficiency/COP</b>				
Calculations for thermal efficiency/COP must be presented, and the values should be measured in a laboratory under realistic flows and temperature conditions. Measuring points should be chosen according to standard.	The calculations used must be reported	Laboratory measurements should be reported	Review of the calculations and laboratory measurements	Measurements in the demonstration house
	<input type="checkbox"/>	<input type="checkbox"/>		

<b>Heat recovery</b>				
<p><u>Exhaust air</u> thermal efficiency (<math>\eta_{\text{exhaust air}}</math>) at flow rate and pressure drop as described above and <u>at an operating point of -15°C</u>, according to EN 13141-7. Average value of the measurement over a longer period of time, including the impact of any automatic defrost function.</p>	70%	80 %	Review of laboratory measurements	Measurements in the demonstration house
	<input type="checkbox"/>	<input type="checkbox"/>		
<b>Heat pump coefficient of performance during heat recovery and heating</b>				
<p>Coefficient of performance (<math>\text{COP}_{\text{V-HH-WH}}</math>) of the units heat pump at simultaneous heat recovery, heating and production of tap water <sup>1</sup> according to section 7.8.4.2 of SS-EN 16573: 2017.<sup>2</sup></p> <p><u>Prerequisites:</u> air flow rate, pressure drop and temperatures as above. A hydronic supply temperature of +35°C can be assumed if the unit is designed for underfloor heating.</p>	<p>At 1700 W rated heating power (mean value)</p> <p>For heating and hot tap water: COP&gt;2.0</p>	<p>At 3400 W rated heating power (mean value)</p> <p>For heating and hot tap water: COP&gt;2.5</p>	Review of laboratory measurements/calculations	Measurements in the demonstration house
	<input type="checkbox"/>	<input type="checkbox"/>		

<sup>1</sup> Tap water production according to tapping cycle L (large) according to EN 16147

<sup>2</sup> In applicable parts meaning a combined testing according to EN 13141-7 and EN 14511-1, -2, -3 and EN 16147

### 3.3 Design

Parameter	Requirements		Verification	
	Mandatory	Desired	Evaluation, Step 1	Evaluation, Step 2
<b>Study Design</b>				
The visible components shall be:	Described with their dimensions in illustrations		Document review scrutiny	Review of the installation and questionnaire
	<input type="checkbox"/>			
<b>Size</b>				
The unit must be:	Described		Document review scrutiny	Installation review scrutiny
	<input type="checkbox"/>			
<b>Heating power</b>				
Rated mean heating power during combined heat recovery, heating and tap water production as above. <sup>3</sup> <u>Prerequisites:</u> Standard airflow rate of 52.5 L/s and 100 Pa external pressure drop on both supply and extract air side of the unit.	> 1,700 W	> 3,400 W	Calculations review scrutiny	Measurements in the demonstration house
	<input type="checkbox"/>	<input type="checkbox"/>		

<sup>3</sup> Upon fulfilment of the mandatory requirement (Passive House), the heating as a whole can be distributed through air heating using the supply airducts, although it can also be completely or partially distributed as underfloor heating or through low-temperature radiators.

### 3.4 Operation and Maintenance

Parameter	Requirements		Verification	
	Mandatory	Desired	Evaluation, Step 1	Evaluation, Step 2
<b>Operations and maintenance instructions</b>				
Operating and maintenance instructions in Swedish must be delivered to the residents before the unit is put into use.	Instructions must be provided		Instructions review scrutiny	A review of how the instructions have been carried out
	<input type="checkbox"/>			
A briefing shall be held with the residents during the installation phase.	Presentation of how the briefing will take place		Instructions review scrutiny	A review of how the instructions have been carried out
	<input type="checkbox"/>			
<b>Users' notes</b>				
User-friendly notes for those components the residents can actually use must be delivered to the residents.	User-friendly descriptions must be submitted		Instructions review scrutiny	
	<input type="checkbox"/>			
<b>Accessibility</b>				
The installation should be accessible from the front for servicing and maintenance.	The accessibility shall be described		Document review scrutiny	
	<input type="checkbox"/>			
<b>Operational reliability</b>				
A service plan and organization is required for how emergency maintenance will take place in Sweden.	An emergency maintenance plan shall be provided		Plan review scrutiny	
	<input type="checkbox"/>			

<b>Periodic maintenance</b>				
The need for periodic maintenance must not exceed 2 times per year.	A maintenance plan must be provided		Maintenance plan review scrutiny	
	<input type="checkbox"/>			
The need for periodic maintenance must be clearly stated in the maintenance plan.	Maintenance plan		Maintenance plan review scrutiny	
	<input type="checkbox"/>			
<b>Ease of replacement</b>				
Wearing parts requiring replacement during the lifetime of the system must be easily replaced.	A description of the wearing parts and how to replace them must be provided.		Description review scrutiny	
	<input type="checkbox"/>			
Spare parts shall be available during the life of the product.	The availability shall be described		Description review scrutiny	
	<input type="checkbox"/>			
The installation must be equipped with an alarm function, visually accessible to the user.	A description must be provided		Description review scrutiny	
	<input type="checkbox"/>			



### 3.5 Robustness

Parameter	Requirements		Verification	
	Mandatory	Desired	Evaluation, Step 1	Evaluation, Step 2
<b>Lifespan</b>				
The installation must be robust and have a satisfactory function for X years of operation at normal maintenance.	X > 15 years	X > 20 years	Reporting of the technical service life of the included components	
	<input type="checkbox"/>	<input type="checkbox"/>		
<b>Sustained energy recovery rate</b>				
The system's heat recovery must not decrease more than 5% over the lifespan.	A warranty must be provided		Document review scrutiny	Document review scrutiny
	<input type="checkbox"/>			
<b>Materials</b>				
The material must be recyclable 50 weight-% (Ref. Swan).	Must be specified		Document review scrutiny	
	<input type="checkbox"/>			
The included components must be made of materials that are resistant to the refrigerant and Swedish drinking water.	Must be described		Document review scrutiny	
	<input type="checkbox"/>		<input type="checkbox"/>	
The included components must be included in those assessed in the <i>Sunda Hus</i> [Healthy House] materials database and have been rated as A, B or C+ or in <i>Byggvarubedömningen</i> [Building Materials Assessment] and rated as Recommended or Acceptable.	Must be specified		Document review scrutiny	
	<input type="checkbox"/>		<input type="checkbox"/>	

### 3.6 Health

Parameter	Requirements		Verification	
	Mandatory	Desired	Evaluation, Step 1	Evaluation, Step 2
<b>Air quality</b>				
There must be sufficient space for an ePM1 50% air filter (alternatively F7) on the supply air side	Must be specified		Document review scrutiny	
	<input type="checkbox"/>			
Air filter class according to ISO16890 (alternatively according to EN 779) on the supply air side	ePM2.5 50 % (or M6)	ePM1 50% (or F7)	Document review scrutiny	Installation review scrutiny
	<input type="checkbox"/>	<input type="checkbox"/>		
Filters, non-washable	Must be specified		Document review scrutiny	
	<input type="checkbox"/>			
Air filter class ePM2.5 50% according to ISO16890 (alternatively M6 according to EN 779) on the extract air side, or better	Must be specified		Document review scrutiny	
	<input type="checkbox"/>			
<b>Noise</b>				
The sound power level $L_w$ at the duct connections of the unit and radiated by the casing of the unit to its surrounding shall be measured and reported in accordance section 8 of EN 16573: 2017  Reported octave band is expanded to 31.5 - 8000 Hz and also the C-weighted sound power levels shall be reported.	Must be specified		Document review scrutiny	

	<input type="checkbox"/>			
Indoor sound levels: The tender shall include instruction on how to install the unit in a utility room <sup>4</sup> so that the sound emitted from the installation to the indoor measured according to standard SS 25267:2015 comply with sound class A according to Table 7:21B in BBR 25, or better.	Sound class A	Sound class B	Document review scrutiny	Measurements in the demonstration house
	<input type="checkbox"/>	<input type="checkbox"/>		
Outdoor sound levels: The tender shall include instruction on how to install the unit during different mounting conditions so that the free field-normalized sound pressure at the property boundary do not exceed 40 dBA.	Must be specified		Document review scrutiny	Measurements in the demonstration house
	<input type="checkbox"/>			
Structure-borne sound: The tender shall include installation instruction on how vibration noise is remedied.	Must be specified		Document review scrutiny	
	<input type="checkbox"/>			

<sup>4</sup> The door(s) between the utility room and other indoor premises is/are assumed to be closed when the sound class is achieved.

### 3.7 Statement of costs

Parameter	Requirements		Verification	
	<i>Mandatory</i>	<i>Desired</i>	<i>Evaluation, Step 1</i>	<i>Evaluation, Step 2</i>
<b>Present (savings - investment)</b>				
The following shall be reported: Investment cost for the installation in SEK (excl. drilling) Operating electricity in kWh/year Costs for filter change SEK/year Other maintenance costs in SEK/year The residual value in SEK after 20 years	Must be indicated.		Calculation and reporting of costs in the project's Excel template	Reporting of costs
	<input type="checkbox"/>	<input type="checkbox"/>		

### 3.8 Tenderer particulars

Parameter	Requirements		Verification	
	<i>Mandatory</i>	<i>Desired</i>	<i>Evaluation, Step 1</i>	<i>Evaluation, Step 2</i>
<b>Solidity</b>				
Economic status and solidity must be reported.	Must be specified		Review scrutiny of the report	
	<input type="checkbox"/>			
<b>Capacity</b>				
The tenderer must have sufficient capacity to supply the tendered solution to the market.	Must be specified		Review scrutiny of the report	
	<input type="checkbox"/>			
<b>Experience</b>				
Review at least one reference project in which the company participated.	Must be specified		Review scrutiny of the report	
	<input type="checkbox"/>			
<b>Organisation</b>				
The tenderer must describe their organization and the key people who will work in the project.	Must be specified		Review scrutiny of the report	
	<input type="checkbox"/>			
<b>Quality and environmental management systems</b>				
The tenderer must describe the quality and environmental systems used within the company.	Must be specified		Review scrutiny of the report	
	<input type="checkbox"/>			

<b>Presentation</b>				
The tenderer must be available for oral presentation of the tender during the evaluation stage.	The tenderer will participate		Meeting with the tenderer	
	<input type="checkbox"/>			