Appendix B: Specification of requirements

Technical procurement of heat recycling systems in existing apartment blocks

Objective

To develop complete systems for recycling heat from ventilation air in existing apartment blocks.

Conditions

Technical procurement covers the systems needed for recycling heat, including components and measures relating to ventilation air in existing apartment blocks. This includes conversion of existing ventilation systems (natural, exhaust, or exhaust/intake ventilation) for recycling.

Technical purchasing embraces a complete system for recycling heat, including installation and other measures needed for installation (e.g. sealing of climate screens, construction of fan rooms, preliminary adjustment.)

In addition to the requirements for technical procurement it is necessary that a complete competitive tender want to also include an otherwise complete and well-functioning heating and ventilation system which complies with legal requirements when modifying buildings, e.g. duty of care, accessibility, fire regulations, etc, i.e. laws and ordinances in force shall apply.

General

The requirements and wishes proposed here are expressed in the form of "must" and "want" features. "Must" requirements are basic requirements which must always be fulfilled. "Want" requirements do not have to be fulfilled but will be taken into account favourably during assessment. Requirements that are fulfilled better than the "want" requirements will be more highly rated.

Principal requirements

The heat recycling system must fulfil the following principal requirements:

a. The technical solutions must be constructed such that heat from the ventilating air flow is recycled to the benefit of the building (for heating rooms and/or for domestic hot water).

b. The heat recycling system must have good energy efficiency and life cycle cost.

c. The ventilation plant must be designed so that requirements for an indoor environment are fulfilled.

d. Components that are visible in apartments or stairwells must be of a design acceptable to most residents.

e. The system solution must not have a negative effect on the building's function, e.g. with a considerable reduction of the area able to be let.

f. Rebuilding must not cause considerable disruption for the residents.

g. The system solution must be robust. Components which may need replacement during the plant's lifetime must be of standard measurements and be easy to replace.

h. Operating and maintenance instructions must be included. The system must be designed so that it is easy to run and maintain by ordinary operating staff.

i. It must be possible to continually measure the efficiency of the recycling system e.g. through integration with the premises' control and surveillance system.

Requirements for energy efficiency

PARAMETER	REQUIREMENT Must be fulfilled	REQUIREMENT Want to be fulfilled	Verification Before installation	Verification After installation
<u>Electrical efficiency</u> Specific electricity requirement for ventilation systems (SFP) on normal flow through the building i.e. 0.35 l/(sm²) throughout the building	Building Council: F-system with recycling: 1.00 kWh/(m^3/s) FTX-system: 2.0 kW/(m^3/s) ☐	☐	Estimate from project drawings	Measurement
<u>Seal</u> New ventilation ducts must have a seal as per AMA VVS &Kyl	Class C circular ventilation ducts Class B for rectangular ventilation-ducts ☐	Class D circular ventilation ducts Class C for rectangular ventilation ducts ☐		Control measurement on 10% of the duct systems
<u>Seal</u> Existing ventilation ducts must have a seal as per AMA VVS &Kyl	Class B circular ventilation ducts Class A for rectangular ventilation ducts If sealing is needed, the sealing method must be describe ☐	Class C circular ventilation ducts Class B for rectangular ventilation ducts ☐	Method for sealing to be examined	Control measurement on 10% of the duct systems
<u>Efficient energy use:</u> Building's energy performance (energy for heating, domestic hot water and maintenance of premises to be reduced on exterior air flow 0.35 l/(sm^2) at least,	30 kWh/m²A_{temp}, year and 60% of ventilation loss to be recycled ☐	40 kWh/m²A_{temp}, year and 80% of ventilation loss to be recycled ☐	Energy estimate Tenderers must give results from measured COP and temperature conversion efficiency in laboratory	Measurement Comparison energy use before and after installation. Check of conversion efficiency for recycling
<u>Efficient use of electricity:</u> Building's need for electricity on premises increased by not more than,	F-systems: 12 kWh/ m²A_{temp}, year Natural ventilation: 14 kWh/ m²A_{temp}, year ☐	F-systems: 10 kWh/ m²A_{temp}, year Natural ventilation: 14 kWh/ m²A_{temp}, year ☐	Estimated energy	Measurement Comparison electricity use before and after installation.

Requirements as to cost

PARAMETER	REQUIRE-MENT **Must be fulfilled**	REQUIRE-MENT **Want to be fulfilled**	**Verification** Before installation	**Verification** After installation
<u>Current value (Saving – Investment):</u> Current value cost saving through greater energy efficiency must be greater that the total cost of the recycling system during a lifetime of, Applies to at least 10 apts Calculated interest rate: 4 % Energy price increase: 2 % heating 4% electric Electric energy price: 1.0 SEK/kWh Heating energy price: 0.60 SEK/kWh	12 year ☐	8 year ☐	Statement of profitability and cost calculation	Statement of costs

Requirements as to indoor climate parameters

PARAMETER	REQUIREMENT **Must be fulfilled**	REQUIREMENT **Want to be fulfilled**	**Verification** Before installation	**Verification** After installation
Air speed in living areas (50 cm from outer walls with windows)	In winter, max 0.15 m/s In summer, max 0.25 m/s ☐	☐		To be measured on complaints in questionnaires.
Intake air temperature 50cm after intake air device or alternatively exhaust air device	Min 16 °C at design winter temperature ☐	☐		Random checks in 10 % of apartments measured at outdoor temperature of around + 5°C and at least -5°C.
Change of air in apartments Outside air flow Can be need-controlled	Operational status: Occupied ≥ 0.35 l/(sm²) Empty apartment ≥ 0.10 l/(sm²) ☐		On need control, describe technology for determining presence or absence	Flow measurement at exhaust air device. On need control, operating times must be logged.
Air quality	CO_2 content in exterior air must not exceed 1000 ppm in any room (max. average value over 12 hours at ventilation flow ≥ 0.35 l/(sm²)) ☐	☐		Random checks in room thought to have least ventilation

Max. permitted values sound level in apartments from ventilation	Class B in bedrooms and living rooms Class C in bath-rooms and kitchens ☐	Class A in bedrooms and living rooms Class B in bath-rooms and kitchens ☐		Random checks on 10% on apts (at least 3 apts.) (as per SS 025267)
Sound damping towards surroundings	Same level as before rebuilding ☐	Lower level than before rebuilding ☐		Measurement before and after installation (as per SS 025267)
Sound damping between apartments	Same level as before rebuilding ☐	☐		To be measured on complaints in questionnaires
Indoor climate (odours, draughts, noise, temperature etc.)	Requirements according to BBR and Health and Welfare recommendations must be met after installation ☐	Improved indoor climate ☐		Indoor environment questionnaire before and after installation.

Requirement as to building's design and function

PARAMETER	**REQUIREMENT Must be fulfilled**	**REQUIREMENT Want to be fulfilled**	**Verification** Before installation	**Verification** After installation
Components and ducts visible in apartments or stair wells must be of a design acceptable to most residents	Must be described ☐	☐	Examination of documents by representatives of customer group	Examination by interior design architect and representatives of customer group. Additional question in questionnaire
System solution must not impact negatively on residential function e.g. through considerable reduction in lettable area	Must be described ☐	☐	Examination of documents by representatives of customer group	Examination by interior design architect and representatives of customer group. Additional question in questionnaire

Requirement as to installation

PARAMETER	REQUIREMENT Must be fulfilled	REQUIREMENT Want to be fulfilled	Verification Before installation	Verification After installation
Duct installation in apartments with inhabitants in residence must not exceed:	5 successive days where no apartments needs more than 3 working days exclusive of preliminary adjustment and inspection ☐	3 successive days where no apartments needs more than 2 working days exclusive of preliminary adjustment and inspection ☐	Examination of installation timetable	Time measurement through random tests during installation

Requirement as to robustness

PARAMETER	REQUIREMENT Must be fulfilled	REQUIREMENT Want to be fulfilled	Verification Before installation	Verification After installation
Components which may need replacement during the system's lifetime must be easy to exchange and be of standard dimensions	Description of incorporated components ☐	☐		Examination by expert

Requirements as to operation and maintenance

PARAMETER	REQUIREMENT Must be fulfilled	REQUIREMENT Want to be fulfilled	Verification Before installation	Verification After installation
Recycling components that require maintenance must be sited so as to be accessible. Maintenance includes preliminary adjustment, flow control, cleaning, filter exchange and other measures.	Must be described ☐	☐	Check on projecting drawings (That they match the maintenance instructions)	Check
Operating and maintenance instructions must be supplied to operating staff before the plant is commissioned.	Must be described ☐	☐	Check on general instructions.	Check on specific instructions.
Easily understood user's descriptions for residents must be supplied.	Must be described ☐	☐	Check on general instructions.	Check on specific instructions.

Requirements as to monitoring of temperatures, flows and energy consumption

PARAMETER	REQUIREMENT Must be fulfilled	REQUIREMENT Want to be fulfilled	Verification Before installation	Verification After installation
Input-, exhaust- and output air temperatures in the ventilation system Outdoor air temperature	It must be possible to connect the temperature sensor to the control/ monitoring system. Description of measurement instability on sensor ☐	☐	Check	Check
Exhaust and input air flow	It must be possible to connect the flow sensor to the control/monitoring system. Description of measurement instability on sensor ☐	☐	Check	Check
Electric consumption of the ventilation and heat recycling system	It must be possible to connect the electricity meter to the control/monitoring system. Description of measurement instability on sensor ☐	☐	Check	Check

Requirements as to system flexibility

PARAMETER	REQUIREMENT Must be fulfilled	REQUIREMENT Want to be fulfilled	Verification Before installation	Verification After installation
Open solution for the control and regulation system, which can be integrated with components of different brands/makes	Must be described ☐	☐	Check	Check