

Rak-43.3415 Building Physics Design 2 – Acoustical Design Design exercise, Autumn 2015

You work as an acoustical consultant in a hospital design project. The client requires that the patient rooms in the hospital meet the Class C guideline values for airborne sound insulation given in standard SFS 5907 *Acoustic Classification of Spaces in Buildings*. Your task is to present adequate structures, including glazings and door, as well as silencers in ventilation shafts with which the sound insulation requirements can be fulfilled.

A plan of the patient rooms, including the ventilation system, and a projection of the corridor wall are given in the appendix (Fig 1-2). Standard SFS 5907 is given as a pdf-file in the MyCourses page. (The standard is for Aalto University's use only - please don't distribute it to any third parties.)

The design exercise is done in groups; see your own group on the last page. Each group shall present their individual design solutions as a written report with the needed drawings and calculations as appendices.

The report shall include the following information:

- **Sound insulation values**

Structures:

Calculate the sound reduction indexes of all the structures needed in your design (including the glass sections in the corridor wall) in one-third octave bands 100-3150 Hz. Also determine and report the single-number values (R_w) of each structure. Use the calculation models given in the course book RIL 243-1-2007, Chapter 5, or the lecture slides.

Flanking transmission along ventilation shafts:

Take account of the flanking transmission along the ventilation shafts using the calculation model given in RIL 243-1-2007, Chapter 12. For “starting attenuation”, $D_{\text{l\ae}ht\ddot{o}}$, use the equation given in the lecture slides. Do the calculations in octave bands 63-4000 Hz. Determine adequate silencers based on your calculation.

Combined sound insulation:

Calculate and report the combined sound insulation between the patient rooms and between the corridor and patient room.

Present all the calculations, both frequency-band and single-number values, and the equations you have used in the appendix of your statement.

- **Drawings**

Present the construction types (rakennetyypit) you have chosen for the wall between the patient rooms and the corridor wall. Also present drawings of all the structural junctions and sealing details that you find significant to sound insulation. All the drawings shall be made in scale using AutoCad and plotted as appendices to your statement.

- **Written part**

Begin your report with a brief written part in which you explain and justify clearly your design solutions to the imaginary client. The first page of the statement shall be a cover page with the following information: all the persons who have done the exercise with student numbers, name of the course, date. Example of the structure of the statement: introduction, sound insulation requirements, description of calculation methods, description of chosen structures (in written form plus references to drawings in appendices, include calculated single-number R_w values in the text), description of structural details and references to drawings in appendix.

Please keep your report brief and clear!

Hints:

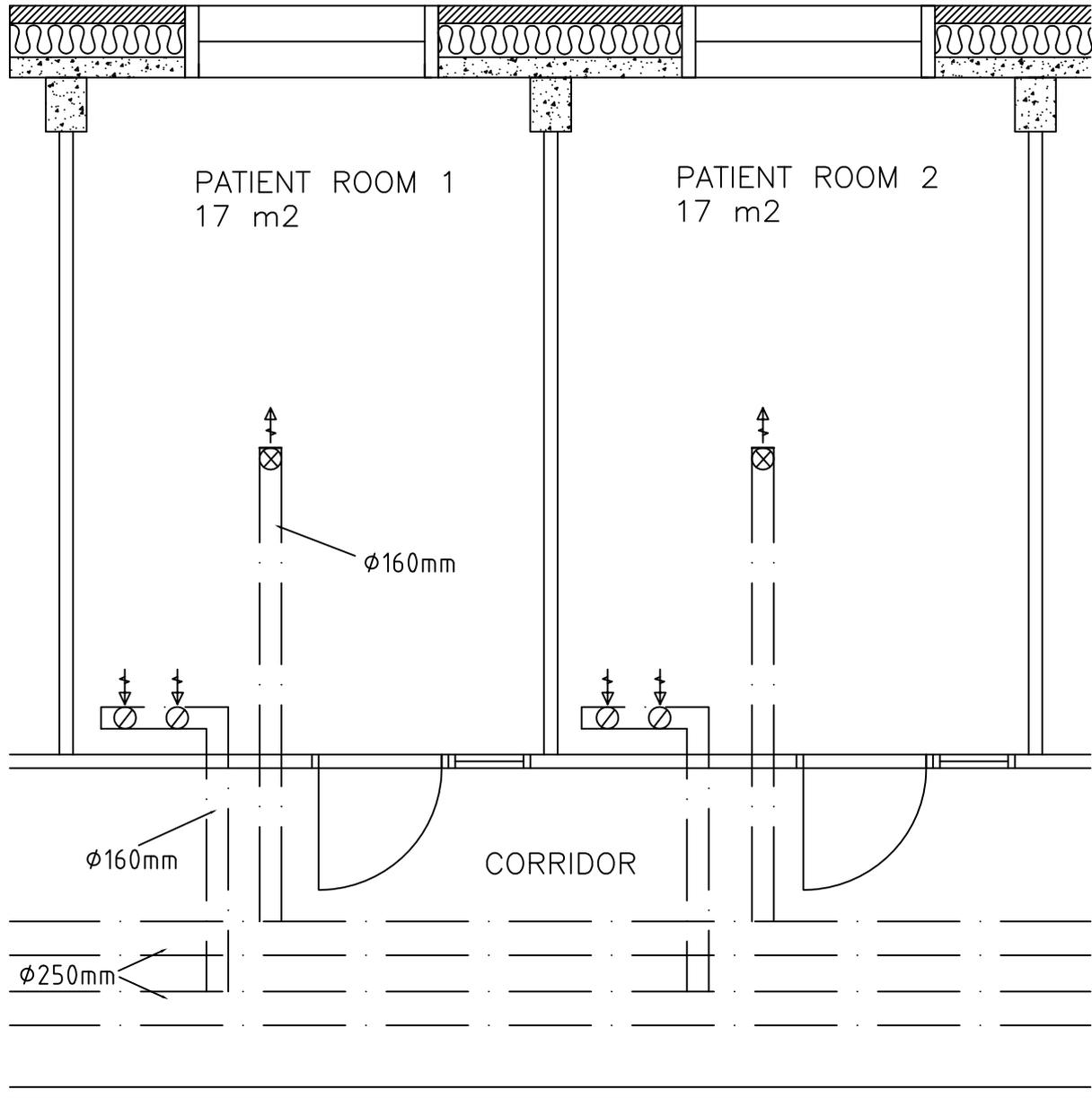
- You can assume that the sound insulation of the floor, roof and exterior wall are adequate, thus structural flanking transmission can be neglected in the calculations. However, depending on the types of structures you choose, consider how you can solve the junction detail to the corridor wall so as to minimize flanking transmission.
- Sound insulation values of doors are difficult to find in frequency bands; if you can't find any, you may calculate the combined sound insulation of the corridor wall using single-number R_w values.
- Attenuation values of terminal units and silencers can be found on the internet...

Design exercise with appendices is sent via e-mail as a single pdf-file to matias.remes@helimaki.fi. Name the pdf-file as follows: “Rak-43.3415_Design exercise 2015_Group X”, where X is the number of your group.

The deadline for sending the report is Tue 3.11.2015.

The design exercise is graded on the principle of approved/failed.

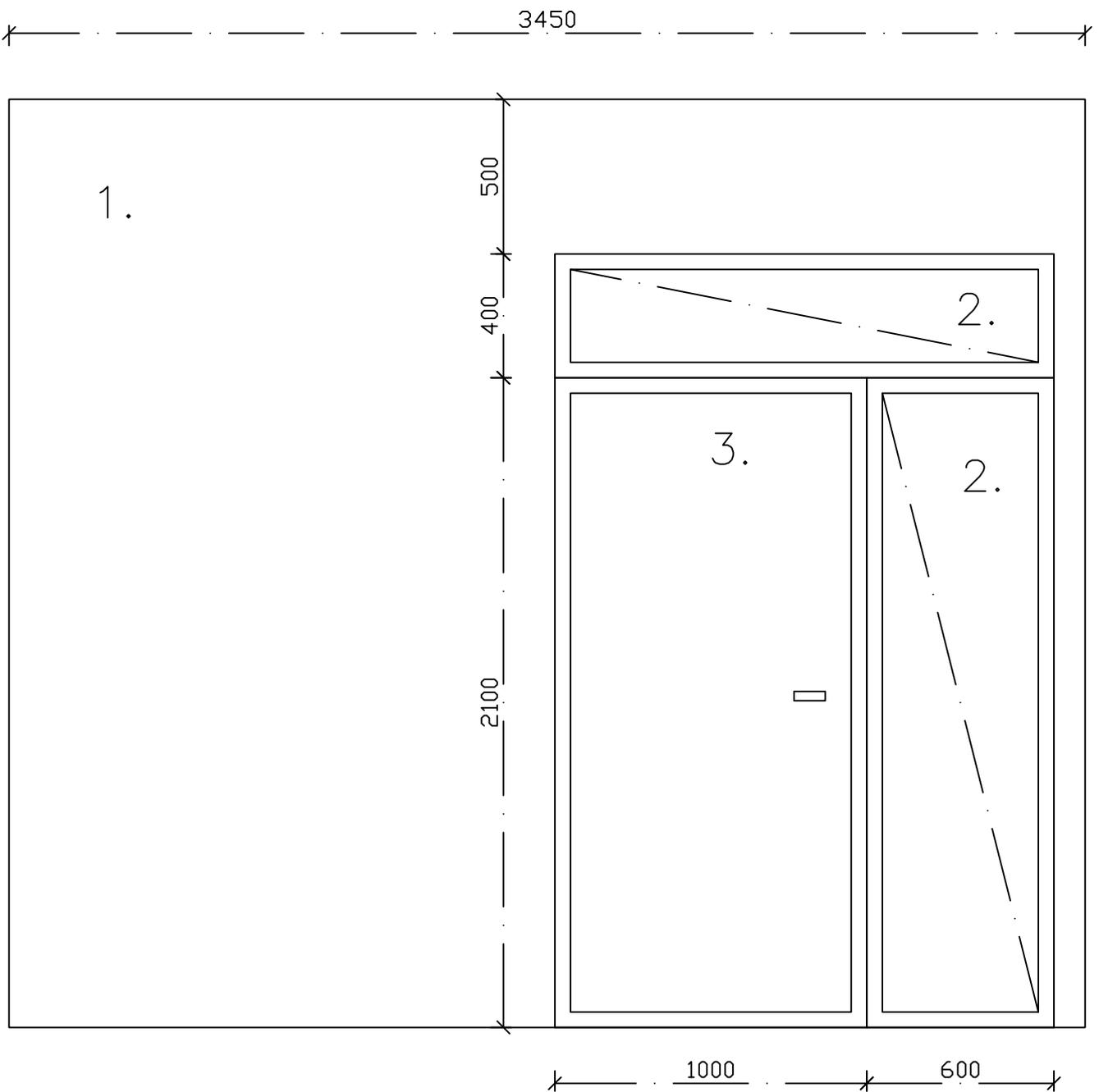
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Inlet air terminal unit, type: KTS 160, Fläktwoods Oy
Exhaust air terminal unit, type: KSO 160, Fläktwoods Oy

Exterior wall structure: concrete 150 mm, mineral wool 250 mm, brick 130 mm
Floor structure: hollow core slab 370 mm
Roof structure: hollow core slab 370 mm

Airborne sound insulation requirements according to Class C in standard SFS 5907,
Acoustical Classification of Spaces in Buildings



1. Solid corridor wall
2. Glass
3. Flush door (laakaovi)