BME Faculty of Architecture
Department of Building Constructions

Building Construction 3.
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TUTORIAL CLASS OUTLINE
to the 2nd workshop exercise of the Building Construction 3. course
Internal Door with Folding-type Frame; Performance-Based Selection

1. Selecting the appropriate door type based on performance criteria

Doors are building products; therefore, the topic of this workshop exercise is not door design, but rather the selection of appropriate door type based on performance criteria.

One of the most important performance characteristics of internal doors is the airborne sound insulation capacity. The performance rating threshold values regarding the airborne sound insulation capacity of internal doors is defined in standard "MSZ 15601-1:2007" for Hungary.

The actual numeric threshold values of airborne sound insulation capacity ($(R_w+C)_{actual}$) equal those specified in the standard (see table below) if the functions of the designed rooms match the room functions specified in the standard:

$(R_w+C)_{actual} = R_w+C$

Building type	Name of room or structure exposed to noise and the name of the room to be sheltered from noise	Building quality level	Performance data (R_w + C) dB	
			Wall	Door
Residential	Between staircase block and residential room	standard	51	33
		high	54	36
	Between staircase block and entry hall	standard	51	25
		high	54	28
	Within an apartment, wall between a room and any other space, if there are no doors between them	standard	-	-
		high	39	-
Hotel	Accommodation. 3 stars or higher, between hotel room and hallway	standard	47	30
		high	52	33
	Accommodation. 2 stars or lower, between hotel room and hallway	standard	43	27
		high	47	30
Healthcare	Between medical room traffic area or staircase	standard	43	27
		high	48	30
Education	Between classroom and traffic area or staircase	standard	45	27
		high	48	32
Office	Between office and traffic area or staircase	standard	37	28
		high	42	33
	Between meeting room and traffic area or staircase	standard	42	33
		high	47	33

If the functions of the designed rooms do not match the room functions specified in the standard, then the actual numeric threshold values of airborne sound insulation capacity *($(R_w+C)_{actual}$)* is calculated using the following formula:

$$(R_w+C)_{té} = R_w+C + \Delta R_{s,}$$

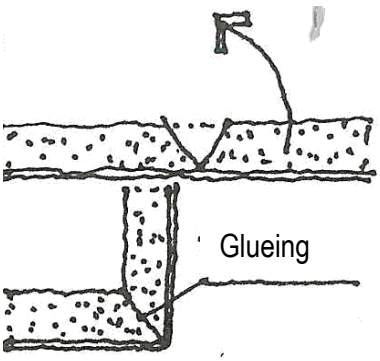
where ΔR_s is the airborne sound insulation capacity modifying coefficient specified by another table of the standard, in 5 dB increments. For example:

Modifying coefficient, $\Delta R_{s,}$ *(dB)*	Function of room exposed to noise
0	- general purpose classroom, teacher's office - presentation room
5	- office with more than 5 people, network printer, plotter, copy machine etc. - public retail space with no music
10	- school hallway -music class room, gym - public restaurant without music

2. Workshop exercise

2.1. Internal door with folding-type frame

This door frame type is called folding because of the method of its construction.
A groove is cut into the good quality chipboard after which it is folded and glued, as illustrated on the sketch. The trims on both sides are made using this technology (one is for covering the gap between the wall and the frame, the other one is connected to the door leaf). This door type may have veneer or numerous other surface finishes. The internal surface of the frame is lined with special paper.



The door leaf is usually veneered but may be laminated or powder-coated, as well.
Due to its structural layout:

- this frame type fits virtually all wall widths (4-38 cm)
- it has a high tolerance to fit uneven wall widths (-5, +10 mm)

As these doors are brought to the construction site with high quality, finalized surface finishes, they are built in at the final stage of construction. They require no dummy frames. The frame is transported to the construction site in two pieces and assembled on the spot.
Hinges, doorknobs and locking mechanism:

- Two simple hinges fixed to the frame by four screws each.
- Internal door lock, adjustable safety cover plate and door knob set.

Assembly:
First the part of the frame that connects to the door leaf is assembled using special metal fasteners manufactured exclusively for this purpose. The frame is then positioned in the wall hole accurately and fixed by two times three wedges along the vertical frame side. The frame is braced temporarily from the other side, at the same spots. The gap between the frame and the wall or dummy frame is then filled with polyurethane foam. After the setting of the foam (15-30 minutes), the temporary braces are removed and the trims are mounted. The elastic sealing strip in the frame to leaf connection groove allows the silent closing of the door (cushioning) besides providing the sufficient connection.

The door leaf is profiled at the frame connection and offers a double connection.

There are sliding doors available on the market with folding frames, but their acoustic properties are inferior to regular folding frame type doors. In case of sliding doors, the leaf edge is not profiled. The supporting structure consists of an adjustable rail with brake and end cushion, a vertically adjustable roller cart and a point-like bottom guide.

2.2. High quality door with folding-type frame

If higher quality components and detail solutions are used, the performance of the folding frame-type door increases significantly compared to the simple version. Continuous sealing along the frame-to-leaf connection and an automatic mechanical sealing at the bottom detail provides excellent sealing due to the mechanism that triggers the elastic profile to move downwards and connect to the floor seamlessly. This detail solution is also very effective if the door separates spaces with two different floor cladding types (e.g. warm and cold).

The main technical parameters of the door are the following:
- Airborne sound insulation capacity: R_w+C = 32 dB
- Relative weight of door leaf: 28 kg/m^2
- Sealing: Double sealing along three sides
  Automatic sealing at the bottom detail
- Gap between wall and frame: Mineral wool and PUR foam infill
- Number of hinges: Three

2.3. Internal door with steel frame, offering high acoustic insulation performance

The steel frame and the hard laminate surface of the door leaf offer a higher resistance to mechanical impacts and cleaning.

The main technical parameters of the door are the following:
- Airborne sound insulation capacity: R_w+C = 40 dB
- Relative weight of door leaf: 32 kg/m^2
- Sealing: Double sealing along three sides
  Threshold + automatic sealing at the bottom detail
- Gap between wall and frame: Cement mortar infill
- Number of hinges: Multi-tension (increased sealing)

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