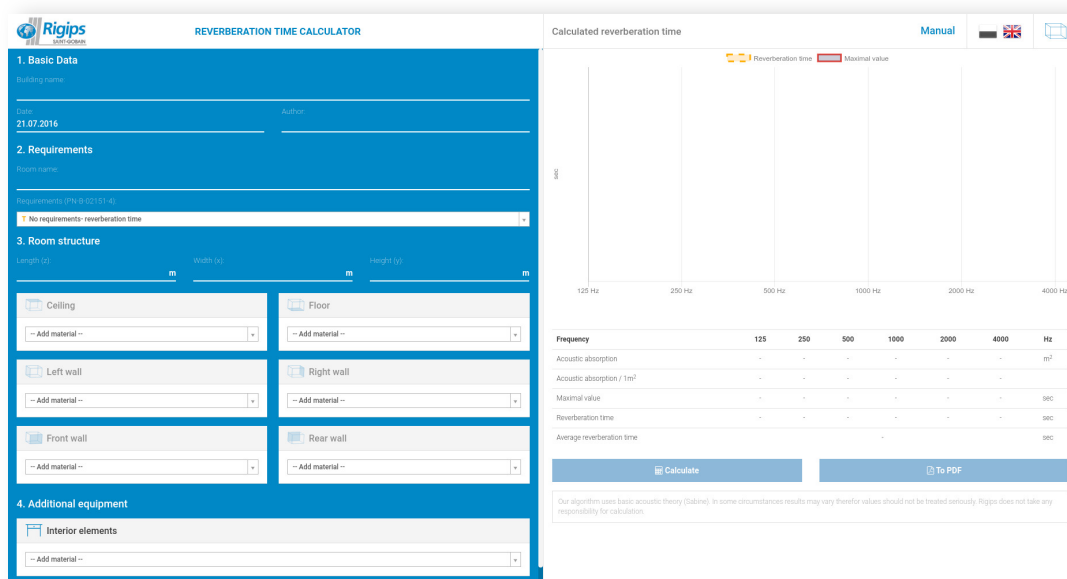


User guide for Rigips reverberation time calculator

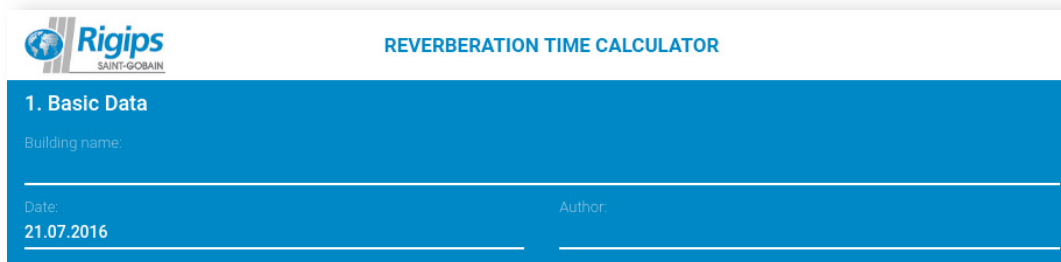
This guide is designed to get known, show the possibilities and let easy start with Rigips reverberation time calculator. The calculator can be used to calculate nominal absorption and reverberation time in rooms, so then to evaluation of acoustic reverberation conditions in these rooms. Particularly it refers to requirements of Polish standard PN-B-02151-4 „Wymagania dotyczące warunków pogłosowych i zrozumiałości mowy w pomieszczeniach oraz wytyczne prowadzenia badań”. The calculator is based on Sabine’s formula and can be used for estimation of reverberation time in typical rooms, reminding all limitations related to Sabine theory, like ideal diffused acoustic field or uniform placement of absorbing materials. We remind that this program is not suited to make calculations for cinemas, theaters, concert halls or big open halls with unusual shape. It is not suited to calculate round nor oval rooms. In such cases you need to consult acoustician about your project.

So this calculator can be used to calculate reverberation conditions in class rooms, kindergartens, conference rooms, offices, corridors, hotel rooms, hospital rooms and other similar rooms with simple (typical) shape.



The screenshot shows the 'REVERBERATION TIME CALCULATOR' interface. The left sidebar contains four sections: '1. Basic Data' (Building name, Date: 21.07.2016, Author), '2. Requirements' (Room name, Requirements: PN-B-02151-4, No requirements - reverberation time), '3. Room structure' (Length, Width, Height in meters; Ceiling, Floor, Left wall, Right wall, Front wall, Rear wall, each with an 'Add material' button), and '4. Additional equipment' (Interior elements, with an 'Add material' button). The right main area shows 'Calculated reverberation time' with a 'Manual' button, language flags (Polish and English), and a 3D view icon. Below this is a chart of reverberation time vs. frequency (125 Hz to 4000 Hz). A table below the chart shows calculated values for Acoustic absorption, Acoustic absorption / 1m³, Maximal value, Reverberation time, and Average reverberation time. At the bottom are 'Calculate' and 'To PDF' buttons. A disclaimer at the very bottom states: 'Our algorithm uses basic acoustic theory (Sabine). In some circumstances results may vary therefore values should not be treated seriously. Rigips does not take any responsibility for calculation.'

1. This is a view of starting screen. There is a “blue colored” field on the left side – area to input data by user. On the right side there is a table with calculation results and generated chart of reverberation time (or acoustic absorption) in the function of frequency. There are two buttons below the table:
 - "Calculate" – used to recalculate input data (usually it is done automatically after every change of data)
 - "To PDF" – used to save and/or print the results of calculation in PDF format file.
 In up right corner of the screen you can find buttons for selection the language: Polish or English (marked with flag icons) and a button marked with “a cube” to open or close the 3D view of the room.

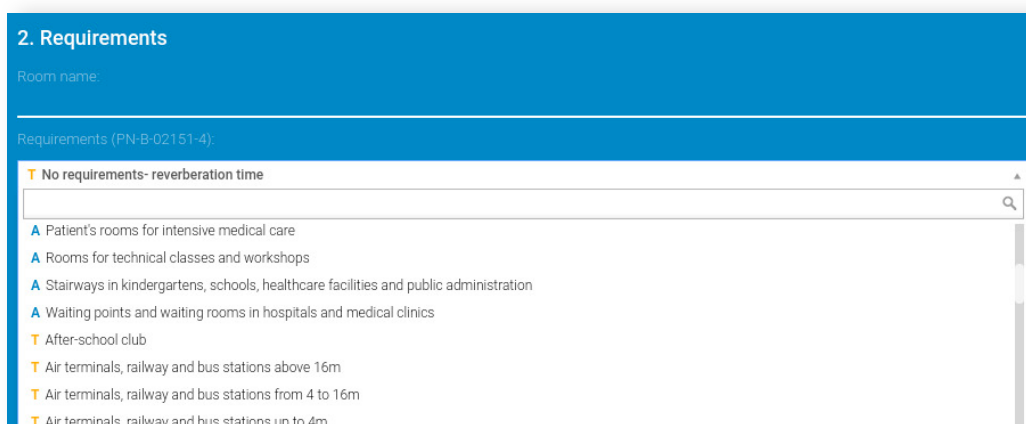


1. Basic Data

Building name: _____

Date: **21.07.2016** Author: _____

- On the top of the left (blue) part of the screen we have a field named „1. Basic Data”. You can input here a name of the building (e.g School no.5), date (actual date is default) and the author of calculation.



2. Requirements

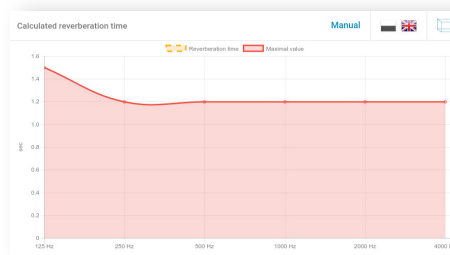
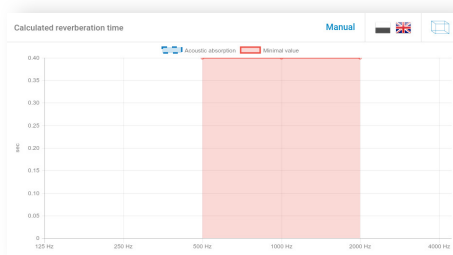
Room name: _____

Requirements (PN-B-02151-4):

T No requirements- reverberation time

- A** Patient's rooms for intensive medical care
- A** Rooms for technical classes and workshops
- A** Stairways in kindergartens, schools, healthcare facilities and public administration
- A** Waiting points and waiting rooms in hospitals and medical clinics
- T** After-school club
- T** Air terminals, railway and bus stations above 16m
- T** Air terminals, railway and bus stations from 4 to 16m
- T** Air terminals, railway and bus stations up to 4m

- Below you can find a field named „2. Requirements”. You can type in here the name of the room (e.g class IIB) – this is important due to saving this file later. The name of saved PDF file will be a combination of building name and room name. Below we have a drop-down list of rooms with requirements described in Polish standard PN-B-02151-4. You shall select one of the rooms, appropriate or most similar with function to calculated one. The norm describes requirements either for reverberation time either for acoustic absorption, depending on kind of the room. Therefore to make the selection easier, the names on the list start with the symbols: „**T**” (reverberation time) or „**A**” (acoustic absorption). Calculator can be used also to calculate reverberation time or acoustic absorption without relating the result to any requirements – you shall select then option “No requirements – reverberation time” or “No requirements – acoustic absorption” from the list. In such case there will be only one line visible on the graph.



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4. The line of required minimal acoustic absorption (if the room with symbol **A** was selected) or maximal reverberation time (if the room with symbol **T** was selected) will appear automatically on the chart. The requirements of reverberation time refer to all 6 main octave frequencies, from 125 to 4000 Hz. The requirements of acoustic absorption refer only to middle octave frequencies 500, 1000 and 2000 Hz, so the graph of the line is partial in this case.

3. Room structure (480 m²)

Length (z): **10.00 m** Width (x): **12.00 m** Height (y): **4.00 m**

<p>Ceiling (120 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>2x12,5 mm plasterboard on steel and 50 mm mineral wool, painted surface 120.00 m² ✕</p>	<p>Floor (120 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>Wood floor on wood beams 120.00 m² ✕</p>
<p>Left wall (40 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 40.00 m² ✕</p>	<p>Right wall (40 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 40.00 m² ✕</p>
<p>Front wall (48 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 48.00 m² ✕</p>	<p>Rear wall (48 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 48.00 m² ✕</p>

5. The next step is typing in the dimensions of the room in the area named „3. Room structure”. The dimensions shall be given in meters, program rounds the figures to 0,01 meter. After implementing the dimensions the program will calculate and attribute all surfaces: ceiling, floor, walls with appropriate values. These values will appear below, next to the surface names. The calculator will control then total area of each surface with declared values when describing materials – you are not able to input smaller or bigger value of each surface then right one due to dimensions. For example – if left wall consists of a window, door, standard plasterboard and perforated plasterboard, then the sum of all partial areas must be equal to total wall surface given from dimensions. The program will control and correct automatically these areas if needed.

REVERBERATION TIME CALCULATOR

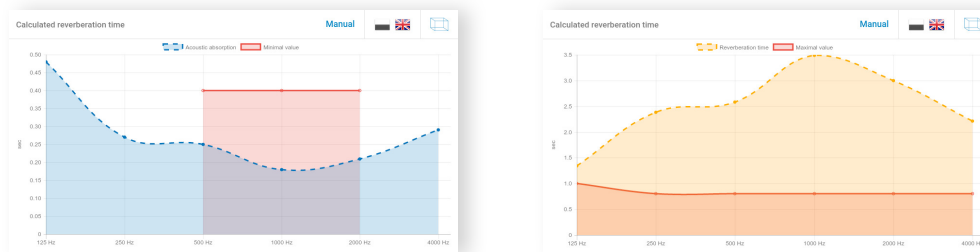
3. Room structure (240 m³)

Length (z): **10.00 m** Width (x): **12.00 m** Height (y): **2.00 m**

<p>Ceiling (120 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>2x12,5 mm plasterboard on steel and 50 mm mineral wool, painted surface 120.00 m² ✕</p>	<p>Floor (120 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>Wood floor on wood beams 120.00 m² ✕</p>
<p>Left wall (20 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 20.00 m² ✕</p>	<p>Right wall (20 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 20.00 m² ✕</p>
<p>Front wall (24 m²) ✓</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 24.00 m² ✕</p>	<p>Rear wall (24 m²) ⚠</p> <p>-- Add material --</p> <p>Materials:</p> <p>22 mm chipboard, 50 mm cavity with mineral wool 48.00 m² ✕</p>

- The next step is defining and ascribing proper finishing materials to all surfaces in the room: ceiling, floor and walls. The materials shall be selected from drop-down lists “-- Add material --”. The program will prompt the proper material when you type in the part of the name (this can accelerate the searching). You can define many materials to every surface. The program will automatically split the area of the surface into equal parts when adding second and next materials. Later you can edit and correct every material quantity „by hand”, and calculator will keep controlling the sum of the square meters on given surface. Every material can be deleted as well, using ✕ button located on the right side of material list. The program will confirm if data for each surface is correct by showing the green symbol ✓ next to the name of the surface. If any error appears in input data then symbol ⚠ will appear with proper statement, and the background color of surface will change into red.
- WALLS** – after selecting the material for the first wall the program will input this material for all other walls by default. Then you can exchange this material by other, change the amount of square meters or add next material.

8. WINDOWS and DOORS – they are implemented into list of finishing materials for walls. You shall add them to proper wall by selecting from the list. When adding window or doors the calculator will input area of 2 m² by default, controlling the sum of surfaces continuously. Then the area can be edit and changed “by hand”.



9. After correct input of data for all surfaces the second line will appear on the chart – calculated reverberation time or acoustic absorption, and the figures with results will appear in the table. Additionally the proper statement about fulfilling or not the requirements of a standard PN-B-02151-4 will appear as well.

4. Additional equipment

Interior elements

-- Add material --

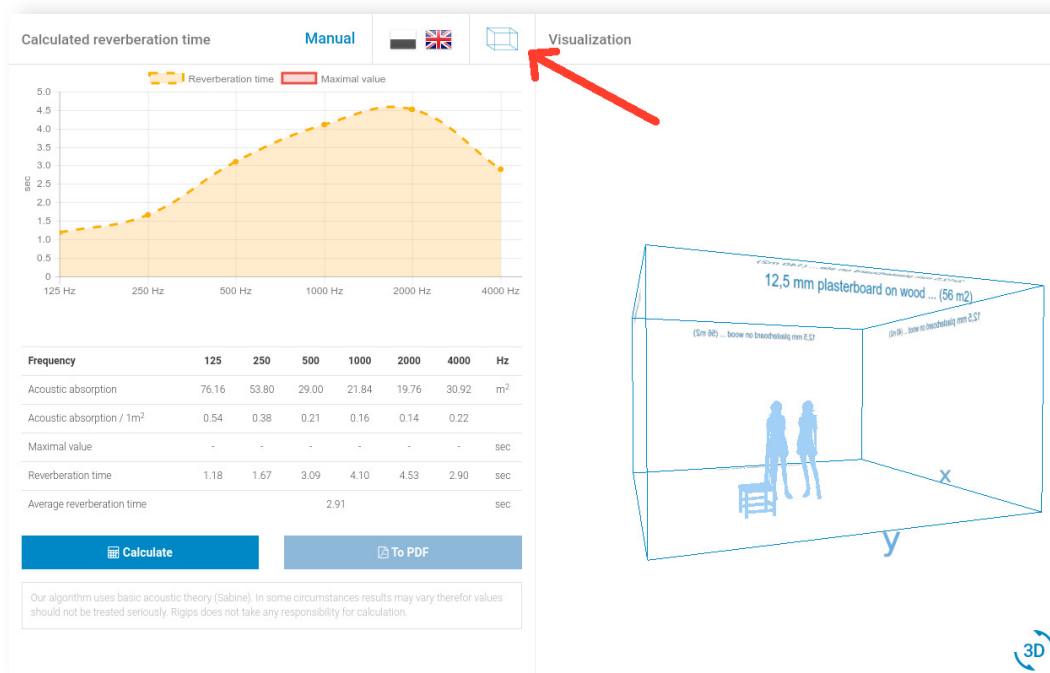
Materials:

Empty seats - fabric upholstered	m ²	x
Curtains	m ²	x
Cotton curtains	m ²	x

10. The last step of your calculation can be (but it is not a must) adding furnishing and other elements, like furniture, chairs, curtains, people, etc. These elements you shall select from drop-down list in the lowest field, named „4. Additional equipment”. **Note, that any value of surface of additional element is given automatically** after selecting. The statement about error will appear, to remind the user to type in the surface of element „by hand”.
11. The results of your calculation can be saved and printed, by generating PDF file. You shall click the button „to PDF”. The program will ask you about preferred option: to open or to save the file. After opening and checking you can print it and/or save it, changing the name and location, if necessary. After selecting “Save” option the program will directly save the PDF file with the name created as combination of building name and room name (in our case it will be “School no.5 – class IIB”) in the folder given in internet browser settings. In the case of changing only materials in next versions of calculation

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(the names of the building and room remains the same) the program will create files with the same name and next number of version.



- Visualization of the room – you can open an additional window with 3D visualization of the room by clicking the button in top right corner, marked with „cube”. There will be visible doors and windows on selected walls, some furnishing elements will be visible as well. Block can be turned around and seen from every side. Next clicking in “cube” button will close the window with a view of the room.

REMARK: In case of Internet Explorer browser a 3D visualization can be not seen or only partially seen, depending on the version of IE program and update status.