AN INTELLIGENT SOLUTION FOR SOUND ABSORPTION
ROLLER SHUTTER SYSTEM RAUVOLET ACOUSTIC-LINE
ACOUSTICS IN WORKING ENVIRONMENT

FOREWORD

ACOUSTIC COMFORT IS THE BASIS FOR HUMAN MOTIVATION AND PERFORMANCE

Due to increasing demands on the capabilities of employees and a working environment that is constantly falling victim to cost pressure within the company, the physical and psychological pressures in the office workplace have resulted in an area of conflict when it comes to work structuring.

The desire for openness, transparency and space-related flexibility in the architecture and room layout on the one hand and changes in work resources on the other has upset the previously good and acoustically unobtrusive room atmosphere.

Concentration and communication at work are impossible under such conditions. It is scientifically proven that physical and psychological stress factors reduce the performance of office workers by approx. 25-30%. It is therefore essential that the overall sense of comfort in the workplace is made the focus of architectural work carried out by specifiers, but also companies commissioned to carry out planning.

The sound-absorbing structural surfaces in the current steel/glass architecture are generally not sufficient to condition good room acoustics. Acoustic room zoning to promote comfort means that new technical solutions will have to be developed. Previously popular acoustic rooms with hollow ceiling cavities to limit low-frequency sound waves are now frequently falling victim to aesthetic considerations.

The fittings and furnishings at a company therefore take on an important role in acoustic room conditioning. In terms of sound shielding, reduction of the noise disturbance level, and limitation of reverberation time, the wide-band conditioning roller shutter RAUVOLET acoustic-line from REHAU is an ideal technical solution for anyone planning room acoustics.

The design of the micro-perforated surface fits seamlessly with the aesthetics of the current architectural zeitgeist. When you are looking to optimize space (eliminating functional furniture surfaces), the double roller shutter is by far the best solution.

When it comes to the resonance volume of the cabinet shell, RAUVOLET acoustic-line 12 can condition approx. 80% of the sound energy that occurs in all third-octave bands assessed. Precise positioning during the planning process reduces the propagation of the intrusive direct sound level in the room, as well as the reverberation time.

The room acoustics results of the projects carried out by our consulting engineers show that the use of the roller shutter RAUVOLET acoustic-line meets all various legal planning requirements.
# RAUVOLET ACOUSTIC-LINE

## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awards / reference projects</td>
<td>8</td>
</tr>
<tr>
<td>Design and function combined</td>
<td>10</td>
</tr>
<tr>
<td>Subjective perception of noise</td>
<td>11</td>
</tr>
<tr>
<td>Possibilities for acoustic room design</td>
<td>12</td>
</tr>
<tr>
<td>Noise measurable as a stress factor</td>
<td>13</td>
</tr>
<tr>
<td>Decisive advantages</td>
<td>14</td>
</tr>
<tr>
<td>How it works</td>
<td>16</td>
</tr>
<tr>
<td>Ecological factors</td>
<td>18</td>
</tr>
<tr>
<td>Regulations / questions</td>
<td>23</td>
</tr>
</tbody>
</table>
AWARD WINNER
RAUVOLET ACOUSTIC-LINE HAS RECEIVED MULTIPLE AWARDS

RAUVOLET ACOUSTIC-LINE IS NOT JUST POPULAR DUE TO ITS UNIQUE AND INNOVATIVE ABILITY TO ABSORB SOUND EFFECTIVELY, BUT ALSO AS A RESULT OF ITS ATTRACTIVE, MODERN LOOK. THIS IS SUPPORTED BY THE VARIOUS AWARDS WON BY THE REHAU ROLLER SHUTTER SYSTEM.

Reap the benefits of RAUVOLET acoustic-line - the design solution with added value!

red dot award:
product design 2006 for a high level of design quality
www.red-dot.de

Interzum award 2005:
Category „High product quality”
www.interzum.de

„DESIGN PLUS“:
Award at the specialized trade fair material_vision
material-vision.messefrankfurt.com
REFERENCE PROJECTS
RAUVOLET ACOUSTIC-LINE IN PRACTICAL APPLICATIONS

THE UNIQUE WAY IN WHICH RAUVOLET ACOUSTIC-LINE WORKS IS ALREADY IN EVIDENCE IN VARIOUS REFERENCE PROJECTS.

In the following cases, the specifiers opted to use the innovative REHAU roller shutter system and were able to create a quiet, pleasant working atmosphere.

Infineon Technologies AG
Munich

Eurohypo AG
Frankfurt am Main

Deutsche Bahn AG
Frankfurt am Main

Securvita Gesellschaft zur Entwicklung alternativer Versicherungskonzepte mbH, Hamburg

Commerzbank International S.A. (CISAL Bank), Luxembourg

Photos: Martela
THE EAR IS THE ONLY SENSE THAT CONTINUES TO WORK 24 HOURS A DAY. IT THEREFORE DESERVES MORE ATTENTION. YOUR HEARING ISN’T GETTING ANY BETTER! BUT THE POSSIBILITIES FOR ACOUSTIC RELIEF ARE.

RAUVOLET acoustic-line
The noise level in the workplace was our inspiration for a new innovative product.

Our solution
To focus on acoustics and design.

The product aim
To create a sense of well-being in the workplace.

Our innovation
The sound-absorbing roller shutter system RAUVOLET acoustic-line.

See for yourself!
THE CURRENT TREND IS TOWARDS OPEN-PLAN ROOM LAYOUTS.
AT THE SAME TIME, THIS RESULTS IN HIGHER NOISE LEVELS.

This leads to:
- Increased strain on the ears
- Reduced ability to concentrate
- Reduced performance
- More difficulty understanding what people are saying
- Reduced well-being

The consequences:
- Stress
- High blood pressure
- Damage to hearing
- Cardiovascular complaints

Disruptions in concentration from 35 dB to increased stress from 65 dB:
- Ringing phone: 60 - 80 dB
- Photocopier in operation: 60 - 70 dB
- Someone on the phone: 55 - 70 dB
- Sound of a keyboard: 55 - 70 dB
- Laser printer when printing: 55 - 60 dB
- Photocopier left switched on: 50 - 60 dB
- PC accessing a disc: 35 - 55 dB
- PC left running: 30 - 50 dB
- Laser printer left switched on: 30 - 40 dB
THE INTERACTION OF THE OPTIMUM CONFIGURATION OF THE FLOOR, CEILING, WALLS AND FURNITURE OFFERS POSSIBILITIES FOR THE OPTIMUM ACOUSTIC ROOM LAYOUT.

Less noise improves concentration.

Better concentration increases performance and satisfaction.

Better audibility leads to a pleasant working atmosphere.

An acoustically pleasant atmosphere helps to avoid unnecessary stress. This increases well-being in the workplace and protects employees from acoustic stresses.
In cooperation with the University of Oldenburg, Acoustics Department, REHAU has developed a special ISE Test (Irrelevant Speech Effect Test), which describes the effects of background noises on short-term memory efficiency. The test result shows that the test subjects’ efficiency and ability to concentrate is significantly reduced as a result of typical office noise. This clearly emphasises the need for sound-absorbing elements in the design of modern office environments.

To ensure that the test was representative, the various series of tests were carried out with different test groups. The overall total is now ≥ 1000 persons.

REHAU has adapted the sound-absorbing roller shutter system RAUVOLET acoustic-line to the requirements of modern office environments. The new type of profile design, combined with an innovative internal structure, makes it possible for sound to be absorbed across the front of the roller shutter. The noise stress factor is consequently reduced, making everyday life in the office considerably more pleasant.
THE TREND IN OFFICE ARCHITECTURE IS INCREASINGLY LEANING TOWARDS LARGE OPEN-PLAN SPACES.

However, this upsets the balance of the room’s acoustics and employees are subjected daily to increased noise levels at work. Nowadays, even sound-insulating carpet often has to give way to more attractive parquet flooring and partitions are disappearing in favour of an open-plan concept. New technical solutions must therefore be employed to ensure harmony between modern architecture and good room acoustics. However, it is, above all, the interaction of the optimum configuration of the floor, ceiling, walls and furniture that offers the possibilities for the optimum acoustic room layout.

REHAU has registered numerous property rights in relation to the roller shutter system RAUVOLET acoustic-line. REHAU is the first company to successfully develop a system that is designed for sound absorption through the use of special profiles on items of furniture. REHAU’s development is a highly effective absorber that can be used not only in cabinets but also in partition walls.

The additional advantages of RAUVOLET acoustic-line speak for themselves.

For architects:
RAUVOLET acoustic-line ensures compliance with planning regulations (acoustics form part of the workplace guidelines and are just as important as the structural design and light).

In the workplace:
1. A flexible layout allows sound to be reduced directly at the source of the noise.

2. The right layout also gives employees a sense of their own private space even in large offices to ensure ideal audibility, and making it possible to blank out intrusive background noises.

3. A flexible layout fulfils current and future workplace requirements.

4. In the workplace, the furniture not only functions as storage space, but also has an intelligent additional benefit.
Room without sound absorption

Room with sound absorption through office furniture

Room with sound absorption through office furniture, as well as special ceiling and floor elements
RAUVOLET acoustic-line has a special profile geometry with punched holes along the length of the profile and an effective system inside the hollow section.

The acoustic nonwoven fabric inside acts as an absorption material, soaking up the sound wave energy when it enters the profile and at the same time preventing it from re-emerging. This greatly reduces the reverberation time in the room.

RAUVOLET acoustic-line absorbs noise across the whole frequency range that covers human speech and the majority of noises throughout the working day, proving itself to be a product with linear absorption.

In most frequency ranges, this patented product absorbs almost seven times as much sound as a conventional cabinet. On average, the absorption capacity is between 75% and 80%.

Assessed sound absorption coefficient $\alpha_w$
RAUVOLET acoustic-line 8 = 0.75
RAUVOLET acoustic-line 12 = 0.80
RAUVOLET acoustic-line 8 mm (cabinet with folders)
RAUVOLET acoustic-line 8 mm (cabinet without folders)

Sound absorption coefficients as per DIN EN ISO 354

RAUVOLET acoustic-line 12 mm (cabinet with folders)
RAUVOLET acoustic-line 12 mm (cabinet without folders)
THE ECOLOGICAL BALANCE IS VERY IMPORTANT TO US. WE THEREFORE USE THE MATERIAL POLYPROPYLENE (PP) TO PRODUCE RAUVOLET ACOUSTIC-LINE.

The material PP, which is completely harmless from an ecological viewpoint, uses little energy during manufacturing and can later be recycled or incinerated. The manufacturing processes run as continual processes in enclosed installations from which no organic solvents are released. Similarly to natural gas, only carbon dioxide and water are produced during combustion. Alongside the ecological advantage, the material PP has other benefits such as its high resistance to UV and heat deformation. It also has the right surface hardness, though it still remains flexible. The material is also particularly shrink-resistant.

Recycling offers an intelligent solution for the re-use of polypropylene products. After being broken down and melted again, this plastic can be remoulded into a new shape.
RAUVOLET ACOUSTIC-LINE
IMPORTANT REGULATIONS FOR OFFICE ACOUSTICS

ISO standards
ISO 3382  Measurement of the reverberation time of rooms with reference to other acoustical parameters, 1997
ISO 11654  Sound absorbers for use in buildings - Rating of sound absorption, publication date: July 1997
ISO 11821  Acoustics - Measurement of the in situ sound attenuation of a removable screen, August 1997
ISO 14257  Acoustics - Measurement and parametric description of spatial sound distribution curves in workrooms for evaluation of their acoustical performance, March 2002

DIN standard
DIN 18041  Acoustic quality in small to medium-sized rooms, May 2004

German guidelines
VDI 2058  Assessment of noise in the working area with regard to specific operations, February 1999
VDI 2569  Sound protection and acoustical design in offices, January 1990
VDI 2720 Part 2  Noise control by means of shielding indoors, April 1983
VDI 3760  Computation and measurement of sound propagation in workrooms, February 1996
RAUVOLET ACOUSTIC-LINE
STILL GOT QUESTIONS?

If you want more information, samples or advice with regard to RAUVOLET acoustic-line, please contact your local REHAU Sales Office.

You can also visit us online on our RAUVOLET acoustic-line homepage: www.acoustic-line.net. We look forward to hearing from you!

Our verbal and written advice relating to technical applications is based on experience and is to the best of our knowledge correct but is given without obligation.

The use of REHAU products in conditions that are beyond our control or for applications other than those specified releases us from any obligation in regard to claims made in respect of the products.

We recommend that the suitability of any REHAU product for the intended application should be checked. Utilization and processing of our products are beyond our control and are therefore exclusively your responsibility. In the event that a liability is nevertheless considered, any compensation will be limited to the value of the goods supplied by us and used by you.

Our warranty assumes consistent quality of our products in accordance with our specification and in accordance with our general conditions of sale.