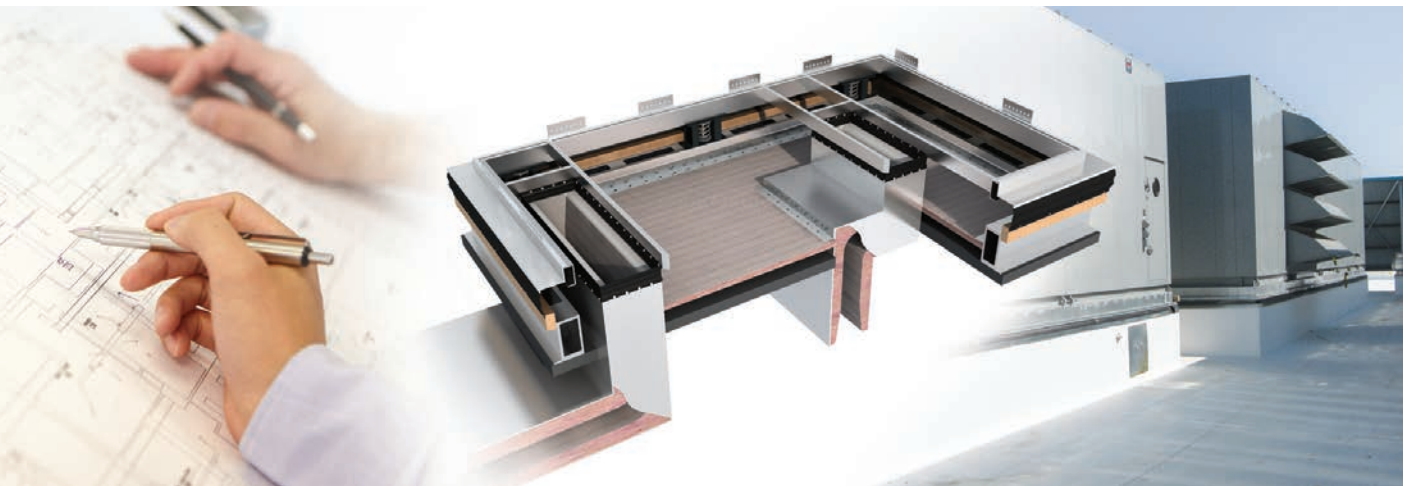


VIBROACOUSTICS®

Noise Control | Vibration Isolation | Restraint Systems



Rooftop Unit System Solution
for noise, vibration, and seismic/wind effects

Rooftop Units



Rooftop units (RTUs) offer a simple and inexpensive solution to heating, ventilation and air conditioning (HVAC) for a wide variety of building types. Being the most commonly used HVAC system, RTUs are found everywhere from factories to schools, and commercial buildings to medical facilities.

If not for the risk of noise problems, consulting engineers would locate RTUs directly over occupied spaces, such as classrooms and meeting rooms. This design practice helps achieve a more energy efficient and economical design. Locating the RTU farther away from an occupied space forces the engineer into a more complex design that ultimately requires more building space, more energy (both due to thermal and pressure losses), and higher building costs.

If not for the risk of noise problems, consulting engineers would locate RTUs directly over occupied spaces, such as classrooms and meeting rooms.

Noise Problems

RTUs are one of the most common causes of HVAC noise problems, and thus a major reason for tenant complaints.

There are many RTU noise paths such as airborne noise, duct breakout noise, and structure-borne noise (see fig 1.0 for complete list). Any of these, if not treated correctly, can create a noise problem. Unfortunately, solving the problem is not as simple as attenuating each of these paths. System complexity, such as fan orientation within an RTU and ductwork design, needs to be considered.

Environmental noise from the RTU's condenser fans, fresh air intakes, exhaust fans and compressors is another concern. Its impact on neighboring property and spaces can instigate lawsuits, tarnishing the reputation of the owner and design engineer.

Consultants often try to avoid these problems at the design stage by placing RTUs over non-critical areas. Doing so, however, removes the benefit that come with setting the units close to or directly over occupied spaces. Others who neglect the potential issue at the design stage will likely end up with a noise and vibration problem that is very costly to fix.

Wind and seismic forces are other factors that require a design engineer's close attention. Depending on the region, RTUs may be exposed to winds of 90 mph (145 kph) to in excess of 150 mph (241 kph) and/or extreme seismic forces. It is therefore necessary to coordinate the connection method from the RTU to the curb, and from the curb to the roof, even though the unit may be rated to meet IBC (US) or NBC (Canada). These connection methods need to be verified through engineering calculations and are required to be stamped by a professional engineer. Coordinating these calculations to obtain building code compliance is a common challenge because of the lack of code knowledge and high level of liability.

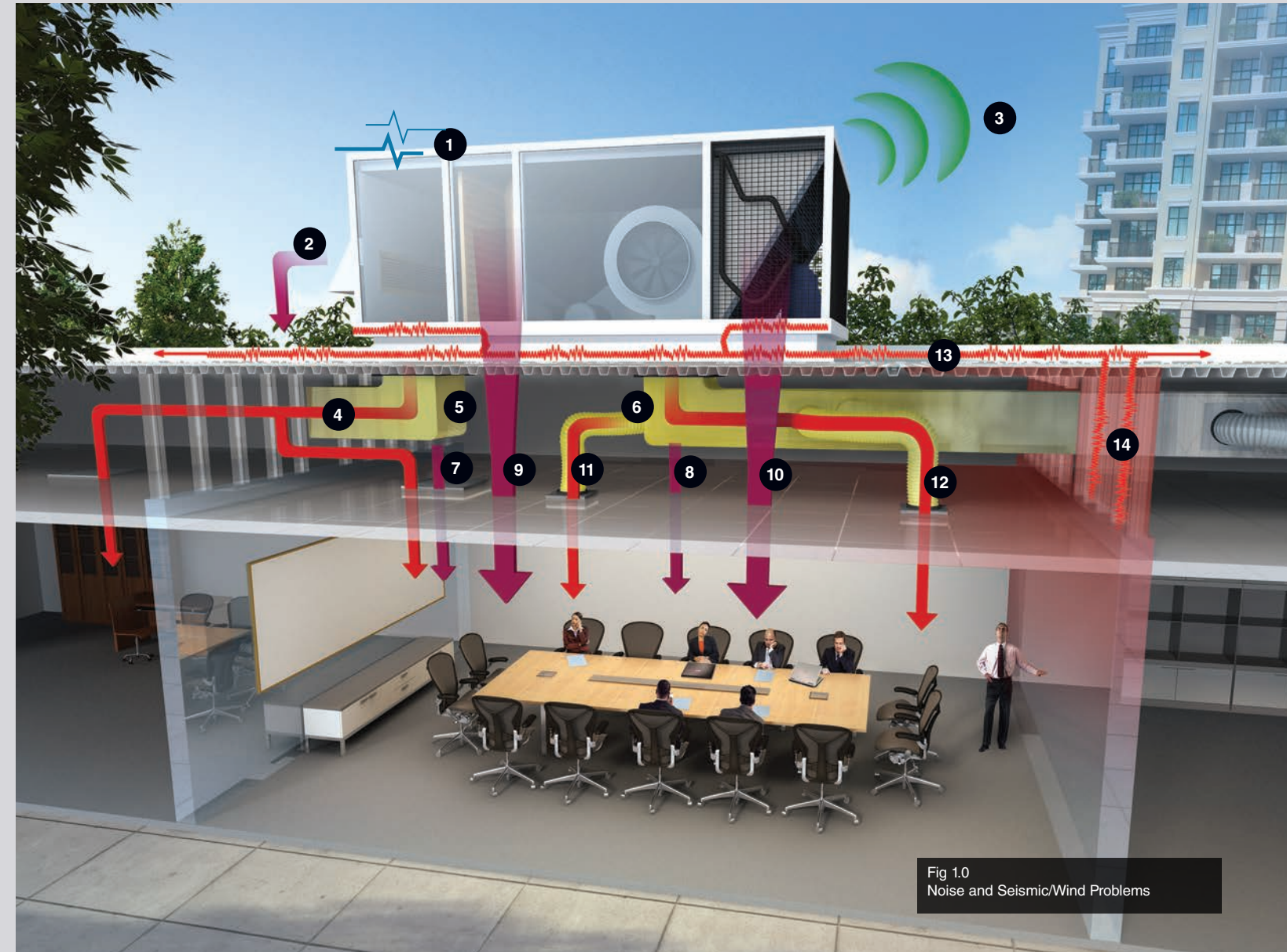


Fig 1.0
Noise and Seismic/Wind Problems

RTU Noise and Seismic/Wind Problems

1	seismic & wind loading	7 & 8	breakout duct-borne noise – supply and return air
2	flanking radiated external noise	9 & 10	radiated noise
3	environmental noise	11 & 12	duct-borne noise – supply air
4	duct-borne noise – return air	13	vibration path
5 & 6	aerodynamic system effects & generated noise	14	structure-borne noise

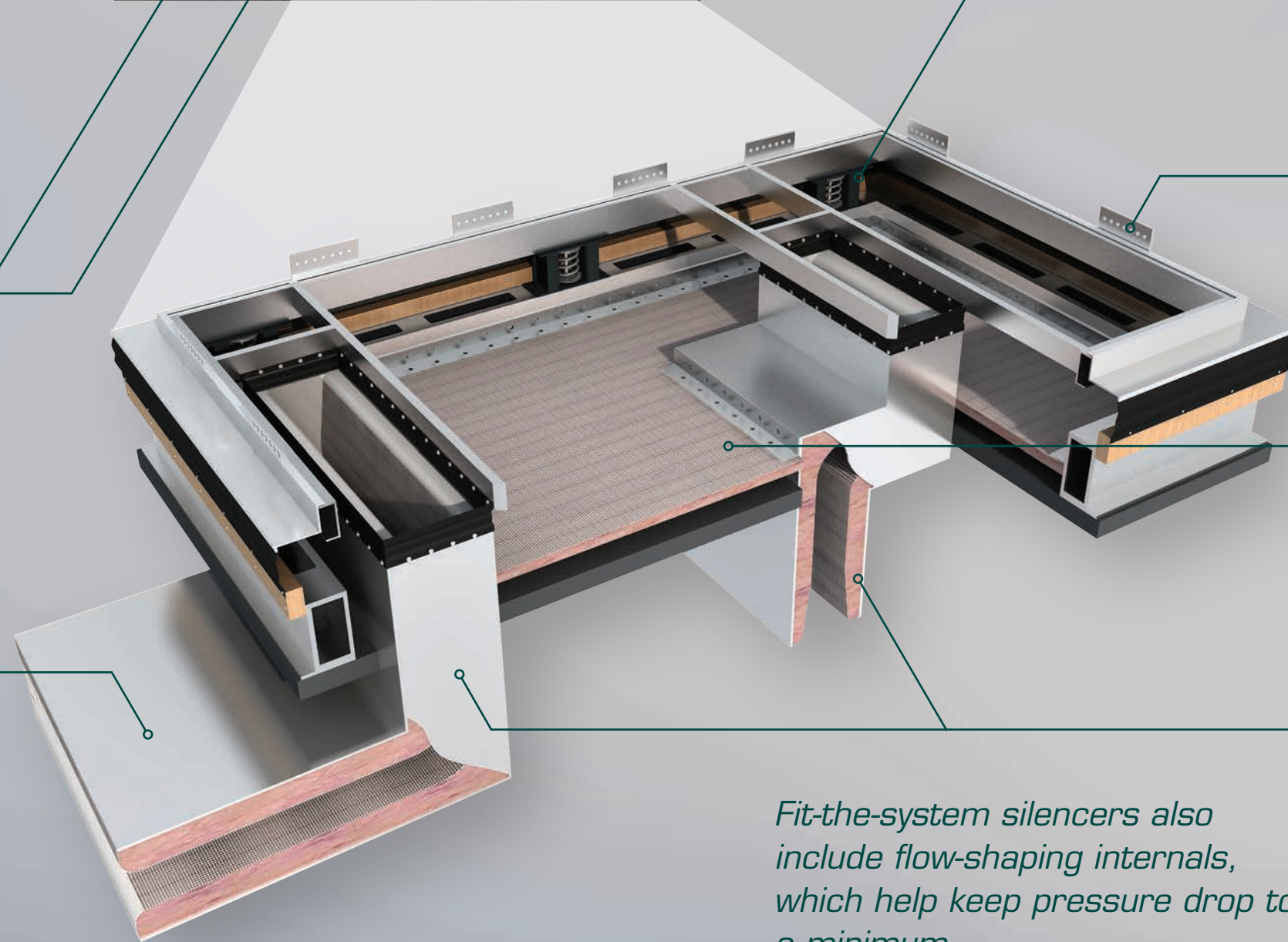
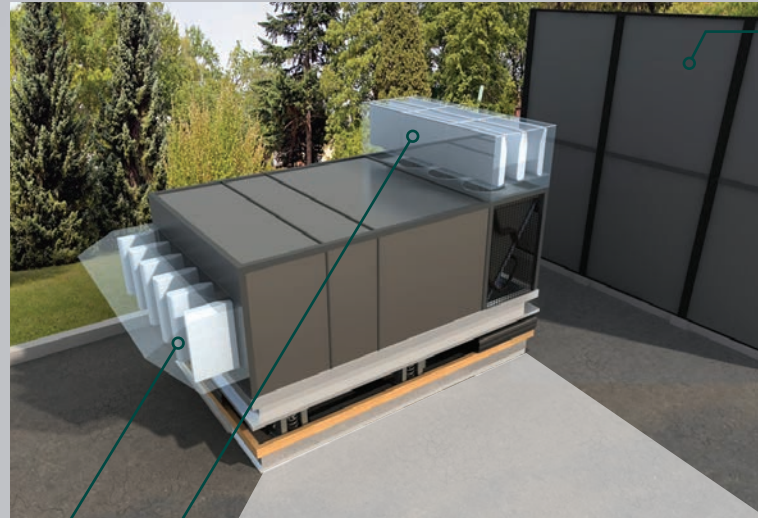
Relocating RTUs removes the benefit that comes with setting the units close to or directly over occupied spaces.

RTU Noise Control Solution

RTUs are the most common cause of noise problems in buildings for a key reason: Usually, only one of the four noise paths is addressed and done so without sufficient technical analysis. Designs will sometimes include silencers to try and address the airborne noise path. However, the structure-borne, radiated, and breakout noise paths are usually left unattended. This is why it is imperative to apply a holistic approach to noise control.

Vibro-Acoustics provides free application engineering (Lay-in) services to analyze the project-specific RTU system design. We then optimize the noise and vibration control solution to ensure all sources and paths are dealt with and the project's sound criteria is achieved.

Vibro-Acoustics' VCR noise control curb system is usually integral to the solution. It enables the consulting engineer to reap the full benefits of locating RTUs over occupied spaces without the number one drawback of a noise problem. According to the project's needs, a number of customizable solutions are integrated into the curb. These are not simply standard options. This provides the engineer a single, amalgamated solution to address multiple areas of concern with single-source responsibility.



INTAKE AND DISCHARGE SILENCERS *To minimize environmental noise*

targets problems **2 3**

Typical condenser fans have little static pressure to spare for silencing noise radiated to property lines. Vibro-Acoustics' intake and discharge silencers are designed to minimize pressure drop and resist corrosion due to the environment.

HTL (HIGH TRANSMISSION LOSS) CASING *To address breakout noise*

targets problems **7 8**

After performing a breakout analysis, HTL casing is provided to attenuate breakout noise. This is a better alternative to field applied duct lagging because single-source responsibility is provided by Vibro-Acoustics.

NOISE CONTROL VERTICAL BARRIER *To minimize environmental noise*

targets problem **3**

Vibro-Acoustics' noise barriers help prevent property line noise problems. They can act as architectural screening as well as effective noise control that does not reduce equipment performance.

VIBRATION ISOLATION *To dampen vibrations that cause structure-borne noise*

targets problems **13 14**

Vibro-Acoustics isolates the entire RTU system externally. We take into consideration the location of the equipment in relation to neighbouring occupied spaces, roof deflection, as well as sound criteria. This is the only sure way to address all vibration sources effectively.

ANCHORAGE CALCULATIONS WITH PE/P.ENG STAMP *For seismic and wind loading*

targets problem **1**

For code compliance, all required anchorage calculations are performed and we provide connection details for the curb. In addition, the design and calculations are stamped by a professional engineer.

NOISE CONTROL CURB BARRIER *To block radiated noise*

targets problems **9 10**

Noise radiating from the bottom of the RTU is often overlooked. Located inside the Vibro-Acoustics noise control curb, the engineered barrier attenuates low-frequency noise before it passes through the ceiling and into the occupied space.

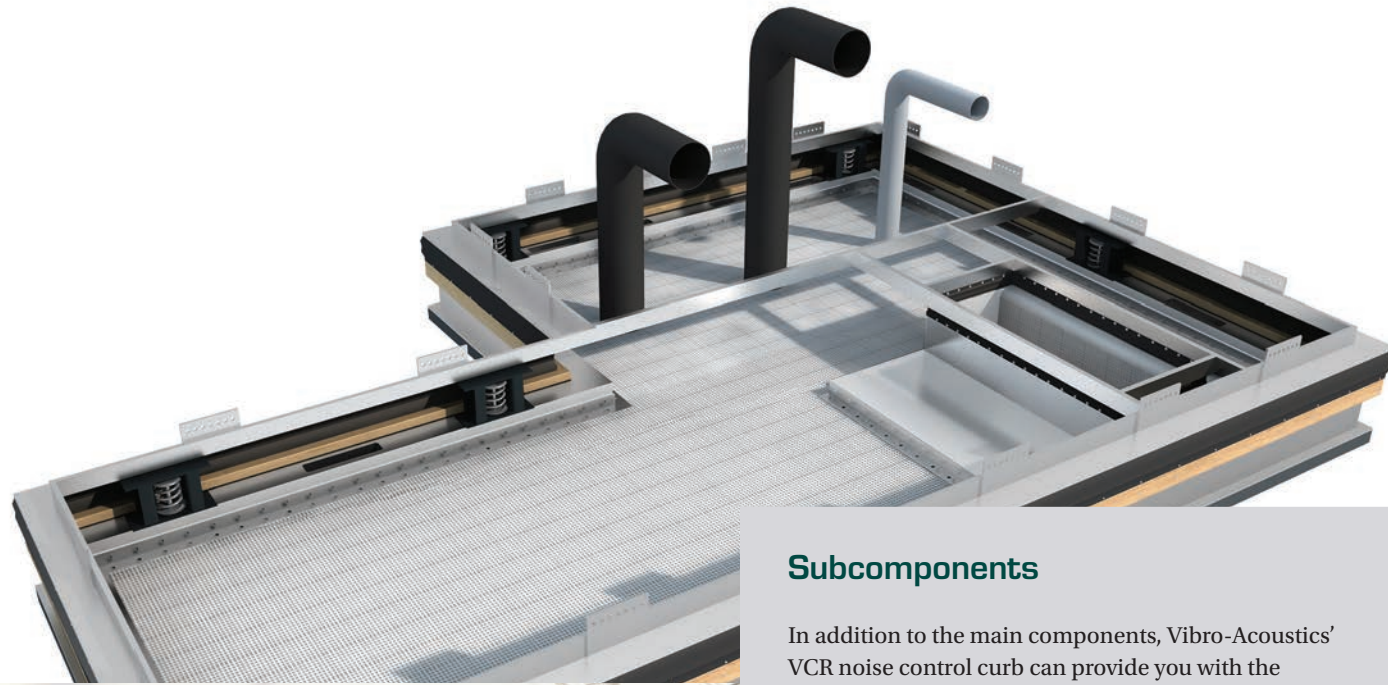
FIT-THE-SYSTEM SILENCERS *To address airborne noise*

targets problems **4 5 6**

11 12

Built to the required shape and size to provide sufficient insertion loss while meeting space restrictions. Fit-the-system silencers also include flow-shaping internals, which help keep pressure drop to a minimum.

Fit-the-system silencers also include flow-shaping internals, which help keep pressure drop to a minimum.



Subcomponents

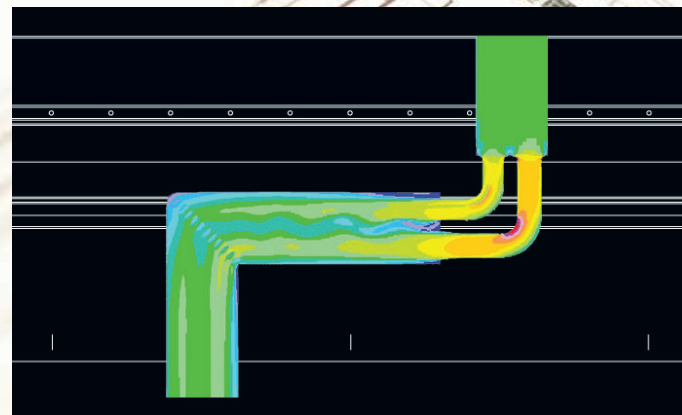
In addition to the main components, Vibro-Acoustics' VCR noise control curb can provide you with the flexibility to include subcomponents of the HVAC system, such as pipe chases, filter banks and coils within the roof curb itself – valuable benefits when ceiling space is limited.



End Result Guarantee*

Included with our RTU system solution, Vibro-Acoustics will guarantee that the sound criteria in the occupied space and property line will be met. This guarantee is unique in the industry because it is not simply a performance guarantee that the product works in an ideal test facility, but assurance to the consulting engineer that their risk has been minimized.

* Guarantee based on provided information



Pressure Drop Guarantee*

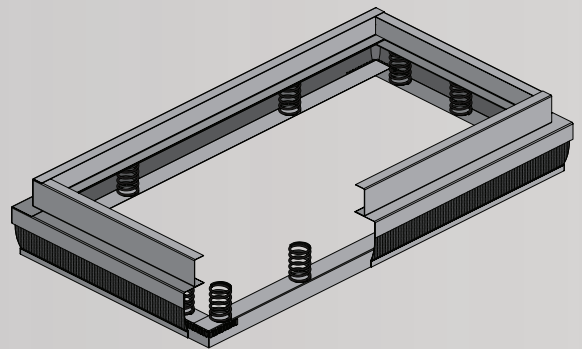
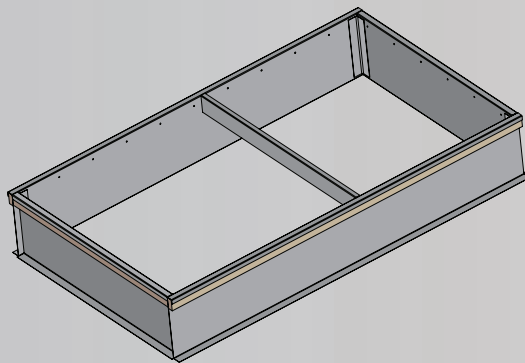
At Vibro-Acoustics, we pride ourselves in being highly experienced in HVAC noise control *and* HVAC aerodynamics. With every noise control solution we work on at the design stage, we provide a pressure drop guarantee. This guarantee, which includes aerodynamic system effects, provides a level of comfort for design engineers, who can be confident in a noise control solution that doesn't create pressure drop problems.

Prevent a noise disaster and client complaints by taking advantage of our RTU system solution.



Contact Vibro-Acoustics or your local sales representative today to find out more about our RTU noise control solution and free Lay-in (design assist) service.

Vibro-Acoustics also offers standard curbs and isolated rails



vibro-acoustics.com

355 Apple Creek Blvd, Markham, Ontario, Canada L3R 9X7 1-800 565-8401

info@vibro-acoustics.com

Phone: (416) 291-7371

Fax: (416) 291-8049

Toronto • Nashville • Reno • New York • Houston



LIT-RTU-003