

NOISE CONTROL SERVICES

ACOUSTIC PRODUCTS AND DESIGN

Rectangular Attenuators

Model NCT - *Energy Saving*

Introduction

The special shaping of the splitter units in the NCT range of rectangular attenuators gives enhanced aerodynamic performance. This range is suited to applications where energy costs are important or space restrictions govern.

Through extensive testing the NCT range achieves healthy levels of acoustic performance in conjunction with improved aerodynamic efficiencies. The performance testing of these units has been carried out with the materials used in the manufacturing process. As there is no substitution of materials performance guarantees can be made with certainty.

For applications where higher levels of acoustic performance is required refer to the NCS range of attenuators.

Through our manufacturing facility a vast selection of sizes and configurations can be supplied. Installation can be arranged if required.

Applications

These attenuators are suitable for most applications incorporating sound attenuation and airflow. For example;

HVAC air distribution systems

The control of fan noise and crosstalk attenuation are typical HVAC applications for these attenuators. The standard construction is ideal for this type of application.

Industrial Machinery

Heavy duty constructions are available for industrial applications incorporating thick wall mild steel casings, heavy duty flanges, supports and lifting attachments.

Acoustic Splitter Only

The splitter elements can be supplied separately for applications such as concrete or builders work air risers. Spans of over seven metres have been installed using special splitter construction techniques.

Bend Attenuators

The NCT-B range of attenuators is available as a 90 degree bend configuration for applications where space is limited. The acoustic and aerodynamic performance is different than a standard straight attenuator. Contact Noise Control Services for design and selection assistance

Hygienic and Water-Resistant Uses

The NCT range of attenuators is not available in this configuration. Refer to the NCM range for units suitable for this application

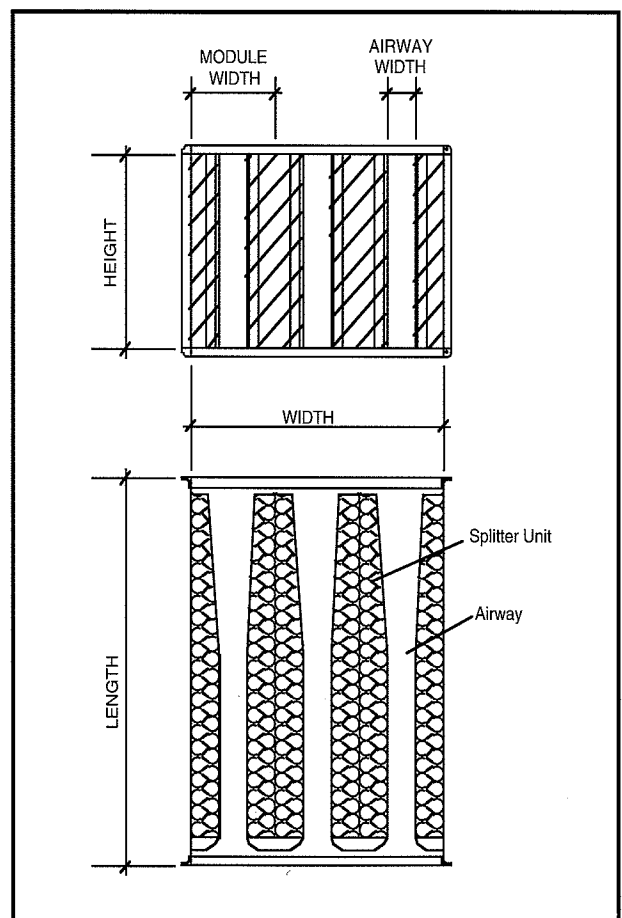
Construction

The attenuator is constructed as depicted below. Air is allowed to pass through the airways between the splitters while noise is absorbed in the porous material contained within the splitters.

The casings are manufactured from pre-galvanised sheet steel. End flanges are supplied and are typically proprietary systems although other flange systems are available on request. On larger units structural angle reinforcements are included.

The splitter modules are constructed from pre-galvanised sheet steel frames. The inlet has an aerodynamically shaped folded nose. The tails of the splitter include a tapered section. The porous infill material is protected behind a layer of galvanised perforated sheet steel.

Other constructions are available. These include stainless steel, heavy duty industrial construction, PVC, powder-coated or epoxy paint finishes.



Acoustic Performance

The static insertion loss performance figures have been measured in accordance with AS1277-1983 *Acoustics - Measurement Procedures for Duct Silencers*. A testing facility has been purpose built to allow the verification of the acoustic performance of these attenuators.

Various configurations of airway size and length are available. Higher acoustic performance is achieved by lengthening the attenuator and by decreasing the airway size. By offering various combinations of length and airway width the size and aerodynamic performance can be optimised for the particular application.

Noise Control Services has developed a computer program that selects the suitable configurations from the NCS, NCT and NCM ranges that meet the acoustic and aerodynamic performance requirements. The program is available on request.

Selection

The first step in selecting a suitable attenuator configuration is to choose a model that meets the required insertion loss from the opposite table. This will determine the length and module width of the attenuator.

The next step is to determine the width and height of the attenuator. The width must be even increments of the module width. For example a model NCT-350-24 is available in widths of 350mm, 700mm, 1050mm, 1400mm , 1750mm etc. The height can be selected to suit the application.

Thirdly calculate the pressure loss and regenerated noise . The air flow through the attenuator is required for both calculations. If the pressure loss and/or regenerated noise are too high then the width and/or height of the attenuator needs to be increased.

Lastly calculate the weight of the attenuator.

When placing an order specify the model, width and height of the unit.

NCT Attenuator Range

| Model | Module Width (mm) | Length (mm) | Static Insertion Loss (dB) | | | | | | | |
|--|-------------------|-------------|----------------------------|-----|-----|-----|----|----|----|----|
| | | | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| NCT-250-6 NCT-250-9 NCT-250-12 NCT-250-15 NCT-250-18 NCT-250-21 NCT-250-24 | 250 | 600 | 4 | 7 | 14 | 26 | 30 | 37 | 31 | 20 |
| | | 900 | 5 | 11 | 21 | 36 | 44 | 42 | 34 | 25 |
| | | 1200 | 7 | 15 | 29 | 45 | 48 | 47 | 37 | 31 |
| | | 1500 | 9 | 19 | 37 | 50 | 50 | 50 | 39 | 36 |
| | | 1800 | 11 | 23 | 43 | 50 | 50 | 50 | 48 | 48 |
| | | 2100 | 13 | 27 | 47 | 50 | 50 | 50 | 50 | 50 |
| | | 2400 | 15 | 31 | 50 | 50 | 50 | 50 | 50 | 50 |
| NCT-275-6 NCT-275-9 NCT-275-12 NCT-275-15 NCT-275-18 NCT-275-21 NCT-275-24 | 275 | 600 | 3 | 5 | 11 | 21 | 28 | 30 | 20 | 14 |
| | | 900 | 5 | 9 | 19 | 31 | 40 | 38 | 37 | 20 |
| | | 1200 | 6 | 12 | 24 | 40 | 45 | 43 | 33 | 25 |
| | | 1500 | 8 | 15 | 29 | 45 | 48 | 48 | 39 | 29 |
| | | 1800 | 9 | 18 | 35 | 50 | 50 | 50 | 43 | 32 |
| | | 2100 | 10 | 21 | 40 | 50 | 50 | 50 | 45 | 36 |
| | | 2400 | 11 | 24 | 45 | 50 | 50 | 50 | 50 | 39 |
| NCT-300-6 NCT-300-9 NCT-300-12 NCT-300-15 NCT-300-18 NCT-300-21 NCT-300-24 | 300 | 600 | 3 | 6 | 10 | 18 | 28 | 26 | 15 | 12 |
| | | 900 | 4 | 8 | 15 | 26 | 34 | 34 | 23 | 17 |
| | | 1200 | 5 | 10 | 21 | 35 | 42 | 40 | 29 | 19 |
| | | 1500 | 6 | 13 | 26 | 41 | 45 | 44 | 35 | 21 |
| | | 1800 | 7 | 15 | 30 | 48 | 47 | 46 | 37 | 24 |
| | | 2100 | 8 | 18 | 35 | 50 | 50 | 50 | 42 | 26 |
| | | 2400 | 9 | 20 | 39 | 50 | 50 | 50 | 45 | 28 |
| NCT-325-6 NCT-325-9 NCT-325-12 NCT-325-15 NCT-325-18 NCT-325-21 NCT-325-24 | 325 | 600 | 3 | 5 | 10 | 15 | 27 | 23 | 12 | 12 |
| | | 900 | 4 | 7 | 14 | 23 | 35 | 30 | 18 | 15 |
| | | 1200 | 5 | 9 | 19 | 32 | 40 | 35 | 25 | 17 |
| | | 1500 | 6 | 11 | 24 | 40 | 44 | 40 | 30 | 20 |
| | | 1800 | 7 | 13 | 28 | 44 | 46 | 44 | 34 | 22 |
| | | 2100 | 8 | 15 | 33 | 47 | 50 | 47 | 38 | 24 |
| | | 2400 | 9 | 17 | 37 | 50 | 50 | 50 | 42 | 26 |
| NCT-350-6 NCT-350-9 NCT-350-12 NCT-350-15 NCT-350-18 NCT-350-21 NCT-350-24 | 350 | 600 | 3 | 4 | 9 | 12 | 26 | 20 | 12 | 10 |
| | | 900 | 5 | 6 | 14 | 21 | 32 | 25 | 17 | 13 |
| | | 1200 | 5 | 8 | 18 | 29 | 37 | 31 | 22 | 15 |
| | | 1500 | 6 | 10 | 23 | 37 | 41 | 36 | 26 | 17 |
| | | 1800 | 7 | 12 | 27 | 42 | 45 | 40 | 29 | 18 |
| | | 2100 | 7 | 14 | 31 | 46 | 47 | 44 | 32 | 20 |
| | | 2400 | 8 | 15 | 35 | 50 | 50 | 48 | 35 | 21 |
| NCT-375-6 NCT-375-9 NCT-375-12 NCT-375-15 NCT-375-18 NCT-375-21 NCT-375-24 | 375 | 600 | 3 | 4 | 8 | 11 | 21 | 17 | 11 | 8 |
| | | 900 | 4 | 6 | 13 | 19 | 27 | 22 | 16 | 11 |
| | | 1200 | 4 | 7 | 17 | 26 | 33 | 27 | 20 | 14 |
| | | 1500 | 5 | 9 | 21 | 32 | 38 | 31 | 23 | 15 |
| | | 1800 | 6 | 11 | 24 | 37 | 42 | 35 | 25 | 16 |
| | | 2100 | 7 | 13 | 28 | 43 | 46 | 39 | 28 | 17 |
| | | 2400 | 7 | 14 | 31 | 48 | 50 | 43 | 30 | 18 |
| NCT-400-6 NCT-400-9 NCT-400-12 NCT-400-15 NCT-400-18 NCT-400-21 NCT-400-24 | 400 | 600 | 2 | 3 | 7 | 11 | 15 | 13 | 11 | 7 |
| | | 900 | 3 | 5 | 11 | 17 | 21 | 18 | 14 | 9 |
| | | 1200 | 4 | 7 | 15 | 23 | 28 | 23 | 17 | 12 |
| | | 1500 | 4 | 9 | 19 | 29 | 34 | 27 | 20 | 13 |
| | | 1800 | 5 | 10 | 22 | 35 | 39 | 31 | 22 | 14 |
| | | 2100 | 6 | 11 | 25 | 41 | 44 | 35 | 24 | 15 |
| | | 2400 | 6 | 12 | 28 | 46 | 49 | 39 | 26 | 16 |

Pressure Loss

To calculate the pressure loss firstly calculate the attenuator velocity. This is the airflow volume divided by the cross sectional area. Locate on the graphs below the attenuator model line and read off the pressure loss. For clarity the intermediate lengths are not shown. For intermediate lengths interpolate between adjacent lengths.

This pressure loss is for ducted inlet and ducted exit installations. Additional pressure loss will occur if the attenuator is installed with a plenum type intake or discharge.

Example:

Model : NCT-350-24, 1750W x 900H x 2400L

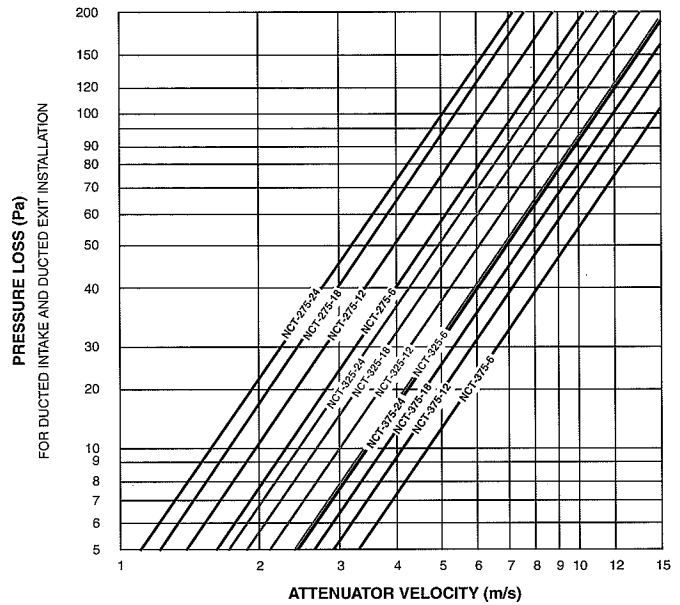
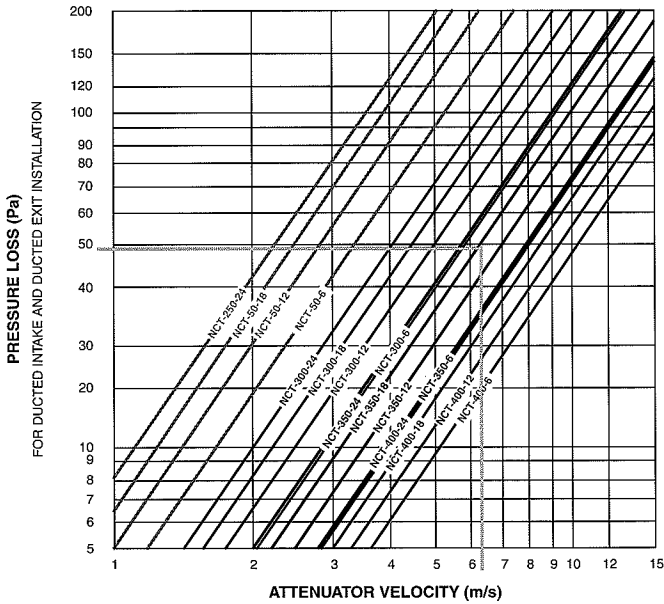
Airflow = 10.0m³/s

Attenuator area = 1.75m x 0.9m = 1.575m²

Velocity = 10.0 m³/s ÷ 1.575m² = 6.35m/s

Pressure loss = 49Pa (from left graph)

Note: The pressure loss figures are for uniform air flow at the intake to the attenuator. Poor inlet and exit conditions will result in an increase in the pressure loss through the attenuator. Poor conditions may be a bend or fan located close the attenuator.



Weight

Calculate the attenuator weight in two steps. Firstly look up the body weight on the table opposite. Interpolate for intermediate sizes as required. Secondly look up the individual splitter weight from the table below. Again interpolate as required. Multiply the splitter weight by the number of modules and add the body weight. The module number is the attenuator width divided by the module width.

Example:

Model NCT-350-24, 1750W x 900H x 2400L.

Body weight = 129 kg (interpolated from opposite table)

Splitter weight = 57 kg (from table below)

Module number = 1750 (width) ÷ 350 (module width) = 5

Total weight = 57 x 5 + 129 = 414 kg

| Individual Splitter Weight (kg) | | | | | | | |
|---------------------------------|------------|-----|------|------|------|------|------|
| Height (mm) | Length(mm) | | | | | | |
| | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 |
| 2400 | 48 | 63 | 77 | 96 | 111 | 125 | 140 |
| 2100 | 43 | 56 | 68 | 85 | 98 | 111 | 124 |
| 1800 | 37 | 48 | 60 | 74 | 86 | 97 | 108 |
| 1500 | 32 | 41 | 51 | 64 | 73 | 83 | 93 |
| 1200 | 25 | 32 | 40 | 50 | 57 | 65 | 72 |
| 900 | 19 | 25 | 31 | 39 | 45 | 51 | 57 |
| 600 | 14 | 18 | 22 | 28 | 32 | 36 | 41 |
| 300 | 8 | 11 | 13 | 17 | 20 | 22 | 25 |

| Attenuator Body Only Weight (kg) | | | | | | | | | |
|----------------------------------|-------------|------------|-----|-----|------|------|------|------|------|
| Length (mm) | Height (mm) | Width (mm) | | | | | | | |
| | | 300 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 |
| 600 | 2400 | 40 | 44 | 48 | 53 | 57 | 61 | 66 | 70 |
| | 2100 | 35 | 40 | 44 | 48 | 53 | 57 | 61 | 66 |
| | 1800 | 31 | 35 | 40 | 44 | 48 | 53 | 57 | 61 |
| | 1500 | 27 | 31 | 35 | 40 | 44 | 48 | 53 | 57 |
| | 1200 | 23 | 27 | 31 | 35 | 40 | 44 | 48 | 53 |
| | 900 | 18 | 23 | 27 | 31 | 35 | 40 | 44 | 48 |
| | 300 | 14 | 18 | 23 | 27 | 31 | 35 | 40 | 44 |
| 1200 | 2400 | 70 | 78 | 85 | 93 | 101 | 112 | 124 | 136 |
| | 2100 | 62 | 70 | 78 | 85 | 93 | 101 | 112 | 124 |
| | 1800 | 55 | 62 | 70 | 78 | 85 | 93 | 101 | 112 |
| | 1500 | 47 | 55 | 62 | 70 | 78 | 85 | 93 | 101 |
| | 1200 | 39 | 47 | 55 | 62 | 70 | 78 | 85 | 93 |
| | 900 | 32 | 39 | 47 | 55 | 62 | 70 | 78 | 85 |
| | 300 | 24 | 32 | 39 | 47 | 55 | 62 | 70 | 78 |
| 1800 | 2400 | 100 | 111 | 122 | 133 | 144 | 155 | 166 | 177 |
| | 2100 | 89 | 100 | 111 | 122 | 133 | 144 | 155 | 166 |
| | 1800 | 78 | 89 | 100 | 111 | 122 | 133 | 144 | 155 |
| | 1500 | 67 | 78 | 89 | 100 | 111 | 122 | 133 | 144 |
| | 1200 | 56 | 67 | 78 | 89 | 100 | 111 | 122 | 133 |
| | 900 | 45 | 56 | 67 | 78 | 89 | 100 | 111 | 122 |
| | 300 | 34 | 45 | 56 | 67 | 78 | 89 | 100 | 111 |
| 2400 | 2400 | 131 | 145 | 159 | 173 | 187 | 201 | 215 | 229 |
| | 2100 | 116 | 131 | 145 | 159 | 173 | 187 | 201 | 215 |
| | 1800 | 102 | 116 | 131 | 145 | 159 | 173 | 187 | 201 |
| | 1500 | 87 | 102 | 116 | 131 | 145 | 159 | 173 | 187 |
| | 1200 | 73 | 87 | 102 | 116 | 131 | 145 | 159 | 173 |
| | 900 | 59 | 73 | 87 | 102 | 116 | 131 | 145 | 159 |
| | 300 | 44 | 59 | 73 | 87 | 102 | 116 | 131 | 145 |

Regenerated Noise

Turbulence from airflow through the attenuator airways generates noise. This regenerated noise increases as the airflow velocity increases. Laboratory testing has resulted in a procedure for calculating the level of regenerated noise.

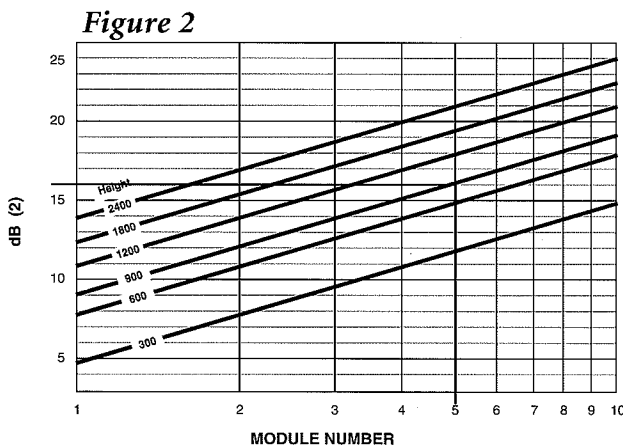
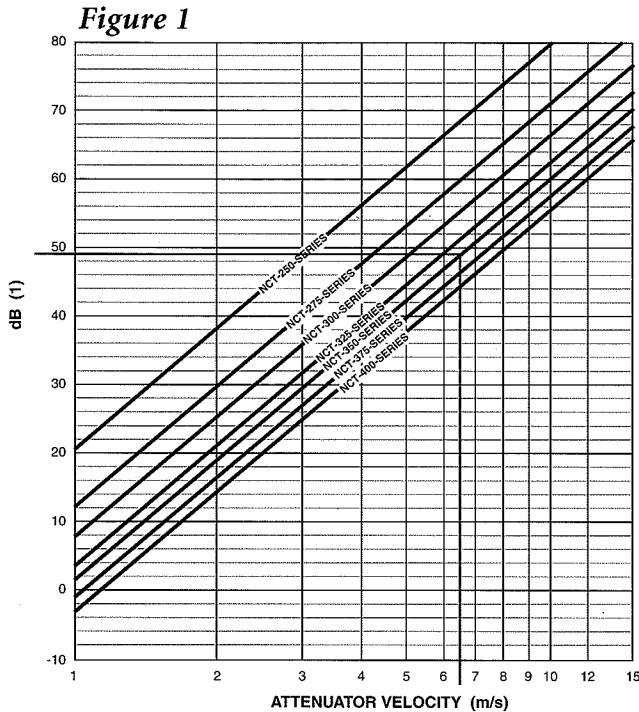
To calculate the regenerated noise from an attenuator:

- Calculate the attenuator velocity. This is the airflow volume (in m³/s) divided by the cross sectional area of the attenuator (in m²).
- From figure 1 determine dB(1) using the velocity and the attenuator model series.
- From figure 2 determine dB(2). The height and number of modules is required. The number of modules is the attenuator width divided by the module width.
- Determine the spectrum correction values from table 1. Use the value of dB(1) from figure 1 to find the corresponding spectrum corrections.
- Add dB(1), dB(2) and the spectrum corrections to get the regenerated sound power level at each frequency.

Example:

For attenuator model NCT-350-24 with dimensions 1.750m wide by 0.900m high and 2.400m long. Airflow of 10.0m³/s.

- The attenuator velocity = $10 \div (1.750 \times 0.900) = 6.34\text{m/s}$
- From figure 1 dB(1) = 49dB
- From figure 2 dB(2) = 16. For a height of 900mm and a module number of 5. The number of modules is the width (1750mm) divided by the module width (350mm for a NCT-350-24, from insertion loss table).
- Calculate the Regenerated Sound power level as the sum of dB(1) + dB(2) + the spectrum corrections. This is shown in the table below.



| Regenerated Sound Power Level Calculation | | | | | | | | |
|---|----------------|-----|-----|-----|-----|-----|-----|-----|
| | Frequency (Hz) | | | | | | | |
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| dB(1) | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 |
| dB(2) | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| Spectrum Corr. For dB(1)=49 | 1 | 0 | -5 | -9 | -13 | -14 | -17 | -21 |
| Total = Sound Power Level | 66 | 65 | 60 | 56 | 52 | 51 | 48 | 44 |

| Table 1 : Spectrum Corrections | | | | | | | | |
|--------------------------------|----------------|-----|-----|-----|-----|-----|-----|-----|
| dB(1) from Figure 1 | Frequency (Hz) | | | | | | | |
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| <45 | 1 | 0 | -5 | -10 | -15 | -19 | -23 | -27 |
| 45-55 | 1 | 0 | -5 | -9 | -13 | -14 | -17 | -21 |
| 55-60 | 1 | 0 | -5 | -9 | -11 | -11 | -13 | -16 |
| 60-65 | 1 | 0 | -5 | -8 | -9 | -9 | -10 | -12 |
| >65 | 1 | 0 | -5 | -7 | -8 | -8 | -8 | -10 |

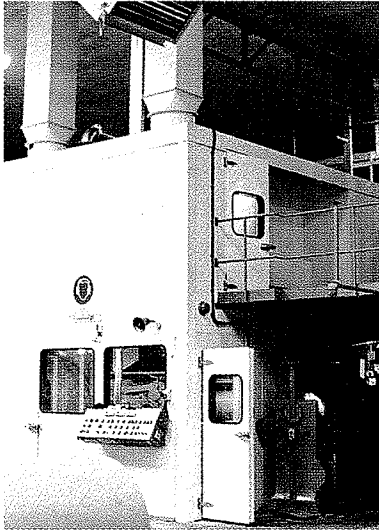
Guidelines:

For typical HVAC applications the guidelines in the table to the right can be used as a quick assessment of the allowable level of regenerated noise. For this calculate dB(1) and dB(2) and add these together. Compare this with the expected noise level in the room.

| dB(1) +dB(2) | Expected room noise level |
|-----------------|---------------------------------|
| 80 | NC 60 |
| 70 | NC 50 |
| 60 | NC 40 |
| 50 | NC 30 |

This is a guide only and is no substitute for a full duct analysis. Contact Noise Control Services for a full acoustic analysis.

Our Product Range Includes



NC50 and NC100 Modular Engineered Acoustic Structure

Modular acoustic enclosures designed for cost effective noise control in industrial, commercial and building services installations. Applications such as machinery housings, fan plenums, research and test rooms, sound proof rooms, generator and compressor houses, all purpose rooms and audiometric booths.

Quietflow Acoustic Louvres

Acoustic louvres designed to meet the requirements of the architectural and mechanical consultants. Quietflow acoustic louvres are rugged yet functional. Designed to permit airflow and control noise. Applications such as plant rooms, chiller and cooling tower barriers and fan plenums.

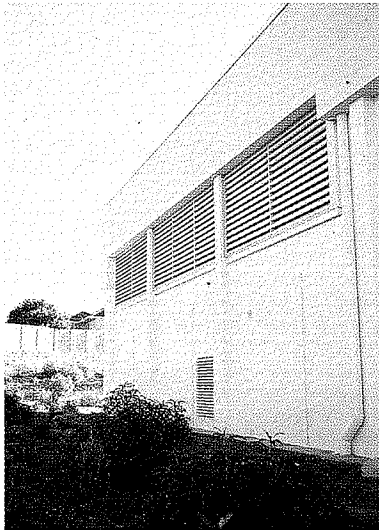
Packaged Attenuators

Cylindrical Models - Type LP and HP

Cylindrical attenuators for the control of noise from axial flow fans. Units are available to match all manufacturers fan sizes. These attenuators are available in four types giving various degrees of noise attenuation. The types are one diameter long with and without an internal pod and two diameter long with and without an internal pod. Various constructions and finishes are available.

Rectangular Models - Type NCS, NCT and NCM

These rectangular models are available in three types. A standard high performance type (Type NCS), a low pressure loss type (Type NCT) and a water resistant and hygienic type (Type NCM). The attenuators are all engineered with proven aerodynamic and acoustic efficiency. Exclusive features highlight the design of this range. These features are inlet cones, acoustic fill protected by perforated metal, heavy outer steel for structural stability and reduction of case break-out noise are all standard components of the design. As well as the standard mechanical services duct applications, these splitter type attenuators can be installed on cooling towers, chillers, industrial fans and blowers. Available in various materials and finishes depending on the application.



Acoustic Doors

Taken from the NC50/100 system the all metal acoustic doors are available in various sizes from single leaf up to large double leaf doors 3600mm x 3600mm. The heavy doors are pre-hung on a structural frame ready to install in any builder's work opening. Applications such as plant rooms, test cells, studios and audiometric booths.

Industrial Attenuators

The full range of industrial silencers include vent silencers for steam and gas venting, exhaust silencers for engines, reactive type units for intakes to compressors, combination reactive and dissipative units for Rootes type blowers and general purpose cylindrical silencers for numerous applications. These heavy, all welded constructions are available in various finishes.



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Equipment may change without notice

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