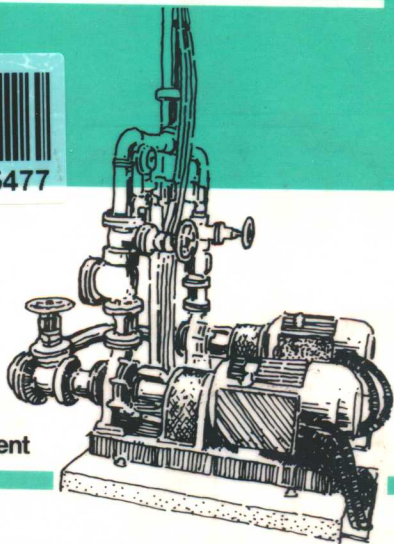




消減工業噪音 實用指南

A

Practical Guide for the Reduction of Industrial Noise



香港政府環境保護署
Environmental Protection Department

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**A PRACTICAL GUIDE
FOR
THE REDUCTION OF INDUSTRIAL NOISE**

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Hong Kong

WITHDRAWN
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PART I: INTRODUCTION

1. What is the use of this booklet?

This booklet is written to provide a basic understanding and some practical solutions of common industrial noise problems that could affect the environment. It also serves as a useful reference of locally available products and services.

2. Who should read this booklet?

This booklet will be useful to plant managers and engineers, maintenance personnel, operators of noisy equipment and other readers who may have little acoustic background but may have to deal with noise problems from their industrial activities or machinery.

3. How to use this booklet?

This booklet is specifically written for the purpose of problem solving. Therefore, readers with a particular noise problem can refer to the Quick Reference Guide in Section 4 of Part I, identify the type and nature of their noise problems, and go directly to the sections indicated there for possible solutions. It is, therefore, not necessary for readers concerned about a particular problem to read through other sections not related to the topic of their interest. For readers who would like to be further informed of the many noise reduction principles, Part III provides a useful and systematic summary.

It is intended that the booklet will be updated and expanded from time to time and the Environmental Protection Department would therefore be pleased to receive any additional relevant information.

4. Quick Reference Guide

Source of Noise Problem	Possible solution	Relevant Section
Fan	<ul style="list-style-type: none"> • Smooth air flow • Treat with acoustic chamber • Install silencer • Replace worn-out bearing 	5 5 and 15.1 5 and 15.4 5 and 14.1
Duct	<ul style="list-style-type: none"> • Stiffen vibrating surface • Apply composite lagging 	6 6
Pipe	<ul style="list-style-type: none"> • Apply composite lagging • Use anti-vibration mounts 	7 7 and 15.5
Water pump	<ul style="list-style-type: none"> • Use partial enclosure • Use acoustic enclosure • Replace worn-out bearing • Use anti-vibration mounts 	8 and 15.1 8, 15.1 and 15.4 8 and 14.1 8 and 15.5
Air-cooled condensing unit/chiller	<ul style="list-style-type: none"> • Plan siting of equipment • Use acoustic enclosure • Install silencer • Replace worn-out bearing 	13.2 9 and 15.1 9 and 15.4 9 and 14.1
Water cooling tower	<ul style="list-style-type: none"> • Plan siting of equipment • Install silencer • Furnish acoustic mat into the water basin • Erect barrier • Adjust fan belt tension 	13.2 10 and 15.4 10 10 and 15.2 10
Plant room	<ul style="list-style-type: none"> • Improve plant room sound insulation • Use anti-vibration mounts 	11 and 15.3 11 and 15.5
Machinery such as collection hopper, friction saw and plastic grinder	<ul style="list-style-type: none"> • Select quiet equipment and process • Add resilient pad on the impact surface • Stiffen vibrating panel • Use acoustic enclosure • Erect barrier • Apply acoustic lining • Check maintenance condition 	13.1 12 12 12 and 15.1 12 and 15.2 12 14.1 and 14.2
Complicated problem	<ul style="list-style-type: none"> • Consult noise control specialist 	Appendix E

PART II : COMMON LOCAL INDUSTRIAL NOISE PROBLEMS AND SOLUTIONS

5. Fan

Problem:

- (a) Turbulent air flow noise
- (b) Whining noise at high rotating speed
- (c) High frequency tonal bearing noise

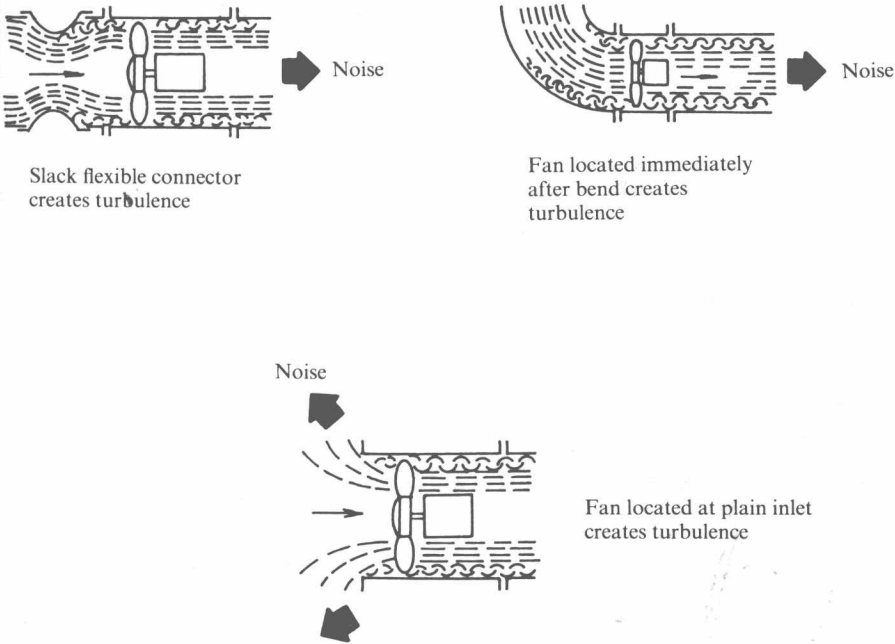


Figure 1 Fan turbulent air flow noise

Brief Description of Problem and Remedy:

Cause of Problem	Remedy	R*
(a) <i>Turbulent air flow noise</i> Generated by the turbulence of air due to obstacle in the air flow	• avoid locating fans immediately behind heaters, cooling coils, bends, transformation sections	1
	• avoid creating any sudden change in flow components	1
	• fit coned or bell mouth shroud to all open running fans	1
	• enclose the fan unit in a chamber internally lined with sound absorbing material	2
	• install silencers	2
(b) <i>Whining noise</i> Resulted from high running speed of fan	• reduce the fan speed	1
	• re-select fans of lower rotating speed	2
(c) <i>High frequency tonal bearing noise</i> Created by worn-out bearing	• replace the bearing	1

R* Recommended order of application

Samples Solutions:

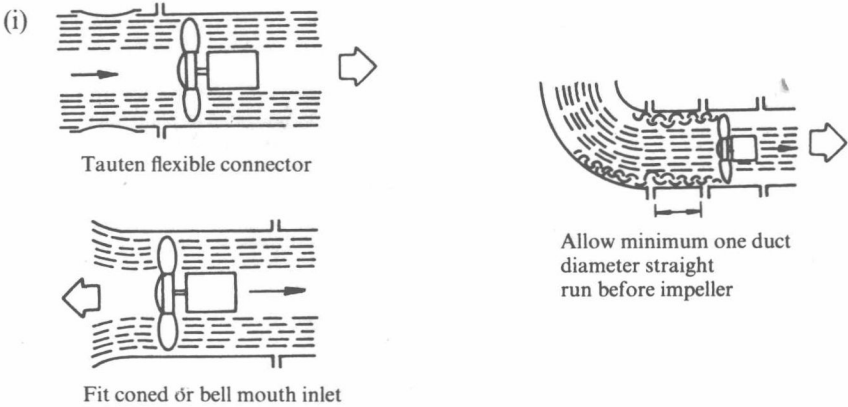


Figure 2 Reduction of turbulence

(ii)

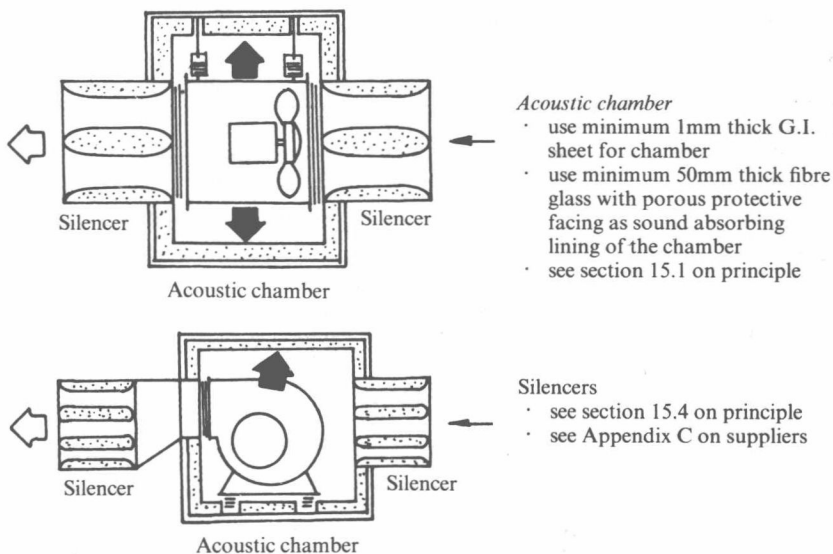


Figure 3 Application of acoustic chamber and silencer for fans

6. Ducts Noise

Problem:

- (a) Rumbling duct panel noise
- (b) Low frequency breakout noise through the duct surfaces

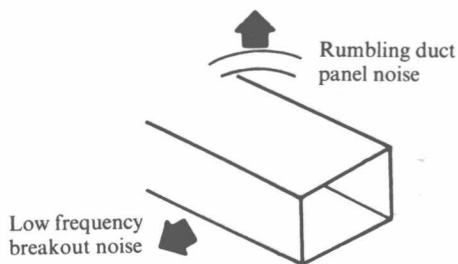


Figure 4 Duct noise

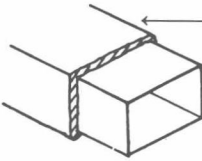
Brief Description of Problem and Remedy:

Cause of Problem	Remedy	R*
(a) <i>Rumbling duct panel</i> Duct surface is induced by the air flow to vibrate	· stiffen the vibrating panel with supporting webs	1
	· apply damping material to the vibrating panel	2
(b) <i>Low frequency breakout noise</i> Noise inside the duct passes through the duct surface	· apply composite lagging of a sound absorbing inner layer and a heavy outside cladding to the entire length of the duct surface	1

R* Recommended order of application

Sample Solutions :

(i)

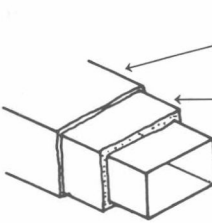


Damping material

- use bituman or rubber type material
- see Appendix A on suppliers

Figure 5 Application of damping compound to reduce noise from vibrating ductwork

(ii)



Outside cladding

- use minimum 13mm thick plastering or loaded vinyl fabric

Sound absorbing material

- use minimum 50mm thick fibre glass board
- see Appendix B on suppliers

Figure 6 Application of composite lagging to reduce noise breakout from ductwork

7. Pipe Noise

Problem :

- (a) Ringing pipe noise
- (b) Structure-borne vibrating pipe noise found at other part of the building

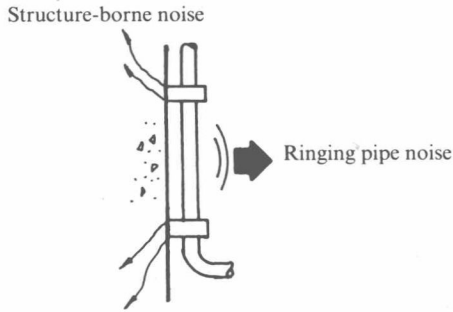


Figure 7 Pipe noise

Brief Description of Problem and Remedy:

Cause of Problem	Remedy	R*
(a) <i>Ringing pipe noise</i> Pipe wall is excited and set into vibration by the fluid flow inside the pipe	· apply composite lagging of a sound absorbing inner layer and a heavy outside cladding to the entire length of the pipe surface	1
(b) <i>Structure-borne vibrating pipe noise</i> Vibration of piping is transmitted via the structure to other parts of the building	· install anti-vibration mounts between the pipe and its supports	1

R* Recommended order of application

Sample solutions :

(i)

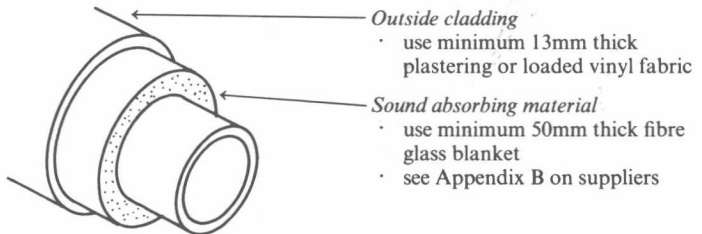
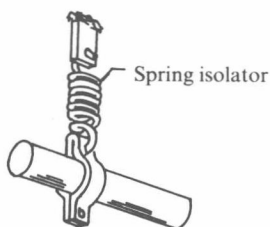


Figure 8 Application of composite lagging to reduce noise from ringing pipe

(ii) Ceiling mounting



Anti-vibration mounts

- see Section 15.5 on principle
- see Appendix D on suppliers

Wall mounting

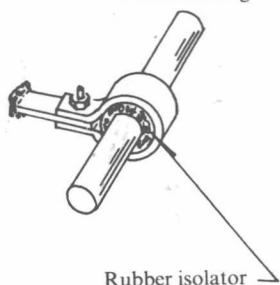


Figure 9 Anti-vibration mounts for pipes

8. Water Pump Noise

Problem :

- (a) Whining pump machine noise
- (b) High frequency tonal bearing noise
- (c) Structure-borne vibrating pump noise found at other part of the building

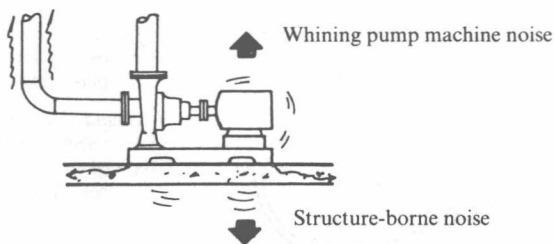


Figure 10 Water pump noise