

NIOSH



TECHNICAL REPORT

INDUSTRIAL NOISE CONTROL MANUAL

Revised Edition

INDUSTRIAL NOISE CONTROL MANUAL
(Revised Edition)

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NIOSH Project Officer: William N. McKinnery, Jr.

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PREFACE

Employer and employee awareness of the problems of industrial noise has increased notably in the past decade. Industry's concern about noise, especially since the mid-1960s, has been growing steadily. In the early 1970s, the Occupational Safety and Health Administration (OSHA) established a noise exposure regulation specifically for workplaces. Industry has responded to the new interest in noise reduction, but has encountered difficulties in correcting individual noise problems and implementing company-wide noise reduction programs. Company personnel who may have little or no understanding of the causes or solutions of the problems of noise may be asked to select a noise control method or device, to choose noise control materials, to use noise measuring instruments, or to decide whether to call upon a qualified consultant.

In this dilemma, industry's need is clear: practical information about noise control, information based on methods that have been tested and found successful - in terms of effectiveness, time, and cost - in achieving an acceptable noise environment in industrial plants. In the mid-1970s, the National Institute for Occupational Safety and Health (NIOSH) contracted for a manual of such practical information. The result was the *Industrial Noise Control Manual* [HEW Publication No. (NIOSH) 75-183], which included essential information about noise control techniques and a collection of case histories of successful noise control projects in industrial plants.

In 1977, NIOSH scheduled a revision of the popular *Manual* to cover work performed between 1975 and 1978. For this edition, previous case histories have been reprinted, new case histories have been added, and additional case histories have been abstracted from current literature. The revised *Industrial Noise Control Manual* now contains a comprehensive presentation of practical applications of noise control in industry.

NIOSH welcomes industrial noise control case histories for future editions of the *Manual*. As in this edition, case histories will carry full identification of the persons who do the work and the firms for which the work is done. The preferred form for case histories is:

- A. Description of the process, machine, and noise problem
- B. Noise measurements made and discussion of findings
- C. Control approaches - advantages and disadvantages
- D. Results in terms of the noise reduction achieved and the cost
- E. Pitfalls to avoid when implementing the control methods
- F. Figures - noise data (e.g., octave-band sound pressure levels)
- G. Sketches of area layout, machine/operator relationship, construction details of noise control devices
- H. Photographs of machines before and after modifications - 8 x 10 glossy preferred.

Case histories should be sent to:

Physical Agents Control Section, CTRB
Division of Physical Sciences and Engineering
National Institute for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, Ohio 45226

ABSTRACT

This *Manual* contains basic information on understanding, measuring, and controlling noise, and more than 60 actual case histories of industrial noise control projects. It is written for persons who have had little or no experience in noise control. Included are sections on noise problem analysis, basic methods of noise control, acoustical materials, and the choice of a consultant. An extensive, partially annotated bibliography of books and articles on relevant topics is included in the *Manual*, as is an annotated list of sources containing more case histories.

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1. INTRODUCTION

WHAT THIS *MANUAL* IS ABOUT

Noise problems abound in industry. They encompass:

- Intrusion of plant noise into nearby residential areas
- Intrusion of plant noise into adjoining office spaces
- Interference with speech communication and audible warning sounds by noise in the work area
- Permanent hearing loss and other detrimental health effects caused by long-term exposure to excessive plant noise.

The first three problems reflect the "annoyance" effects of noise; the fourth involves actual physiological damage.

This *Manual* can help you, the plant executive, engineer, or staff member, solve all four kinds of problems. In addition, much industrial noise today is subject to Federal regulations, and this *Manual* will help you meet Federal standards, but the approaches to noise control described in this *Manual* apply to *all* situations in which noise annoys or harms humans, not just those situations covered by regulations.

In the first, or general discussion, part of this *Manual*, we emphasize *approaches* to noise control. Why approach and analysis, rather than outright solutions? The reasons are two:

- Learning how to approach and analyze the general problem of noise is more valuable than learning the solution to a few specific problems of noise;
- The sources of industrial noise are so many that a listing of these sources, their uses, and their almost innumerable possible treatments would fill an encyclopedia, not a manual.

We present, therefore, one broad, basic approach, in the form of four short questions.

Also, in the first part of this *Manual*, we discuss noise control techniques in general, rather than in terms of specific applications. The general discussions that appear in the next four

sections of this *Manual* are, we believe, a necessary introduction to the second part: detailed reports of the actual case histories.

ORGANIZATION OF THE MANUAL

An effective approach to a noise problem can be divided into these four questions:

- Is there a problem?
- How severe is it?
- What causes it?
- What can be done to solve it?

The next four sections of this *Manual* – Noise Problem Analysis, Noise Control, Noise Control Materials, and Selecting and Choosing a Consultant – discuss these questions and offer answers, or information on which you can base your answers. In the following Case Histories section, more than 60 examples of actual noise control are arranged by treatment category, rather than by machine type, to illustrate approaches to noise control as well as solutions to individual problems.

The *Manual* ends with an extensive, partially annotated bibliography of books and articles on topics discussed throughout the book and an additional annotated list of sources containing more case histories.

Note: Metric units are used generally throughout the *Manual*, though some English units have been retained, particularly in several older case histories.