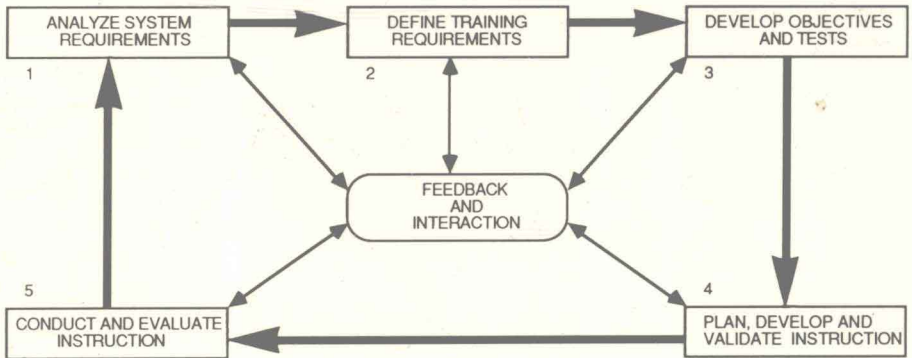

Systematic Safety Training



Kingsley Hendrick

Systematic Safety Training

Kingsley Hendrick

*Transportation Safety Institute
Oklahoma City, Oklahoma*

MARCEL DEKKER, INC.

New York and Basel

Hendrick, Kingsley.

Systematic safety training / Kingsley Hendrick.

p. cm. -- (Occupational safety and health; 19)

ISBN 0-8247-8238-0

1. Industrial safety--Study and teaching. I. Title. II. Series:
Occupational safety and health (Marcel Dekker, Inc.) ; 19.

T55.2.H46 1990

613.6'2'071--dc20

89-25831

CIP

This book is printed on acid-free paper.

Copyright © 1990 by MARCEL DEKKER, INC. All Rights Reserved

Neither this book nor any part may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, microfilming, and recording, or by any information storage and retrieval system, without permission in writing from the publisher.

MARCEL DEKKER, INC.

270 Madison Avenue, New York, New York 10016

Current printing (last digit):

10 9 8 7 6 5 4 3 2 1

PRINTED IN THE UNITED STATES OF AMERICA

Systematic Safety Training

OCCUPATIONAL SAFETY AND HEALTH

A Series of Reference Books and Textbooks
on Occupational Hazards • Safety • Health •
Fire Protection • Security • and Industrial Hygiene

Series Editor

ALAN L. KLING

Loss Prevention Consultant
Jamesburg, New Jersey

1. Occupational Safety, Health, and Fire Index *David E. Miller*
2. Crime Prevention Through Physical Security *Walter M. Strobl*
3. Fire Loss Control *Robert G. Planer*
4. MORT Safety Assurance Systems *William G. Johnson*
5. Management of Hotel and Motel Security *Harvey Burstein*
6. The Loss Rate Concept in Safety Engineering *R.L. Browning*
7. Clinical Medicine for the Occupational Physician *edited by Michael H. Alderman and Marshall J. Hanley*
8. Development and Control of Dust Explosions *John Nagy and Harry C. Verakis*
9. Reducing the Carcinogenic Risks in Industry *edited by Paul F. Deisler, Jr.*
10. Computer Systems for Occupational Safety and Health Management
Charles W. Ross
11. Practical Laser Safety *D.C. Winburn*
12. Inhalation Toxicology: Research Methods, Applications, and Evaluation
edited by Harry Salem
13. Investigating Accidents with STEP *Kingsley Hendrick and Ludwig Benner, Jr.*
14. Occupational Hearing Loss *Robert Thayer Sataloff and Joseph Sataloff*
15. Practical Electrical Safety *D.C. Winburn*
16. Fire: Fundamentals and Control *Walter M. Haessler*
17. Biohazards Management Handbook *Daniel F. Liberman and Judith Gordon*
18. Practical Laser Safety, Second Edition, Revised and Expanded
D.C. Winburn
19. Systematic Safety Training *Kingsley Hendrick*

Additional Volumes in Preparation

Foreword

This book fills a key need by providing essential information to assist the safety professional in dealing with new areas of emphasis and directions of effort in safety-related training.

Safety professionals have traditionally been the principal agents in training programs dealing with safety specialty areas. They have also served as peripheral participants in more general organizational training activities.

Through the years, the content and method of "safety training" programs have often tended to stagnate. They have also tended to become more or less isolated from other organization training efforts and, too frequently, from the mainstream of the organization's functional activities and legal and economic problems.

In recent years, organizational safety related problems have changed in two important ways. First, there is an increasing emphasis on total process safety as compared with the traditional focus on "individual accidents." This is most obvious in the various aspects of organizational liability and in areas relating to environmental impairment. Second, there is an increasing need for formal cost-benefit justification for safety related activities, including training.

In response to these needs, there is an increasing tendency of general management to think in terms of more formal safety related organizational training programs to prepare personnel to deal with the multidisciplinary nature of modern risk management. This interest carries a proviso that favorable cost-benefit relationships can be demonstrated. Unfortunately, existing safety training programs along with the safety professionals who conduct them, are often not prepared to deal with this broader organization approach to safety.

Kingsley Hendrick's new book is ideally suited to support safety professionals in upgrading and modernizing the conventional safety training program as well as to support them in dealing with the total organizational approach to safety.

This book leads the safety professional, in a commonsense way, from introductory chapters that define and discuss the need for a new role and for new methods in safety training, through orientation in modern training theories and practices, to training program design, and finally to management considerations in internal marketing of the training program.

A constant implicit emphasis is placed on the need for formality and rigor in designing and conducting training and behavioral modification programs in the modern legal and economic climate.

Knowledge of the material contained in this book is essential for safety professionals who desire to maintain a position of organizational credibility and influence through their training programs in the modern management environment.

Robert J. Nertney, Ph.D.
EG&G Idaho
Idaho Falls, Idaho

Preface

The title, *Systematic Safety Training*, reflects the major theme of this book. The need for congruence between the concerns of safety and the demands of management is becoming increasingly evident as our economy demands higher productivity at lower costs. Safety training, for too long, has not been viewed as cost effective; it is perceived as taking away from the productivity of employees and the profits of an organization. Safety training must be able to show its positive contribution to both immediate and long-range goals and objectives of an organization. This book will help the safety professional develop an overall strategy that others can see as valuable in decreasing losses that result from ineffective performance.

Previously, only a limited number of printed resources were available to help the safety professional develop an effective safety training program. These either focused primarily on compliance with regulations or perpetuated traditional training methods. Now, using concepts and tools developed for system safety and risk management, this book provides the safety professional with an approach to safety training that emphasizes the importance of training personnel to perform planned activities safely and to respond effectively to unplanned events that often result in accidents and losses.

This book presents strategies and tactics to provide training for both normal and unexpected events. The overall strategy is to improve the extent to which the performance of personnel reduces the risk of loss caused by inefficient performance of normal tasks or ineffective response to unplanned events. This book also presents a number of instructional tactics that address specific performance improvement activities to improve overall safety.

Many current safety training programs focus on training to increase knowledge of rules, regulations, and standards, and to make personnel aware of unsafe acts and conditions. This often results in an improvement in compliance, but fails to improve overall risk-reducing performance.

To achieve the desired improvement goal, this book suggests that a comprehensive safety training strategy be adopted that incorporates a broad spectrum of instructional activities designed to increase the safety skills and knowledge of all personnel and to develop an awareness that reducing risks leads to increased personal and organizational productivity and profit. This book supports such a comprehensive strategy in the belief that it is the most effective approach to achieving the 90% improvement in safety that William Johnson advocated 10 years previously, in *MORT: Safety Assurance Systems*.

The goal of improving the extent to which the performance of personnel eliminates or reduces the risk of loss is one that can only be attained if the entire organization functions in response to events that might lead to losses. Thus, this book uses concepts and tools originally developed for system safety and risk management for the development and presentation of instructional activities to improve safety levels. With this approach, the safety professional is able to emphasize the importance of training personnel to both perform planned activities safely and respond effectively to unplanned events.

A safety training program must be comprehensive. It cannot focus on operational personnel only, but must include those who establish and monitor the work environment to ensure that the lowest level of risk is achieved in congruence with the organization's goals.

The point of this discussion is that the safety training program advocated in this book does not focus exclusively on tasks that are typically reported as accidents. Rather, this book recognizes that many, if not most, reportable accidents and losses reflect previous poor performances in conceiving, designing, and operating the system within which the reportable accidents occur. It also recognizes that personnel need to be prepared to respond to and control emergencies before they become losses and to minimize losses when they do occur.

Ultimate responsibility for implementing such a comprehensive safety training effort will undoubtedly fall on an organization's safety professional. However, safety professionals are not always aware of the instructional strategies that can effectively provide the necessary safety knowledge, skills, and attitudes with a minimal demand on productive time. This book provides suggestions for a systematic approach to safety training that is congruent with other organizational strategies.

The foundation of this approach is laid in Chapter 1 where the need for a systematic approach is documented by comparing the re-

sults of nonsystematic training with the results obtained when a planned process is used. Chapter 2 advances this discussion by developing a systematic, process-oriented description of the development and presentation of instructional activities. Chapter 3 provides several ways to define the needs for safety training, including both traditional and risk-management-derived approaches.

From this background, Chapters 4 through 10 address concepts and techniques for use in the safety training program. First, strategies and tactics for the development of knowledge and skills are presented in Chapters 4 through 8. Each strategy is discussed in terms of its application to specific types of training needs, appropriate instructional tactics, and monitoring techniques. Chapter 9 explains the development and use of behavioral objectives and instructional tactics. Chapter 10 focuses on activities whose primary purpose is the development of a willingness to perform in a safe and healthful manner.

The third section of the book discusses the safety training program in terms of its environments (Chapter 11), planning and programming (Chapter 12), marketing to obtain support and resources (Chapter 13), and evaluation (Chapter 14).

Finally, several Appendixes are included that provide more specific guidance on instructional activities, ranging from techniques for defining training needs, through classroom arrangements, to writing tests. Specifically, these Appendixes address needs surveys and analyses, task analysis, the principles of performance improvement, the development and presentation of learning activities, classroom arrangements, test construction, and the preparation of visuals. An extensive index is provided, as is a comprehensive list of references.

Though written primarily for the practicing safety professional who wants to develop and manage an effective safety training program, the book will also be ideal for students, since each of its fourteen chapters is followed by several questions to stimulate creative thinking, research and application.

Kingsley Hendrick

Acknowledgments

No book is exclusively the product of one author. Every author is deeply indebted to many people whose encouragement and patience made the final book possible. Dan Petersen first asked me to write a book on safety training. I felt able to do that because of the support given me as Chief of the Standards and Performance Staff of the Coast Guard's Safety Programs Division. Bill Lowry, the Division's Chief, gave me the challenge and the freedom to develop a safety training program for the Coast Guard that would meet OSHA requirements and be within the resource restraints the Coast Guard faces.

Later, as my ideas developed, I learned a great deal more about safety training from the Transportation Safety Institute, an organization dedicated to excellence in safety and security training. Many of the ideas and techniques in this book can easily be traced to the standard procedures of the Institute. Both TSI's Director, Dr. H. Aldridge Gillespie, and its Deputy Directors, Walter O'Connor and Bill Nash, have provided guidance, critiques, and suggestions that have been incorporated into this book.

I also give great thanks to Dr. Robert J. Nertney of the Systems Safety Development Center. Dr. Nertney has generated more clear and creative thinking about improving human performance for safety than anyone I know. His reading of the manuscript for this book and his conviction that this, with two other Marcel Dekker books, *Investigating Accidents with STEP* and *MORT: Safety Assurance Systems*, would provide all that a safety professional needs for basic reference, provided a real foundation on which I felt confident to build.

No author could fail to give thanks to his personal support staff—those people in his life who give him the time and space to be alone with his creation which they don't really understand. So, I give thanks to Marvin and Gini who tolerated my hours of isolation and unintelligible dedication to papers and computers.

Nor could an author ignore his publisher's staff. In my case, thanks go specifically to Barbara Dunleavy, my friendly and supportive Production Editor, and to Ruth Dawe, who gave me more encouragement and praise along the way than any author really deserves.

Contents

<i>Foreword</i> (Robert J. Nertney)	iii
<i>Preface</i>	v
<i>Acknowledgments</i>	ix
1. The Need for a Systematic Approach to Safety Training	1
1.1 Why Do We Need a Book on Safety Training?	1
1.2 Need for a Systematic Approach to Safety Training	2
1.3 Nonsystematic Safety Training	5
1.4 Abstract Thinking and Safety	6
1.5 Safety Models and Safety Training	10
1.6 Summary	18
2. System Concept for Safety Training	25
2.1 Introduction	25
2.2 What Is a Process?	26
2.3 The Change Response Model	27
2.4 An Event Environment Model	32
2.5 Models with Potential Use in Safety Training	36
2.6 Summary	42

3.	Defining the Needs for Safety Training	45
3.1	Introduction	45
3.2	Traditional Approaches to Needs Assessment	49
3.3	Strengths and Weaknesses of Traditional Needs Assessment Approaches	52
3.4	Some Attempts at Solution	56
3.5	Systematic Approaches to Assessing Safety Training Needs	58
3.6	Summary	65
4.	Instructional Strategies	69
4.1	Importance of Careful Program Design	69
4.2	Who Can Help You Select Instructional Strategies?	71
4.3	Ranking Safety Training Needs	71
4.4	Selecting Instructional Strategies	76
4.5	The Instructional Activity Process	80
4.6	Summary	82
5.	Technical and Specialized Training	89
5.1	Introduction	89
5.2	Development of Technical and Specialized Training	92
5.3	Identifying Participants	93
5.4	Possible Tactics	93
5.5	Sources of Technical and Specialized Training	97
5.6	Monitoring	99
5.7	Summary	100
6.	Task-Related Training	103
6.1	Introduction	103
6.2	Content Sources	105
6.3	Targets	106
6.4	Coordination Procedures	111
6.5	Implementation Alternatives	115

<i>Contents</i>	<i>xiii</i>
6.6 Monitoring	116
6.7 Summary	117
7. Work Group Development	121
7.1 Introduction	121
7.2 Identifying Work Group Process Hazards	122
7.3 Techniques of Work Group Training	129
7.4 Monitoring	131
7.5 Summary	131
8. Improving Work Group Outputs	135
8.1 Introduction	135
8.2 Goals and Objectives	137
8.3 Achieving the Objectives	138
8.4 Other Outputs to Improve	141
8.5 Procedures	143
8.6 Monitoring	145
8.7 Summary	146
9. Instructional Tactics	151
9.1 Introduction	151
9.2 Behavioral Objectives	152
9.3 Instructional Tactics	154
9.4 Summary	169
10. Willingness	173
10.1 Introduction	173
10.2 Basic Principles	175
10.3 General Application	177
10.4 Conditions Affecting Principles of Behavioral Change	177
10.5 General Techniques	180
10.6 Summary	189

11. The Environments of the Safety Training Program	193
11.1 Introduction	193
11.2 The General Cultural Environment	194
11.3 The Environment of Safety	195
11.4 Your Program's Environment	199
11.5 Summary	203
12. Planning and Programming Safety Training	207
12.1 Introduction	207
12.2 Planning Overview	209
12.3 The General Document	210
12.4 Annual Work Plan and Budget	212
12.5 Standing Operating Procedures	215
12.6 Guidelines	218
12.7 Keeping Current	219
12.8 Summary	221
13. Marketing the Safety Program	223
13.1 Introduction	223
13.2 Preparation for Marketing	224
13.3 Ensuring Support	226
13.4 Presenting the Request Package	232
13.5 Summary	235
14. Evaluation	239
14.1 Introduction	239
14.2 Evaluation Targets	240
14.3 Four Levels of Evaluation	241
14.4 Some Evaluation Tools	243
14.5 Some Applications for Evaluation	247
14.6 Summary	252
Appendix A. Needs Surveys and Analyses	257
Appendix B. Task Analysis	267

<i>Contents</i>	<i>xv</i>
Appendix C. Principles of Performance Improvement	273
Appendix D. Behavioral Objectives and Taxonomies	279
Appendix E. Development and Presentation of Learning Activities	289
Appendix F. Test Construction	297
Appendix G. Preparation of Visuals	303
Appendix H. Classroom Arrangements	307
<i>Bibliography</i>	<i>313</i>
<i>Works Cited</i>	<i>321</i>
<i>Index</i>	<i>325</i>