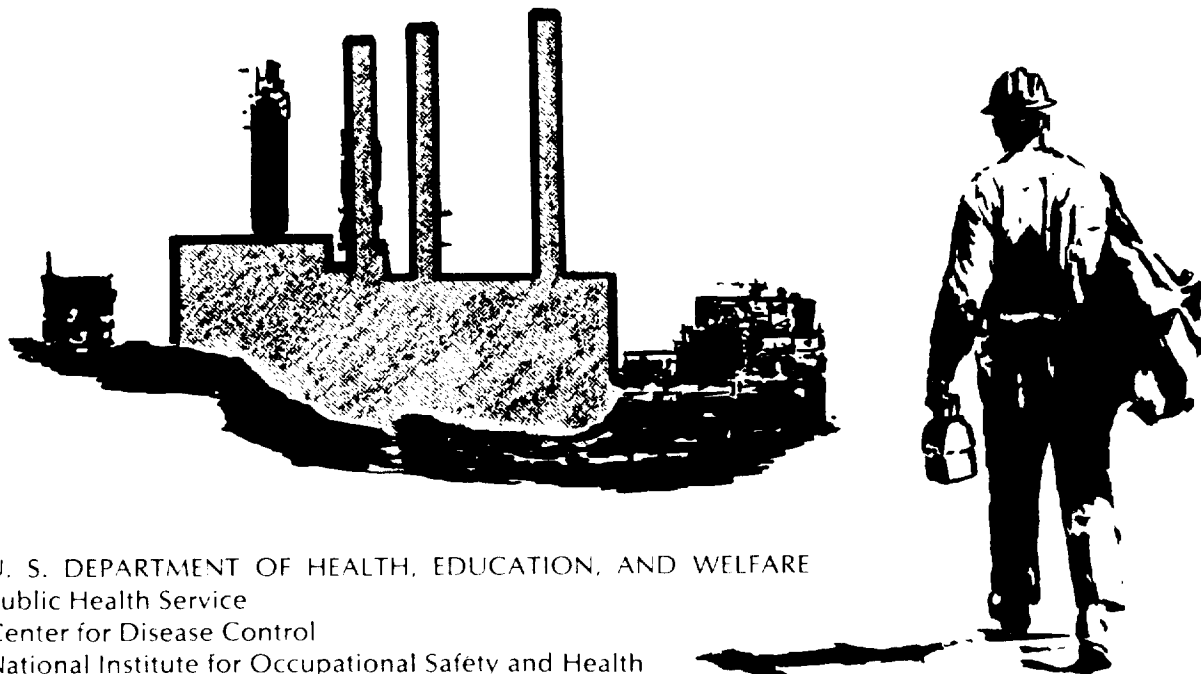


NIOSH

CRITERIA FOR A
RECOMMENDED STANDARD.....

OCCUPATIONAL
EXPOSURE TO
NITROGLYCERIN and
ETHYLENE GLYCOL
DINITRATE



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

criteria for a recommended standard....

**OCCUPATIONAL EXPOSURE
TO
NITROGLYCERIN and ETHYLENE GLYCOL
DINITRATE**



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

June 1978

For sale by the Superintendent of Documents, U.S. Government
Printing Office, Washington, D.C. 20402

DISCLAIMER

Mention of company name or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

DHEW (NIOSH) Publication No. 78-167

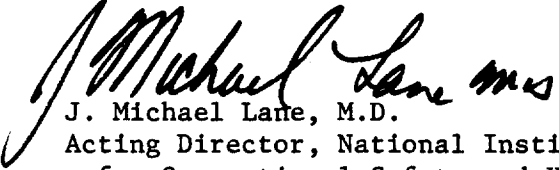
PREFACE

The Occupational Safety and Health Act of 1970 emphasizes the need for standards to protect the health and provide for the safety of workers occupationally exposed to an ever-increasing number of potential hazards. The National Institute for Occupational Safety and Health (NIOSH) evaluates all available research data and criteria and recommends standards for occupational exposure. The Secretary of Labor will weigh these recommendations along with other considerations, such as feasibility and means of implementation, in promulgating regulatory standards.

NIOSH will periodically review the recommended standards to ensure continuing protection of workers and will make successive reports as new research and epidemiologic studies are completed and as sampling and analytical methods are developed.

The contributions to this document on nitroglycerin (NG) and ethylene glycol dinitrate (EGDN) by NIOSH staff, other Federal agencies or departments, the review consultants, the reviewers selected by the American Industrial Hygiene Association, and by Robert B. O'Connor, M.D., NIOSH consultant in occupational medicine, are gratefully acknowledged.

The views and conclusions expressed in this document, together with the recommendations for a standard, are those of NIOSH. They are not necessarily those of the consultants, the reviewers selected by professional societies, or other Federal agencies. However, all comments, whether or not incorporated, have been sent with the criteria document to the Occupational Safety and Health Administration for consideration in setting the standard. The review consultants and the Federal agencies which received the document for review appear on pages v and vi.


J. Michael Lane, M.D.
Acting Director, National Institute
for Occupational Safety and Health

The Division of Criteria Documentation and Standards Development, National Institute for Occupational Safety and Health, had primary responsibility for the development of the criteria and recommended standard for Nitroglycerin and Ethylene Glycol Dinitrate. Anthony E. Romero of this Division served as criteria manager. SRI International developed the basic information for consideration by NIOSH staff and consultants under contract CDC-99-74-31.

The Division review of this document was provided by J. Henry Wills, Ph.D. (Chairman), Jon R. May, Ph.D., and Richard A. Rhoden, Ph.D.

REVIEW CONSULTANTS

H. Lloyd Garvey, Ph.D.
Department of Pharmacology
College of Medicine
Howard University
Washington, D.C. 20059

James P. Keogh, M.D.
Southeastern Community Health Office
Baltimore, Maryland 21224

John W. Knauber
Bureau of Occupational Health
Department of Environmental Resources
Harrisburg, Pennsylvania 17120

Clarence W. Quesenberry
President, Oil, Chemical, and Atomic Workers
International Union, Local 3-495
Radford, Virginia 24141

Richard G. Sailer
Hercules, Incorporated
Wilmington, Delaware 19898

William J. Taylor, Ph.D.
Atlas Powder Company
Dallas, Texas 75251

FEDERAL AGENCIES

Department of Defense
Office of Assistant Secretary of Defense

Department of the Army
Army Environmental Hygiene Agency
Director of Environmental Management

Department of the Navy
Bureau of Medicine and Surgery
Navy Environmental Health Center

Department of the Air Force
Office of the Surgeon General
Aerospace Medicine Division

Department of Energy
Division of Operational and Environmental Safety

Department of Health, Education, and Welfare
Food and Drug Administration

Department of the Interior
Mining Enforcement and Safety Administration

Department of Transportation
Office of Hazardous Materials

CONTENTS

	<u>Page</u>
PREFACE	iii
REVIEW CONSULTANTS	v
FEDERAL AGENCIES	vi
I. RECOMMENDATIONS FOR A NITROGLYCERIN:ETHYLENE GLYCOL DINITRATE STANDARD	1
Section 1 - Environmental (Workplace Air)	4
Section 2 - Medical	4
Section 3 - Labeling and Posting	6
Section 4 - Personal Protective Equipment and Clothing	8
Section 5 - Informing Employees of Hazards from NG and EGDN	10
Section 6 - Work Practices	11
Section 7 - Sanitation	17
Section 8 - Monitoring and Recordkeeping Requirements	18
II. INTRODUCTION	20
III. BIOLOGIC EFFECTS OF EXPOSURE	24
Extent of Exposure	25
Historical Reports	28
Effects on Humans	33
Epidemiologic Studies	93
Animal Toxicity	104
Correlation of Exposure and Effect	124
Carcinogenicity, Mutagenicity, Teratogenicity, and Effects on Reproduction	130
IV. ENVIRONMENTAL DATA	133
Sampling and Analytical Methods	133
Environmental Concentrations	139
Control of Exposure	144
Biologic Monitoring	148
V. WORK PRACTICES	149
Control of Hazards to Health	149
Control of Hazards to Safety	153

CONTENTS (CONTINUED)

	<u>Page</u>
VI. DEVELOPMENT OF STANDARD	161
Basis for Previous Standards	161
Basis for the Recommended Standard	165
VII. RESEARCH NEEDS	176
VIII. REFERENCES	179
IX. APPENDIX I - Sampling and Analytical Method for NG and EGDN	192
X. APPENDIX II - Material Safety Data Sheet	203
XI. TABLES	213