

Comprehensive Safety Recommendations for Land-Based Oil and Gas Well Drilling

NIOSH

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

COMPREHENSIVE SAFETY RECOMMENDATIONS FOR
LAND-BASED OIL AND GAS WELL DRILLING

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National Institute for Occupational Safety and Health
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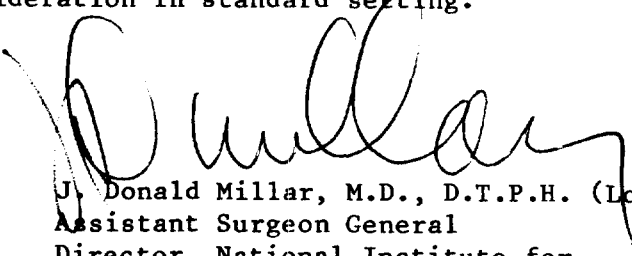
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PREFACE

The Occupational Safety and Health Act of 1970 (Public Law 91-596) states that the purpose of Congress expressed in the Act is "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources...by," among other things, "providing for research in the field of occupational safety and health...and by developing innovative methods, techniques, and approaches for dealing with occupational safety and health problems." Later in the Act, the National Institute for Occupational Safety and Health (NIOSH) is charged with carrying out this policy. One method by which NIOSH responds to this charge is to publish Technical Guidelines.

Technical Guidelines present the results of comprehensive systematic analyses of occupational hazards, and suggestions for preventing injury and disease among workers. They are intended to supplement existing Federal safety and health standards and may provide background useful in formulating new standards for development. In the interest of wide dissemination of this information, NIOSH distributes Technical Guidelines to other appropriate agencies, organized labor, industry, and public interest groups. We welcome suggestions concerning the content, style, and distribution of these documents.

This particular document addresses workers engaged in land-based oil and gas well drilling operations. It was prepared by the staff of the Division of Safety Research in conjunction with the Division of Standards Development and Technology Transfer, NIOSH. I am pleased to acknowledge the contributions made by consultants and reviewers, in particular the International Association of Drilling Contractors (IADC), the American Petroleum Institute (API), representatives of other Federal agencies, other reviewers, and the staff of the Institute. However, responsibility for the conclusions and recommendations belongs solely to the Institute. All comments by reviewers, whether or not incorporated into the final version, are being sent with this document to the Occupational Safety and Health Administration (OSHA) for consideration in standard setting.



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ABSTRACT

This report serves as an informative analysis of the safety hazards to which workers are exposed during the drilling of land-based oil and gas wells. Comprehensive safety recommendations are presented for the control of worker exposure to the hazards associated with the performance and/or use of the tasks, tools, equipment, and work practices in the drilling of land-based oil and gas wells.

The magnitude of the occupational safety problem in land-based oil and gas well drilling is defined through the development of data estimating the injury and illness incidence rates for the industry (SIC 1381). A detailed analysis of 738 accident case histories from Federal and State OSHA investigations, as well as workers' compensation injury reports, identifies which tasks, tools, and equipment are the most hazardous to the worker and how the worker is injured during well drilling operations. Recommendations are presented for engineering controls and/or operational safe work practices to reduce the occupational hazards of drilling operations.

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CHAPTER I INTRODUCTION AND SCOPE

Based on U.S. Department of Labor (DOL), Bureau of Labor Statistics (BLS) reports, it is estimated that employees in the oil and gas field service industries (Standard Industrial Classification (SIC) 138) were injured at about twice the rate of general industry employees from 1972 through 1980. During this study, examination of three separate sources of injury data (Chapter III) indicated that in the oil and gas well drilling¹ industry (SIC 1381) workers (excluding clerical and administrative support personnel) may have been injured at an even higher rate. Calculations based on these sources of injury data have produced yearly injury incidence rates that range from 11.2 (lost-time injuries only, as computed by the International Association of Drilling Contractors) to 49.4 (compensable injuries recorded by the Texas Workers' Compensation State Board of Insurance) incidents per 100 person-years. The workers involved in drilling activities, the population at risk in this study, increased in number from approximately 25,000 in 1971 to nearly 80,000 in 1980.

Employees who work on drilling rigs may be injured while performing tasks and using equipment unique to well drilling operations; furthermore, these tasks and operations are not specifically addressed by existing Federal occupational safety and health standards. The Occupational Safety and Health Administration (OSHA) General Industry Standards (29 CFR 1910) are applicable to many of the general tasks, equipment, and conditions that are present at well drilling operations; e.g., welding and cutting, scaffolding, handtools, ladders, hydrogen sulfide exposure levels and electrical equipment. However, many of the tasks, equipment, and conditions present at well drilling sites are not specifically regulated by existing Federal safety standards. Some of these include:

- o Tongs
- o Rotary tables and bushings
- o Catheads and catlines
- o Elevators and slips
- o Drill pipe and casing
- o Derrick operations
- o Making and breaking drill pipe connections
- o Well blowout
- o Hydrogen sulfide monitoring.

The scope of this report is to identify the hazards resulting in accidents and injuries during the performance of oil and gas well drilling operations

¹ The term "oil and gas well drilling" as used in this report refers to "land-based oil and gas well drilling."

(SIC 1381), and to recommend safe work practices and technologic improvements that will reduce worker exposure to the identified hazards.

The multiplicity of well servicing and completion operations, as performed by SIC 1389 companies, has not been included in the statistical development of this document; however, this is not intended to exclude servicing and completion contractors from utilizing all applicable safety recommendations presented in Chapter IV.

Chapter II discusses the processes and technologies used to drill oil and gas wells and defines the population at risk in the industry. Chapter III defines the problems: injury incidence rates for the population at risk are presented, and hazardous tasks are identified. Chapter IV presents comprehensive safety recommendations for the oil and gas well drilling industry. Appendix A presents representative case histories of oil and gas well drilling accidents that further demonstrate the uniqueness of drilling operations. An evaluation of the applicability of existing standards (State, Federal, international, and consensus) to oil and gas well drilling operations, and specifically to situations involving unique drilling equipment and tasks, is presented in Appendix B. A glossary of general industry terms is also included at the end of this report.