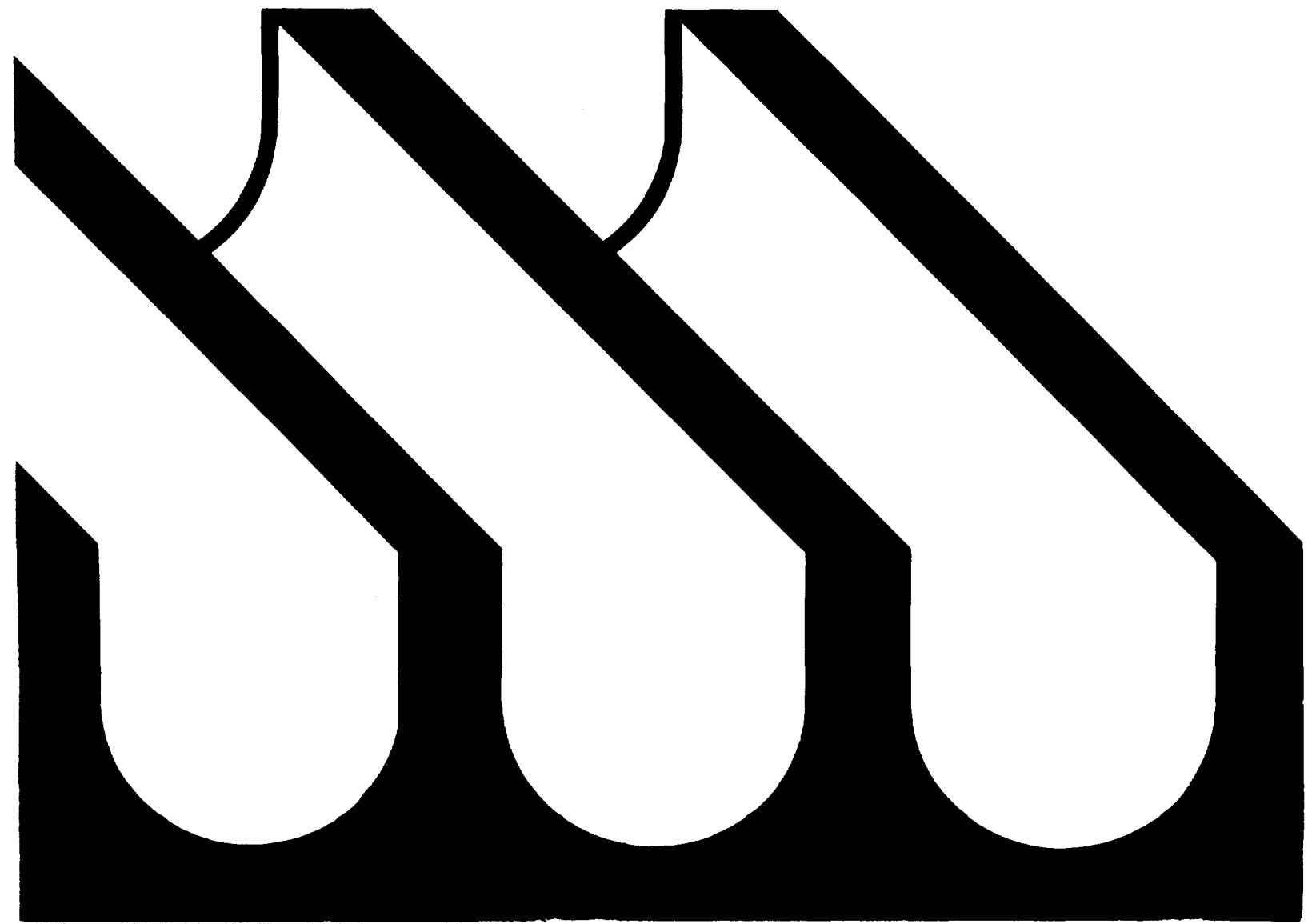


# **NIOSH**

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 the Precast Concrete Products Industry**



COMPREHENSIVE SAFETY RECOMMENDATIONS FOR THE  
PRECAST CONCRETE PRODUCTS INDUSTRY

Contract No. 210-80-0040

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Centers for Disease Control  
National Institute for Occupational Safety and Health  
Division of Safety Research  
Morgantown, West Virginia 26505

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**DISCLAIMER**

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

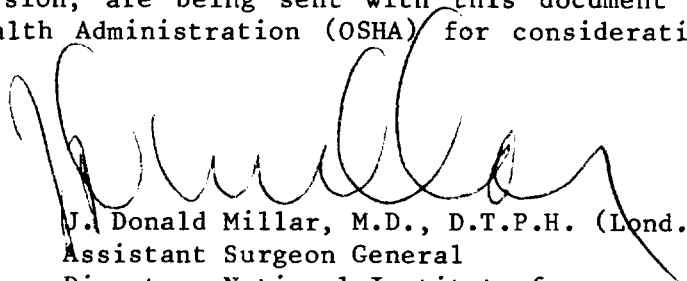
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## PREFACE

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 governmental agencies, organized labor, industry, and public interest groups. We welcome suggestions concerning the content, style, and distribution.

This document provides guidance for protecting workers in the precast concrete products industry. 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 many contributions made by reviewers selected by the Prestressed Concrete Institute (PCI), the American Concrete Pipe Association (ACPA), and the National Precast Concrete Association (NPCA); other reviewers and consultants; representatives of other Federal agencies; 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

Concerned by reports that the precast concrete products industry (SIC 3272) has an injury incidence rate which is consistently at least twice that of the national average, the National Institute for Occupational Safety and Health (NIOSH) began developing this document with the intent of providing recommendations aimed at reducing worker exposure to hazards.

The document characterizes the industry and describes the operations, tasks and processes required to manufacture precast concrete products. The magnitude of the occupational safety problem in the precast concrete products industry is defined through presentation of injury and illness incidence rates. In support of the document's systematic approach to the identification of industry hazards, a detailed analysis of 1,319 accident case histories was performed. This analysis identifies the tasks, tools, and equipment that are the most hazardous to the worker.

For example, materials handling tasks, both manual and mechanical, accounted for 28.0% of the total injuries studied. Tasks associated with welding, burning and cutting accounted for 4.6% of the total injuries. Some of the specific tools found to be particularly hazardous to precast concrete workers include: hoists and cranes, which accounted for 4.4% of the total injuries and 40% of the fatalities; unpowered handtools, which accounted for 5.7% of the total injuries; and powered handtools, which accounted for 5.8% of total injuries.

The determination of how workers are injured during precasting operations led to the formulation of comprehensive safety recommendations. The recommended engineering controls and/or operational safe work practices offered are applicable to product manufacture and delivery to a construction site only, and do not address erection or installation procedures.

To further enhance the document's usability for small to middle-sized pre-casting plants, a chapter addressing safety management principles is presented.

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## CHAPTER I INTRODUCTION

### A. Historical Background

Various forms of cement or cement-lime have been used since ancient times. The Romans used the product in ashlar work (stone and brick) and as concrete in building harbors, piers, canals, and water supply and sewerage systems. The remains of ancient structures reveal that building materials progressed from relatively simple applications of natural materials to cast concrete, one of the earliest substitutes for natural stone. Despite the ravages of time, weather, and warfare, many ancient concrete structures remain to give testimony to their durability.

Following the Roman period, the use of cement and concrete had a long period of dormancy until the emergence of studies by the early British civil engineers in the late 18th century. During the 19th century, after the successful development of the Erie Canal under Governor DeWitt Clinton of New York, engineering projects increased the need for cement and concrete. New sources and techniques were developed, transportation improved, industrial growth expanded, and concern for public health emerged. Transportation requirements created a demand for railways, highways, storm drainage, and bridges; buildings required structural and architectural elements; and improvements in public health called for sewerage, water storage, and water distribution systems.

Technological advances, beginning with reinforced concrete and culminating in contemporary prestressing methods, have made longer, stronger concrete members possible. Thus, concrete has grown out of a mere supplemental relationship with steel into direct competition with it in construction of varying projects.

The widespread use of standardized precast/prestressed concrete products, such as architectural panels, pipe, etc., has brought about the prevalence of fixed, permanent plants for manufacturing concrete products. The improvement of transportational methods and systems has contributed to the evolution of the precast concrete plant, in that it has become cost efficient to mass produce concrete products and transport them to the various construction sites rather than cast members on-site. Such plants capably produce job-specific, one-of-a-kind product as well, offering an alternative to poured-in-place operations, or casting operations adjacent to actual construction sites.

### B. Scope

This document concerns occupational exposure in the manufacturing of precast

concrete products (SIC 3272). Examples of products manufactured within SIC 3272 are contained in Appendix A. Contractors engaged in concrete construction work including on-site precasting of concrete products are classified in the construction industries and are not considered in this document. Other industries concerned with manufacture of concrete products which are excluded from the scope of this document are:

- o Concrete Block and Brick (SIC 3271)
- o Ready-Mixed Concrete (SIC 3273)
- o Lime (SIC 3274)
- o Gypsum Products (SIC 3275).