NIOSH Comments to DOL

COMMENTS OF THE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ON
THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
REQUEST FOR COMMENTS AND INFORMATION ON
HEALTH AND SAFETY STANDARDS; MANUAL LIFTING

29 CFR Part 1910
Docket No. S-750

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

January 1987

The National Institute for Occupational Safety and Health (NIOSH) has reviewed the Occupational Safety and Health Administration (OSHA) request and offers the following comments and supplemental information.

On page 35241, column 3, OSHA discusses employee screening programs. NIOSH believes that employee screening programs based on low back X-rays and routine physical examinations are not effective techniques for reducing back injuries resulting from lifting. Such preselection of employees has not been shown to reduce back injuries and avoids engineering (ergonomic) solutions that may eliminate the hazards of the job (NIOSH, 1981). However, the use of a standardized set of medical criteria for assessing a musculoskeletal injury to the low back may be helpful in determining the effectiveness of those engineering and administrative controls that have been employed to reduce back injuries. The NIOSH Division of Safety Research is currently in the process of developing such a standardized set of medical criteria for this purpose (Nelson, 1986). These criteria will be forwarded to OSHA when they have been completed.

On page 35241, column 3, OSHA discusses strength testing. The value of strength testing as an employee screening mechanism for decreasing musculoskeletal injuries is equivocal at best (NIOSH, 1977). Preplacement strength testing can be effective in reducing the incidence of low back injuries in a work force, provided the muscle groups tested, the body positions used, and the forces applied in the test are similar to those required to perform those tasks that are most stressful. Any standard that incorporates strength testing should consider dissenting views on strength testing. For example, the legal issues of discrimination must be considered when preplacement programs are used as a tool for matching workers' capabilities with the strength demands of a job. Aside from any legal implications, specific criteria for conducting preplacement strength testing must be included in any standard.

On page 35241, column 3, OSHA discusses training. We concur with OSHA that current training programs in manual handling techniques have not been proved to be effective in reducing back injuries. However, such programs have not been proved to be ineffective either. The study by Snook et al. (1978) is often cited as evidence that training is ineffective, but that study did not examine the type or quality of training. Consequently, there is a lack of empirical evidence by which to measure the effectiveness of a good training program in manual materials handling. Also, other studies of training programs may not have adequately evaluated worker compliance with specific aspects of the training program. For example, if a worker population were simply given audiovisual programs on lifting techniques without the benefit of on-the-job instruction and training in the use of lifting techniques specific for the tasks to be performed at the workplace, the results of an evaluation of the training program would have little meaning.

The last paragraph on page 35241, column 3, states: "The engineering approach to controlling lifting injuries is to design the requirements of the job to be within the capability of the workforce." OSHA should consider what proportion of the work force will be targeted. For example, is OSHA suggesting that controls be designed for the 95th percentile male or the 50th percentile male? This issue must be addressed in the proposed rule, and a decision must be made by OSHA based on currently available technical information. NIOSH believes that any effective lifting standard must require consideration of ergonomic factors to reduce musculoskeletal stresses through task, tool, and work station design. Ergonomic principles must be used as the basis for designing lifting tasks to reduce back injuries.

With regard to page 35242, column 1, A. Parameters of the Object Lifted, 3. Presence of Handles, we agree that handles should be used whenever possible. Recent research sponsored by the NIOSH Division of Safety Research provided specific recommendations for container handle design and placement to reduce biomechanical stresses during lifting tasks (Drury and Deeb, 1986a and b).

With respect to OSHA comments on page 35242, column 2, C. Parameters of the Job, asymmetric lifting should be avoided whenever possible even though limited research has been performed; efforts should also be made to identify lifting techniques that minimize stresses associated with asymmetric lifting.

With respect to OSHA comments on page 35242, column 3, and page 35243, column 1, B. Maximum Acceptable Weight and C. Maximum Load Moment, we believe that these have limited applicability for reducing back injuries. Also, because of the constraints identified by OSHA, these approaches may be unnecessarily restrictive under certain conditions.

On page 35242, column 1, OSHA begins a discussion of psychophysics. The use of psychophysics can establish lifting limits by population percentile. Psychophysics can also be used to establish limits for a wide variety of manual materials handling tasks such as pushing and pulling. However, this approach still neglects some aspects of workplace geometry such as obstructions and horizontal distance of the object from the body.

With respect to various OSHA-proposed criteria that may be used to establish a lifting standard, a recent study sponsored by the NIOSH Division of Safety Research found that evaluation methods for jobs that focus on the most stressful part of the job are better predictors of back injury rates than methods that aggregate extremely stressful and moderately stressful tasks into one index (Herrin et al. 1986). Nevertheless, we believe that work physiology criteria that are intended to avoid excessive average heart rate or energy expenditure may provide information concerning muscle fatigue and therefore may be useful for establishing work rates that may lead to reduced back

injury rates. The more appropriate criteria for reducing back injuries are those based on biomechanics or psychophysics and applied to the most stressful task of a job.

The ergonomic approach of redesigning the most stressful tasks is the preferred overall approach for reducing back injuries. Secondary approaches that may be helpful are employee training and preplacement strength testing (ASPH 1986). Programs aimed at increasing employee physical fitness may help to reduce back injuries; thus OSHA should encourage employers to consider such programs.

The implementation of any one of the approaches reviewed by OSHA in the Federal Register would probably result in some reductions in back injuries resulting from lifting; but to have a major impact on total back injuries, no single approach will be as effective as a comprehensive program that incorporates aspects from all the proposed approaches. Certainly, any final standard should incorporate appropriate aspects of ergonomic considerations. By implementing an ergonomics program that draws on diverse areas such as biomechanics, psychophysics, and psychology, industry can develop programs to reduce musculoskeletal stresses that are specific to their particular operations. On the basis of current knowledge in this area, the ergonomic concept of using task, tool, and work station design to reduce musculoskeletal stress can be effective in reducing back injuries due to lifting. A standard could specify minimum guidelines for the implementation of such ergonomic programs.

NIOSH has also solicited comments from users on the efficacy of the NIOSH Work Practices Guide for Manual Lifting. The following observations are based on these comments:

1. Though the manual has been used to provide design criteria for manual materials handling tasks, it is probably used most frequently to evaluate specific jobs to estimate the relative risk of an injury. Its effectiveness is limited by the restricted nature of tasks to which it can be applied (two-handed sagittal plane lifting). Guidelines are needed to set limits for other manual materials handling tasks.

2. Guidelines for determining action limits (AL's) and maximum permissible limits (MPL's) vary widely in complexity of application to different lifting tasks. Probably the most difficult application involves their use for analyzing jobs requiring repetitive lifting. Moreover, NIOSH recommendations for calculating AL and MPL values for some repetitive lifting jobs seem conservative (or even unrealistic) based on widely accepted work rates that are met without any difficulty (or medical complaints) by workers. The NIOSH recommendations for such tasks are being reexamined.

3. On theoretical grounds, there is concern about the usefulness of predicting compressive loads on the spinal column during lifting when those loads are based on static loading and do not take dynamic loading into consideration. A second major concern is that compressive loading of the column is emphasized; no consideration of rotational forces is made (other than recommending that people should not twist while lifting).

Based on the observations listed above, a project was developed with two objectives:

1. To modify existing recommendations in the current Work Practices Guide based on current information, clarifying guidelines as required. Emphasis is placed on repetitive lifting.

2. To develop additional permissible load limits for other than two-handed, sagittal plane lifting. Emphasis is placed on asymmetrical lifting tasks (including one-handed lifts) and lifting loads outside the sagittal plane when there is a rotational component to the lift.

In both cases, an attempt would be made to retain the original method for calculating AL and MPL values. Additional correction factors would be provided for other tasks. For example, the AL for a one-handed lift might be determined by reducing the AL for a comparable two-handed lift by 50%; or the AL for lifting a load from one side across the body might reduce the two-handed sagittal lift AL value by 60% to 70%, depending on the origin of lift.

Two separate groups of experts have been selected to address these objectives. The first group is preparing recommendations for modifying the existing correction factor for repetitive lifting (frequency factor). A draft manuscript has been circulated to the group and is being revised for NIOSH internal review. The proposed correction takes into consideration holding and recovery time for muscle groups and makes possible calculating permissible limits for intermittent, short (ca 10 to 20 min) lifting tasks as well as for those requiring sustained lifting throughout a shift. Also, differences between current NIOSH recommendations and data from several psychophysical studies have been adjusted. Publication of these recommendations is planned for late FY'87 and will be forwarded to OSHA as soon as they are completed.

Guidelines for nonsagittal tasks are being developed by a second group of experts. Topics currently being reviewed for relevance include the following:

- Psychophysical studies for determining maximum acceptable lifts involving asymmetric loading of the spinal column (across the body, one-handed lifts, etc.) and supporting physiological data for such lifts (when relevant).

- Biomechanical information that would predict compressive forces for both asymmetric loading of the spinal column and dynamic loading. If possible, methods will be developed for predicting excessive loading of the column resulting from rotation.

- Methods for improving techniques for analyzing manual materials handling jobs, and the use of decision trees for selecting proper administrative and engineering control procedures.

Based on the reviews of these topics, recommendations will be made to the Director of NIOSH and subsequently to OSHA at the end of FY'87 for the development of an abbreviated, revised Work Practices Guide containing proposed permissible load limits for these tasks.

Finally, we have included copies of several publications relevant to development of a standard for manual lifting. Also included is a copy of the proceedings from the NIOSH-sponsored Symposium on the Prevention of Leading Work-Related Diseases (May 1-3, 1985)--Proposed National Strategies for the Prevention of Leading Work-Related Diseases and Injuries, Part 1 (Section 2, Musculoskeletal Injuries).

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LIST OF ATTACHED STUDIES

ASPH (1986). A proposed national strategy for the prevention of musculoskeletal injuries. In: Proposed national strategies for the prevention of leading work-related diseases and injuries. Part 1. Washington, DC: The Association of Schools of Public Health, pp. 17-34.

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Enclosures and/or attachments that are not included are available free of charge from the NIOSH Docket Office [513/533-8450].

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. PB91-152835

4. Title and Subtitle: NIOSH Testimony on Manual Lifting by R. A. Lemen, January 1987

5. Report Date: 1987/01/30

6.

7. Author(s): NIOSH

8. Performing Organization Rept. No.

9. Performing Organization Name and Address: NIOSH

10. Project/Task/Work Unit No.

11. Contract (C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words): This testimony contains comments and supplemental information from NIOSH as requested by OSHA concerning the Health and Safety Standards on Manual Lifting. Specific topics discussed in this testimony include the employee screening programs, the value of strength testing, training programs in manual handling techniques, the engineering approach to controlling lifting injuries, the usefulness of handles, asymmetric lifting, maximum acceptable weight and load moment, establishment of lifting standards, ergonomic approach of redesigning the most stressful tasks, and recommendations to modify existing current work practices guidelines. Psychophysical studies for determining maximum acceptable lifts involving asymmetric loading of the spinal column and supporting physiological data for such lifts was a topic to be included in developing guidelines for non sagittal tasks. Also included for consideration is biomechanical information and methods for improving techniques for analyzing manual materials handling jobs and the use of decision trees.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms: NIOSH-Publication, NIOSH-Author, NIOSH-Testimony, Lemen-R-A, Worker-health, Occupational-safety-programs, Control-technology, Manual-materials-handling, Manual-lifting, Musculoskeletal-system-disorders

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
		11
	22. Security Class (This Page)	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272(4-77)
(Formerly NTIS-35)
Department of Commerce