Case-Control Study of Sawmill Injuries in Maine

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SIGNIFICANT FINDINGS

This case-control study of risk factors for injuries in wood processing plants identified a number of work environment features that were associated with injury occurrence. Cases were more likely than controls to be employed in machine-paced jobs, to be exposed to dangerous work methods and materials, to experience louder noise levels and faster work pace, to have higher lifting demands and more frequent postural stress, and to experience lower decision latitude and social support at work. The three strongest risk factors in the logistic regression models were processing hard wood, employment in SIC 242 versus 249, and high physical demands. Decision latitude and social support appeared to have small protective effects (although the social support ratings may have been affected by cases' experiences after their injuries). The other variables that were significantly associated with injury occurrence in multivariate analyses were being male, having one year or less on the current job, inability to take a break when tired, and a lockout/tagout program in effect in the plant.

USEFULNESS OF FINDINGS

Assuming that the findings of this study are valid, they provide evidence for the preventable nature of many work-related injuries occurring in sawmills and other wood processing plants in Maine. High physical work load, including lifting demands and postural stress, can be addressed by numerous engineering and administrative controls, ranging from material handling devices, to installation of jigs and fixtures for tools and materials, to job rotation. Dangerous work methods and materials can be avoided by good industrial safety practices, and noise levels can similarly be reduced by proper engineering, selection and installation of equipment. Inability to stop work for a few minutes when tired and associated work organization features (eg., high work pace, machine-pacing, production quotas, and the nature and quality of supervision) are under the direct control of the employer. Decision latitude and social support are similarly consequences of the engineering and administrative organization of the workplace. The higher risk for workers with one year or less on the current job suggests either a healthy worker effect in the study population or an effect of less experience with actual job conditions, or both; to the extent that the latter is true, employer attention to training and other programs specifically targeting the newer worker may have a beneficial effect. There is also evidence here for the effectiveness of a lockout/tagout program, which is required by OSHA regulations but, according to subjects' responses, had not been instituted in 51 (about 14%) of these workplaces.

PLANNED PUBLICATIONS

A manuscript is currently in preparation that will be based on the methods and substantive results presented in this report. A second manuscript will be prepared concerning the agreement between self-reported and observed exposures.

ABSTRACT

Lumber and wood products processing is the second largest industry in the state of Maine, with an annual average employment of approximately 13,500 workers. In 1987, the incidence of OSHA recordable injuries and illness in sawing and related mills (SIC 242-249) was 29.1 cases per 100 workers, more than twice the average statewide rate. An epidemiologic study was carried out of risk factors in the work environment for both injury types among workers in the wood products industry (SIC 242-249) in Maine. The goal was to identify ergonomic and other specific work environment factors that offer the opportunity for prevention, especially through engineering controls. A population-based, case-control study design was employed, in which potential cases were identified from the First Reports of Injury to the Maine Workers' Compensation Commission. Among the interviewed cases, about one-half of the injuries resulting in lost time were acute traumatic incidents and one-half were musculoskeletal disorders. Controls were selected at random from lists of active production workers in participating workplaces and union locals. A total of 157 cases and 251 controls were interviewed to obtain information on demographics, work history, usual production tasks, characteristics of the equipment, tools and product, and other features of the work environment. Information on workplace characteristics was also obtained from three supplementary databases. Cross-product odds ratios were computed to estimate the crude risks associated with specific factors in the task and work environment; multivariate logistic regression modeling was used to control for potential confounding. Cases were more likely than controls to be employed in machine-paced jobs, to be exposed to dangerous work methods and materials, to experience louder noise levels and faster work pace, to have higher lifting demands and more frequent postural stress, and to experience lower decision latitude and social support at work. The three strongest risk factors in the logistic regression models were processing of hard wood, employment in SIC 242 versus 249, and high physical demands. Decision latitude and social support appeared to have small protective effects, although the social support ratings obtained may have been affected by cases' experiences after their injuries. The other variables that were significantly associated with injury occurrence in the multivariate analyses were being male, having one year or less on the current job, inability to take a break when tired, a lockout/tagout program in effect in the plant. The generalizability of, and inferences from, these results may be limited somewhat by the potential for non-representative participation of workplaces and of individuals.

BACKGROUND

Lumber and wood products processing (SIC 24) is the second largest major industry group in the state of Maine, accounting for about 13% of the manufacturing workforce and about 10% of the gross value of production [1]. Excluding logging, the wood products industry includes SIC codes 242 (sawmills and planing mills), 243 (millwork, veneer, plywood, and structural wood members), 244 (wood containers), 245 (wood buildings and mobile homes), and 249 (wood products, not elsewhere classified). Many of the larger workplaces are vertically integrated through several processing stages. In 1987, the wood products industry (SIC 242-249) employed 9,701 workers in Maine, of whom 7,400 (76%) were male and 4,576 (47%) worked in facilities employing 100 or fewer people [2].

In addition to being economically important, wood products processing is also a highly hazardous industry. On the OSHA Form 200, there were 2,682 injuries and illness reported in 1987 for SIC 24 in Maine, equivalent to an incidence rate of 29.1 cases per 100 worker-years [3]. Among these, over one-half were lost time injuries, with an average rate of lost workday cases of 15.5 per 100 worker-years. Both the overall rate of recordable injuries and illnesses and the rate of lost workday cases were more than twice the average rate for the state of Maine [3]. According to the State Workers' Compensation Commission [4], there were 1055 First Reports of Injury in 1987 from Maine sawmills alone (SIC 242), for an incidence rate of 29.3 cases per 100 workers per year [2]. Again, almost half of these injuries resulted in lost work days.

A number of specific safety, ergonomic and health hazards have been identified in Maine sawmills [5]. These include unguarded platforms, stairways, and floor openings; dangerous and improperly guarded equipment, including log booms, saws and conveyors; manual materials handling of logs and other wood products; unshielded hot surfaces; excessive noise; lasers used in cutting guides; and carbon monoxide from power equipment exhaust. Although these hazards are virtually ubiquitous, the conditions under which they actually result in energy transfer and human injury have not been well defined by epidemiologic analysis.

Most of the available, but limited, epidemiologic literature on injuries in sawmills and related wood processing plants is descriptive rather than analytic. For example, the state of Wisconsin has published statistics on injuries in SIC 2420 reportable to the Workers' Compensation Commission, 1971-1974 [6]. One-fourth of the 889 injuries were found to have occurred to machine operators and laborers, including back strain from overexertion and acute trauma from being struck by lumber and wood products. Another 125 (14%) were lacerations, amputations and fractures of the extremities caused by saws to saw operators. Specific factors in the work environment that led to the occurrence of these injuries were not described.

A report from California covered 1,922 injuries and illnesses in SIC 242 (excluding logging) from employers' First Reports of Injury in 1976 [7]. The health outcomes were divided into those that could have been prevented by compliance with existing state health and safety

orders or regulations; those that could have been prevented by improved worker training but not by compliance with orders, and those that were not preventable by either means. One-third of the injuries and illnesses were judged to be preventable by compliance with state orders, including provision of adequate personal protection devices. Virtually the entire remaining two-thirds were considered to be preventable by improved training and education. Thus although this industry is generally accepted as inherently dangerous, only one percent of injuries were judged to be random occurrences that could not have been prevented. The report did not seek to identify those injuries that were preventable by engineering controls, versus administrative controls. For example, 40 percent of all injuries were associated with manual materials handling (lifting, pushing, pulling, and carrying), primarily of lumber and logs; the assumption was made that manual materials handling hazards are amenable only to improved training but not to engineering controls, an assumption that is not justified [8].

In one analytic study of injuries in Maine sawmills [9], internal comparisons were made among an unspecified number of lost work-day injuries reported to the Maine Workers' Compensation Commission. In a multiple regression model, 30% of the variance in days lost from work was explained by three significant variables: processing of hardwood *vs.* softwood, temporary *vs.* regular job assignment at the time of injury, and worker's age. The authors also noted that number of lost work days is an imperfect measure of injury severity, as it is also influenced by company policies and procedures in returning injured employees to work and the availability of "light duty" jobs in the facility; misclassification of severity would most likely result in an underestimation of effect.

Occupational ergonomics is the study of the fit between the worker and workplace. This covers job features as diverse as the size of tool handles, machine guard openings and equipment reach requirements; the weight and location of loads that are manually handled; shift scheduling and overtime; and work organization (pace, repetitiveness, and machine- *vs.* self-paced work). For chronic disorders of the musculoskeletal system, specific ergonomic stressors that have been implicated by biomechanical, clinical and epidemiologic studies include highly forceful manual exertions, highly repetitive tasks, awkward or non-neutral body postures, segmental vibration, and low temperature [10-13]. The prevalence of musculoskeletal disorders has also been found to increase with the pace of work [14,15], machine-paced work [16], and higher production output under piece rate [17].

While these factors have been studied primarily with respect to their musculoskeletal and cardiorespiratory effects, poor ergonomic design of jobs, tools and equipment may also be related to the occurrence of acute trauma through a variety of mechanisms (fatigue, interference with perception or attention, etc.). For example, fatigue (physical or mental) may reduce a worker's attention, coordination and accuracy of motion, and other regulatory processes necessary to escape injury in an inherently dangerous environment. Alternatively, inefficient work processes or physical agents in the work environment (eg., noise) may directly interfere with perception of needed information [18].

Furthermore, acute injuries and musculoskeletal disorders cannot always be clearly distinguished. Musculoskeletal strain may itself manifest with acute onset (eg., some low back pain) or may lead to an acute incident (eg., inability to handle a heavy load may result

in loss of balance and a slip or fall). It has been pointed out that chronic disorders have essentially the same etiologic agents as acute injuries, namely, physical energy (primarily, but not exclusively, in its mechanical form) in doses harmful to human body tissues but over a longer induction period [19].

Many ergonomic factors and related environmental stressors (such as high noise levels) have been linked anecdotally both to acute injury occurrence and to "near misses," whether mediated through stress or another mechanism. However, few epidemiologic studies have been conducted to examine these associations or to provide scientific justification for injury control recommendations [20]. Shift rotation has been implicated as a risk factor for acute injury by several investigators [eg., 21]. One epidemiologic study of forestry in Sweden showed lower frequency and severity of "accidents" (acute injury) after a change from piece-rate to time-based wages [22]. A study in a manufacturing setting found a higher accident rate to be associated with greater labor intensity, i.e., a higher work pace and fewer rest breaks [23]; the plant with higher rates also had a weaker trade union, suggesting that unionization might be (indirectly) protective against injury occurrence.

Thus, the processing of wood products, an important industry in the economy of the state of Maine, results in high rates of both acute and chronic injuries to workers, but there is only limited evidence regarding the contribution of preventable risk factors to the causes of these injuries. An epidemiologic study was therefore undertaken of both injury types among workers in the wood products industries (SIC 242-249) in Maine. The purpose of the study was to identify factors in the work environment that were associated with injury occurrence and that offered the potential for preventive measures, with a special emphasis on identification of hazards that could be remedied by appropriate and feasible engineering controls.

SPECIFIC AIMS

The original specific aims of the project were:

a. Using investigator-collected data, to identify specific ergonomic factors in the work environment that were associated with both injury rates and severity, with particular attention to those that offer the potential for preventive measures, especially engineering controls.

b. To refine and validate psychophysical instruments for worker assessments of the ergonomic features of their tasks and workstations, in the wood products industry, for use in epidemiologic study and surveillance.

The first of these aims was accomplished in full with respect to predictors of injury rates. The results of the tabulated and multivariate analyses, presented below, provide the substantive findings with respect to risk factors in the work environment. With respect to

injury severity, the intention had been to use days lost from work as the measure of severity. However, the 1991 legislative change in reporting requirements (see below) eliminated the filing of First Reports of Injury for injuries that did not result in one or more lost work days, effectively eliminating any basis for comparison in such analyses. In addition, the Maine Bureau of Labor Standards stopped computerizing the number of lost work days after that time, making these analyses impossible.

The second aim was accomplished as far as refinement of the psychophysical instruments, through the pilot interviews. Access to work sites for formal observations, to seek to validate the self-reported data, was quite limited. One employer provided access quite late in the study period, and the data that were collected have not yet been analyzed.

METHODS

Study Design and Sources of Data

The target population for this study consisted of all employees of sawmills, planing mills, and other wood processing facilities (SIC 242-249) in the state of Maine. A prospective case-control study design was employed, in which incident cases (workers experiencing new injuries) were compared with controls (workers selected at random) from the same or similar workplaces. Cases that occurred in participating mills or local unions were identified from employers' First Reports of Injury to the Maine Workers' Compensation Commission. These reports have been routinely computerized since 1985 by the Maine Department of Labor, Bureau of Labor Standards (MBLS), and were made available to the study team by the MBLS.

First Reports of Injury (FRIs) with personal identifiers were abstracted prospectively to identify potential injury cases for the study. A FRI was eligible for inclusion in the study if the injury occurred on the employer's premises and was not a highway motor vehicle accident, and if the employee was not a plant manager or office worker (clerical, sales, etc.).

At the beginning of data collection, the variables coded routinely from the FRIs by the MBLS included the worker's age, gender, years with current employer, occupational title, nature of the injury, part of the body, source and type of injury, and the associated object or substance (i.e., secondary cause). While data collection was underway, in 1992, budget difficulties within Maine state government agencies resulted in a reduction in the extent of computerized data entry. The case interview (see below) had already included a section to confirm the FRI data with the study subject, so these questions were used to obtain the missing information after the MBLS no longer entered it.

Potential controls were randomly selected from the payrolls of participating plants with the same SIC codes or from union membership lists of participating local unions. Two controls were sought per case, although the number of participating workplaces limited the number of

potential controls. As in the selection of cases, managers and office employees were excluded from selection as controls.

Companies and union locals were recruited to participate in the study (i.e., to provide access to production workers for control interviews) by several means. Individual companies were contacted by the Production Technology Center (PTC) at the University of Southern Maine, as well as through occupational health professionals and workers' compensation loss control representatives in Maine known to the Principal Investigator (PI), PTC, or MLGH. The Maine Labor Group on Health (MLGH) contacted all unions that represented any workers in the wood products industry. The PI attended a membership meeting of the New England Lumber Manufacturers' Association in order to explain the study goals and to seek participation. A brief article was submitted to the Newsletter of the Wood Products Manufacturers Association for the same purpose.

Initially, the companies and union locals that agreed to participate were the source of all study subjects (both cases and controls). All First Reports of Injury (FRIs) from these workplaces were selected as potential cases, and the lists of active production workers were sampled for potential controls.

However, the Maine state legislature changed the criteria for reporting incidents to the Workers' Compensation Commission, effective on October 17, 1991, in particular so that First Reports of Injury were only to be filed for injuries that had resulted in one or more lost work days. The number of reported injuries dropped dramatically following these changes. Because of concern regarding study size, it was decided to increase the number of companies from which potential cases would be sampled. With the assistance of the Maine Department of Conservation (Mr. Peter Lammert), all firms in SIC 242-249 were evaluated relative to others in the same category of SIC, workforce size, and type of production equipment. Those companies judged to be reasonable similar to the participating workplaces were added in 1993 to the list from which FRIs (potential cases) were drawn.

All potential cases and controls were contacted by telephone for an interview. As often as possible, the telephone contact was preceded by a letter from MLGH or the PI to the worker's home address, explaining the goals of the study and assuring the subject of the confidentiality of all responses. Most subjects were interviewed at their homes, during evenings or on weekends, although one company agreed to make selected subjects available for interviews during work hours. Subjects were also asked during the interview for authorization to obtain copies of medical records and environmental noise monitoring. Those who consented were sent medical record release forms to sign and return to the study team.

The injury reports and interviews were linked by employer to three supplementary sources of information, the employer files maintained by the MBLS, the Maine Manufacturing Directory, and the Maine Department of Conservation directory of roundwood processors and exporters. The employer files of the MBLS contain company names and addresses and Unemployment Insurance Number (UIAN), a unique identifier issued to each employer, that was used to link FRIs to the other data bases. The Maine Manufacturing Directory (MMD), published until recently under the auspices of the Maine Department of Labor and now by a private organ-

ization, provided approximately biennual updates on the size of the work force, by building or production facility, of each employer in the state. The Maine Department of Conservation Directory of Roundwood Processors and Exporters (DRP) provided data, for each sawmill and related wood processor, on specific type of mill, type of equipment in use, type of wood processed, type and size of product, and annual production output by volume. The latest editions of these directories available covered 1990 (MMD) and 1988 (DRP). In addition, the United Paperworkers' International Union (UPIU) and the United Brotherhood of Carpenters and Joiners (UBCJ) were contacted to verify that facilities in the target industry that were unionized workplaces.

Interview Data

All subjects were interviewed with a standardized questionnaire containing primarily closed-end items. The questionnaire was developed based on discussions with sawmill workers, supervisors and health and safety professionals with experience in the target industry; it was pre-tested and evaluated in individual pilot interviews, by telephone, with other sawmill workers. The interview obtained information from all respondents on demographics (eg., age, gender), anthropometry (eg., height, hand preference) and history of musculoskeletal symptoms within the previous year. For cases with "strains or sprains," additional questions were included regarding frequency and duration of episodes in the past year, location, and intensity of pain.

The majority of the questionnaire was identical for cases and controls, but some items differed because cases were asked about both their usual jobs (before the injury) and the circumstances surrounding their injuries, while controls were asked primarily about their usual jobs, as well as whether they had ever experienced a "near miss" while at their current workplaces. (Both questionnaires are included in Appendix A.)

The standardized interview obtained information from all subjects on their work history, typical work activities, physical workload, characteristics of the equipment used and products processed or handled in the usual job. For cases, this information was also obtained regarding the specific activit(ies) performed at the time of the injury. Controls were asked about their work activities on the last full day worked (to represent a random sample of working conditions). General working conditions and features of the work environment were also addressed, including machine pacing, wage basis (hourly *vs.* piece rate), shift length and schedule, production quotas and output, psychosocial work environment, and whether the subject was performing the usual job at the time of injury.

Psychophysical measures of tool weight, noise intensity, thermal environment, illumination, work pace, intensity of lifting demands and dynamic work (based on Borg's Rating of Perceived Exertion) [24, 25], supplemented the descriptive items of the questionnaire. Subjects were also asked about the presence of and their knowledge about any health and safety programs in the mill, such as worker training or labor-management committees.

The risk factors that were evaluated fell into several categories. First were the workplace characteristics (number of workers, whether or not unionized, etc.), whose effect, if any, was presumed to be mediated through a number of specific work environment features that were measured in the interview. Among those items asked in the interview, some pertained to subjects' usual working conditions, which were postulated to have a long-term effect on risk of injury, whether through chronic physical fatigue or chronic psychosocial strain. Other work environment factors were postulated to have an immediate effect, through short-term fatigue or strain (anxiety) or by interfering with perception and concentration, i.e., processing of information potentially relevant to the worker's safety. These factors were also obtained for the day of the injury, for cases, and for the last full day of work, for controls.

Worksite Observations

One participating company permitted observers to conduct formal workplace job evaluations. Thirteen jobs from which employees had been previously interviewed, and that were sufficiently cyclical in nature that they could be characterized in relatively short observation periods, were identified. These jobs were observed with a standardized checklist that obtained variables corresponding to specific items in the interview. These observational data were collected on each job so that they could be compared with the self-reported data for the same jobs. (The observations were carried out quite late in the study period, and the data have not yet been analyzed.)

Data Analysis

In order to evaluate the likelihood of selection bias, participating and non-participating cases were compared with respect to workplace characteristics; similar comparisons were made between participating and non-participating controls. In addition, participating and non-participating cases were compared with respect to demographic and occupational data available from the FRIs for all of the potential cases and injury type and nature entered for about 40% (136 of 297) of the injuries. (Demographic and occupational data were not available for potential controls who were not interviewed.)

A large number of questionnaire items pertained to the work environment and the physical work load in the subject's usual job. Some of these were designed for single-variable analysis, such as a 4-point scale of noise and 7-point scales of lifting demands, work pace, overall intensity of work load, airborne dust levels, and chemical smells. Other items were designed for the construction of score variables (by linear summation of responses) such as physical exertion, safety hazard conditions, toxic exposures, and physical isometric loads (see Figure 1 for constituents of each index). Most of the latter group were based on questions taken directly from the Job Content Questionnaire [26] and the scores were computed according to the instructions provided by those investigators. Some items were specific to different job categories (eg., number of items inspected or packaged per day, level of whole-body vibration experienced by vehicle operators, etc.) and thus were not asked of all study subjects.

In addition, several score variables were constructed to measure the intensity of psychosocial job demands. They represented the dimensions of decision latitude, psychological demands of the job, and "social support" from (constructive working relationships with) coworkers and supervisors. These scores were all also constructed from the Job Content Questionnaire (see Figure 2 for constituents of each index).

Associations between injury occurrence and risk factors were estimated crudely for dichotomous exposure variables by the cross-products odds ratio with test-based 95% confidence limits, and for continuous variables by the Student t-test (if normally distributed) or the Wilcoxon non-parametric test (if otherwise). Multivariate logistic regression modeling was used to estimate simultaneous associations and to control for potential confounding [27]. Selection of independent variables for "best fit" models was performed using a step-wise fitting procedure to determine the model that provided the largest model chi-square per degrees of freedom with all independent variables significant at $p \leq 0.05$.

Most analyses were based on the entire set of injuries combined. In addition, some cross-tabulations and selection of the "best fit" models were also carried out after the cases were subdivided into the categories of "overexertion" (strain/sprain) and "acute incident" (fall, struck against or by, caught in or between, etc.).

RESULTS

Company Participation

Originally, thirty companies and three union locals agreed to participate (i.e., to provide access to production workers for interviews as controls). However, when data collection began, thirteen of these entities proved unwilling to provide worker names and telephone numbers or a means to contact them, and only twenty companies and union locals actually did participate. Cases were selected from these 20 workplaces for the entire duration of the study. In 1992, an additional 31 companies were identified that were judged comparable to one or more of the originally participating workplaces, for selection of additional potential cases. (All of these facilities had declined to provide access to potential controls.) Among these 51 companies, the 20 that contributed both cases and controls were somewhat larger (number of workers and gross annual sales) and were somewhat more likely to process soft wood in 1988 than the 31 facilities that contributed cases only. However, none of these differences was statistically significant (Table 1).

All 51 participating companies were also compared to the other 321 non-participating workplaces in the target industry (SIC 242-249) in Maine. As a group, in 1990, the participating facilities employed more workers ($p<0.01$), had higher gross annual sales ($p<0.01$) and a higher injury rate ($p<0.01$), were more likely to come from SIC 242 ($p<0.01$), and were more likely to process hard wood ($p=0.06$).

Study Population

The participation rate was 53% among all potential cases and 64% among all potential controls (Table 2). A total of 409 subjects were interviewed at least partially; 391 interviews were completed. For both the potential cases and the potential controls, participants were employed at larger facilities than non-participants (Tables 3 and 4). The workplaces of participating cases had 1990 gross sales about 50% higher than of non-participants, although this data item was missing for more than one-half of the facilities (Table 3). The total injury rate in 1990 did not differ between the workplaces of participating and non-participating cases. The participation rate did not vary between SIC categories or by whether the facility processed hard or soft wood, or both, in 1988.

Comparing the workplaces of participating and non-participating controls, there was no difference in 1990 gross sales; however, the injury rate was more than twice as high at the workplaces of non-participants (Table 4). Among potential controls for whom data were available, the participation rate was more than twice as high for SIC 249 compared with 242 (100% vs. 43%) and was also significantly higher among facilities processing hard wood only (96% vs. 53% for soft or both hard and soft wood) in 1988.

The proportion of potential cases interviewed was comparable between men and women and among the various occupational groups (Table 5). The mean ages did not vary significantly between participants and non-participants, although the proportion interviewed was slightly higher (about 66%) among workers over 50. Among those FRIs with injury information entered, about 60% of the workers with overexertion injuries (nature of injury = strain/sprain) participated, compared with about 41% of workers with other injury types.

Among all interviewed subjects, the cases came from workplaces with slightly smaller workforces, higher gross sales, but very similar injury rates (all in 1990) compared to the workplaces of the controls. The cases were more likely to be employed in SIC 242 than 249 and more likely than the cases to be in workplaces that processed hard wood in 1988 at least some of the time (67% vs. 54%) (Table 6).

The age of the study subjects ranged from 18 to 71 (mean 38.0, SD 11.8 years). The average seniority of the population was 11.5 years (SD 9.8) in the wood products industry, 8.5 (SD 8.6) years with the current employer, and 5.6 (SD 6.7) years in the current job. Cases and controls were of approximately equal age and seniority (Table 7). About three-fourths of the study population was male and almost all were white (there were a total of 10 subjects who were Black, Native American, or Asian-American). The cases were slightly more likely than controls to be male.

Just over one-half of all study subjects (207) were machine operators or attendants (Table 8) (see Appendix B for list of job titles included in each category). About 10% worked in each of the categories of manual material handler, skilled trade, and inspector/grader.

Utilizing the combined data from FRIs and interviews, about one-half of all the cases' injuries were overexertions (Table 9); about the same proportion resulted in sprains or strains or joint

inflammations. The proportions of injury types were comparable to those for whom incident type was recorded on the FRI (Table 5).

Some direct examination of data quality was possible on the basis of items collected from more than one source (MMD, FRI, and/or interview). For example, the facility SIC was reported on the FRI, for all potential cases, and was also available for most workplaces from the 1990 MMD. Among the 249 workers for whom both data items were available, 91% were in agreement at the level of 3-digit SIC. Using the information provided to the study team on which plants were unionized, 90% agreement was found with interview data on this item. The 1988 DRP listing as to whether soft or hard wood was processed agreed with 70% of interview responses for the usual job (this item is known to vary over time at many mills and plants, depending on market conditions). Comparing data from FRIs and interviews of cases, the correlation coefficients were 0.999 for age and 0.955 for years employed at the company.

General Working Conditions

Exposure frequencies varied somewhat by Standard Industrial Classification (Table 10). The subjects in SIC 242 were almost all male; they were more likely to be in machine-paced jobs, less likely to be able to take a break if fatigued during work, and more exposed to loud noise, safety hazards, and heavy lifting. Respondents in SIC 249, who were almost 50% female, were more likely to process hard wood and more exposed to postural stressors. There were no significant differences by SIC in the levels of psychological demands or decision latitude reported, or in the proportions that had received any occupational health and safety training.

Among all subjects, the prevalence of production quotas was 43%, of incentive wages 40%, and of machine-pacing 51%; almost one-half (45%) were not able to take a break if they became fatigued during work. These factors were all statistically associated with each other ($p < 0.05$ for all but one of the pairwise comparisons). Shift work, production quotas, and incentive wages were reported by roughly the same proportions of cases and controls.

There were significant differences among the job titles in the distribution of various exposures of concern. More exclusively self-paced work was found among skilled trades (87%), foremen (82%), and heavy equipment operators (57%) than in other jobs (49% of total population, $p<0.0001$). The skilled trades and forepersons were also more likely to be able to take very short breaks when they were fatigued (overall chi-square, $p=0.004$). Inspectors and graders were the most likely to report exclusively machine-paced work (63%) and inability to take breaks (58%). Environmental noise levels were loudest for machinery and heavy equipment operators (28% and 22%, respectively), and lowest for forepersons (11%) and inspectors/graders (10%) (overall chi-square, $p=0.02$). Workers in each of the job titles were roughly equally divided among the processing of hard wood, soft wood, and mixed, except for the 22 heavy equipment operators, 15 (68%) of whom worked with soft wood. There was no difference in the frequency with which workers in the various jobs reported plant-wide lockout/tagout programs.

The distribution of job titles was virtually identical between cases and controls; this was true for all cases combined and for each of the two case sub-groups. Manual material handlers were most likely to have been on the current job for one year or less (45%, versus 33% of machine operators and less than 30% in all other job titles).

In general, the study subjects rated their exposures rather higher on physical workload and pace than airborne dusts or chemical odors (Figure 3). Exactly one-half (190 of 381) reported no exposure to dangerous equipment or work methods, or other safety hazards (see Figure 1 for definition).

There were significant differences between male and female workers in their job titles and working conditions. For example, the proportion of women workers was markedly lower among heavy equipment operators, skilled trades, and material handlers, and markedly higher among inspector/graders and machine operators (summary chi-square, $p < 0.0001$). Women were disproportionately employed in SIC 249 versus 242 (46% versus 7% of interviewees). Female workers on average had lower lifting demands ($p=0.0003$), higher postural stress ($p=0.19$), lower decision latitude ($p=0.0001$), and higher social support ($p=0.006$).

Work Environment Factors Associated with Injury

Both cases and controls worked about 8.5 hours per day, 5 days per week, on average (Table 11) although 73 (18% of all subjects) reported working from 10 to 12 hours per day, and 10 subjects worked from 65 to 77 hours per week. Cases and controls were about equally likely to work with soft wood, but cases processed hard wood exclusively about twice as often as the controls. Machine-paced work was about 50% more frequent among cases than among controls. Cases were slightly less likely to supervise other workers as part of their job duties.

The cases reported more exposure to safety hazards, to high noise levels, and to chemical odors than the controls did, but there was no difference in their reported exposure to airborne dusts (Table 12). There was no difference in the daily frequency of using the hands near a sawblade, but the frequency of hands working near a pinch-point was significantly higher for cases than for controls.

Several different features of physical workload were characterized for this population, and they were found to be somewhat complementary rather than redundant. For example, work pace was moderately correlated ($r = 0.5$) with two measures of whole-body work load (Physical Exertion II and Physical Workload Intensity) but less so with isometric loading or postural stress (Table 13). The latter two, which had been expected to be rather highly correlated, in fact were only moderately associated ($r=0.4$). The five measures obtained of whole-body physical work (Physical Effort, Physical Exertion I, Physical Exertion II, Physical Workload Intensity, and Lifting Effort) were all fairly highly correlated with each other (correlation coefficients ranging from 0.45 to 0.96).

The overall physical demands of the job were greater for cases than controls by virtually all of the variables and composite scores available (Table 14). The cases reported higher lifting

demands, work pace, whole-body work load (5 measures), postural stress, overall physical exertion, and isometric loading. Among the individual postural stressors, cases were exposed more often to reaching up above shoulder height, reaching forward of the body, bending or stooping, leaning to the side or twisting the body, and twisting the forearm.

Almost one-half (161) of all respondents reported negative skill utilization - i.e., that their actual educational levels exceeded the job requirements (by a median value of 4 years). The psychosocial features of the work environment in the usual job (performed before the injury, for cases) were more stressful for cases than controls. The cases reported lower decision authority, higher psychological job demands, and less social support from either co-workers or supervisors (Table 15). Cases also had marginally lower skill discretion, although controls reported marginally less skill utilization. In addition, the cases reported less job security (with reference to the period before their injuries occurred).

When the cases were sub-divided into acute incidents and overexertions, some differences were found in the strength of association with work environment factors. For example, the association with noise was stronger for the overexertion cases; the odds ratios for moderate and high noise levels were 1.7 and 4.2 for overexertion and 1.0 and 2.1 for acute incidents (Mantel test of linear trend, $p<0.001$ and $p=0.06$, respectively (Table 16). Work pace, whole-body work (all measures) and isometric loading were all scored higher among overexertions than acute cases (Table 17). When work load factors were treated as ordinal (4-level) variables, the tests of linear trend were highly significant ($p < 0.01$) for physical effort, reaching forward, leaning or twisting to the side, and twisting the arm, and weakly so ($p = 0.10$) for reaching above shoulder height.

On the other hand, while the daily frequency of hands near a pinch-point was significantly higher for acute cases than for controls, the frequency was actually lower among this sub-set than among all injuries combined (Table 17). There were only negligible differences between the two sub-sets of cases on each of the psychosocial variables.

Among all subjects, some of their "usual" working conditions varied somewhat from those on the day of the injury (cases) or the day on which a near miss occurred (controls). The Spearman (rank) correlation coefficients for physical work intensity, work pace, and noise were 0.47, 0.45, and 0.70, respectively. In the comparison of general working conditions on the day of the case's injury versus the control's near miss, there were few differences reported (Table 18). The cases were slightly less likely to be working on the first shift and had worked more days continuously since their last day off, although they had worked slightly less overtime in the preceding week. Cases were significantly less likely to be wearing any personal protective equipment at the time (OR=0.3 for PPE in use, 95% CI= 0.1, 0.7). Surprisingly, the cases were more likely to be at their usual jobs at the time of injury than the controls.

On the day of the injury, the cases experienced higher physical work intensity, higher work pace than the controls, and more environmental noise that required shouting in order to be heard (Table 18); however, none of the cases' ratings were markedly different from those for their usual jobs (Tables 11, 12, and 14). Cases reported more cluttered or slippery floor

conditions on the day in question and greater likelihood of a staffing problem. They were also less likely to be wearing any personal protective equipment.

Among the workers who routinely used tools and equipment, cases and controls reported about the same number of hours of use of any tool per day, and about the same daily exposure to an unguarded tool (Table 19). Cases rated their tools higher in weight, force required to operate, and vibration transmitted to the hand than controls. When feeding stock to or unloading stock from the machine, cases reported that they handled heavier loads, less often per day, than the controls.

All of the workers who routinely performed manual material handling tasks reported doing so about 7.5 hours per day (Table 20). Cases and controls had similar "usual" load weights. However, the cases reported higher weights for "the heaviest load lifted in a typical day" and total pounds lifted per day (load weights times load frequencies).

The operators of vehicles and other heavy equipment performed these tasks for just over four hours per day, on average; cases and controls experienced similar levels of segmental and whole-body vibration (Table 20). Cases reported slightly higher levels of upper body force necessary to operate their vehicles.

Among inspection and packaging workers, the cases performed these tasks almost 2 hours more per day and estimated that they handled about five times as many items, on average, per day (Table 20).

Occupational health and safety (OHS) training and other administrative control programs were quite common in the workplaces of the study subjects (at least 85%), and a plant with any one element of such a program was very likely to have others in place, as well. For example, among subjects whose plants had health and safety committees, 91% had provided some OHS training and 92% had instituted lockout/tagout programs.

Cases and controls reported receiving about the same number of hours of on-the-job training when they began their current positions, but the job training for cases had been less likely to address occupational health and safety issues (Table 21). Cases were also less likely to have received any OHS training, although, among those who had, they had received more total hours of training than controls. Lockout/tagout programs were much less common in the workplaces of cases (OR=0.3 for lockout/tagout program, 95% CI= 0.1, 0.5).

Regularly meeting safety committees (OR = 0.2) and posted emergency procedures (OR = 0.6) were also significantly less likely in the workplaces of cases than in those of controls (Table 21). Cases were less likely to feel that their employers were making a genuine effort to protect their health and safety. When asked whether they had ever reported a potential health or safety hazard to a supervisor, 80% of all subjects reported that the supervisor's response had been to seek to remedy the problem, rather than to threaten job security or reprisals. Cases were twice as likely as controls to have received a threatening or blaming response (OR = 2.1, 95% CI = 1.1, 4.2).

The internal consistency of these variables appeared quite good. The ratings of employer effort to promoting OHS were positively correlated with ratings of individuals' supervisor support (Spearman r = 0.50, p = 0.0001) and they were significantly higher for employers who offered OHS training, and had established OHS committees or lockout/tagout programs. The ratings were also higher where the response of the supervisor to the report of a potential hazard had been to seek to remedy it.

Multivariate Analyses

The three strongest risk factors in the logistic regression models were processing hard wood, employment in SIC 242 versus 249, and high physical demands (Table 22). These models controlled for the effect of gender, although with SIC in the model, gender was no longer statistically significant. There was a weak but not statistically significant exposure-response relationship with physical effort level (moderate and high versus low). The coefficients for decision latitude and social support, both highly statistically significant appear small but represent the effect of only unit on each scale.

Several different variables for physical workload were compared in a model that also included hard wood, gender, decision latitude and social support. The odds ratios per unit of physical demand variable, and the corresponding confidence intervals, were identical (Table 23). This was also true of Physical Exertion II (model not shown).

The model with physical effort was then fit with the addition of several indicator variables for work organization features and administrative control measures. Each of these was singly a significant predictor: having worked one year or less on the same job, machine pacing, not being able to take a break during tte day when tired, using personal protective equipment, and a lockout/tagout or occupational health and safety training program in the plant (Table 24). Being new on the job and a lockout/tagout program contributed the most explanatory power (highest model chi-squares) and inability to take a break made the smallest contribution, among those models that could be directly compared (fewer subjects had data on personal protective equipment). The same model was also fit with the addition of high environmental noise (requiring the subject to shout to be heard), either in the usual job or on the day of injury; the odds ratios were 1.7 and 1.2, respectively, and neither was statistically significant. When use of personal protective equipment was added to the model, it had a negative coefficient (for protective effect) but was not statistically significant.

Several of the above variables were inter-correlated and could not be included simultaneously in the same model. For all cases combined, the model that provided the best fit was determined to be that which included hard wood, gender, high physical effort, one year or less on the job, inability to take a break, a lockout/tagout program, decision latitude and social support (Table 25).

The same set of risk factors did not explain as much of the variance in either sub-set of injury types. For the acute incidents, the best-fit model included hard wood, gender, high physical effort, one year or less on the job, a lockout/tagout program and social support; for

overexertions the selected risk factors were hard wood, high physical effort, one year or less on the job, inability to take a break, and social support (Table 25). Among those predictors kept in the models for both case types, the magnitude of the coefficients was similar for each except hard wood, which had almost twice as large an odds ratio for overexertions as for acute incidents.

DISCUSSION

This case-control study of risk factors for injuries in wood processing plants identified a number of work environment features that were associated with injury occurrence. Cases were more likely than controls to be employed in machine-paced jobs, to be exposed to dangerous work methods and materials, to experience louder noise levels and faster work pace, to have higher lifting demands and more frequent postural stress, and to experience lower decision latitude and social support at work. The three strongest risk factors in the logistic regression models were processing of hard wood, employment in SIC 242 versus 249, and high physical workload. Decision latitude and social support appeared to have small protective effects, although social support ratings may have been affected by cases' experiences after their injuries. The other variables that were significantly associated with injury occurrence in the multivariate analyses were being male, having one year or less on the current job, inability to take a break when tired, and a lockout/tagout program in effect in the plant.

If these findings are valid, they are consistent with the *a priori* hypotheses for this study. Hard wood is denser (has higher mass per volume) and thus has more potential energy [9]. Workers processing hard wood are likely to be exposed to higher forces from saw kickbacks and to lift heavier loads. SIC 242 had been predicted to have higher injury rates, because it represents an earlier stage in wood processing, with larger (heavier) wood items and many large sawblades, conveyors, lift trucks, and other possible vectors of energy.

Physical workload was an expected risk factor for both musculoskeletal and acute injuries. The former association is consistent with a large body of literature on back and upper extremity disorders [eg., 28, 29]. The potential association with acute injury has not been examined except in a very small number of studies [20]. For example, "ergonomic stress level" was shown to have a significant effect on injury risk in one investigation [30]. The simultaneous associations in this study with work pace and with inability to rest when tired both suggest a mediating effect of physical fatigue, but the actual mechanisms remain to be determined.

Other results were also consistent with at least some of the limited etiological research on occupational injury, in sawmills or other industrial sectors, that has been conducted to date. Gender, length of experience on the current job, and management style have all been studied by other investigators and found to be associated with injury risk in at least some studies [20]. In the current study, both gender and employment for one year or less were risk factors, as

were supervisor support and management effort to achieve safe working conditions (probably comparable to "management style").

Some of the findings ran counter to the *a priori* hypotheses. For example, shift work was expected but not found to be a risk factor. Environmental noise was associated crudely with injury occurrence but not significantly in the multivariate analyses; it may be highly correlated with other exposures, or it may be less important than other exposures in this environment. Other investigators have found increased risk of injury when workers perform jobs other than their usual ones [31], suggesting either that inexperience in dealing with the particular features of the job demands and work environment limits a worker's response capacity, or that exposure is sustained to physical stresses to which the worker is unaccustomed. In this study, however, the cases were more likely than the controls to be at their usual jobs at the time of injury.

It was also surprising that cases and controls had the same distribution of job titles; it had been expected that some jobs had higher injury risks than others, because of differences in ergonomic exposures and organizational factors. It is possible that the relevant hazards are so widespread, even if different ones predominate in each job, that no workers are unexposed, including working supervisors and foremen. (Higher-level managers were excluded from selection as either cases and controls.)

Interpretation of the statistical associations in terms of etiology, and their generalizability to the industry in general, may be limited somewhat by the potential for non-representative participation of workplaces and of individuals. There were two levels of participation, that of the companies, in providing access to workers for interviews, and that of individual subjects who were or were not interviewed. At the first level, participation by the industry in this study was quite disappointing. Many of the employers contacted were reluctant to provide access to workers, and even among those who agreed to participate originally, about one-third of them subsequently changed their decisions. Of those companies for which data were available (about two-thirds), the facilities that contributed cases only were more likely to process only hard wood in 1988 than those that contributed both cases and controls. Thus, the association between hard wood and case status may have been in part an artifact of non-representative selection.

The limited numbers of companies that participated also has implications for generalizability of the findings, assuming their validity. In particular, the participating companies were larger and had higher injury rates than non-participating companies. This was surprising, as the largest companies in this industry had been shown previously to have lower injury rates [32], and additionally because these companies had a higher prevalence of OHS programs (training, lockout/tagout, etc.) than had been expected. These differences do not in themselves invalidate the findings for the workers actually studied, but the question of generalizability remains (i.e., whether in a broader sample of companies, with even more varied work environments, the relative magnitude of the risk associated with specific factors might have been different).

At the second level, participation by individuals was moderate, although slightly higher among potential controls than potential cases. However, outright refusals were uncommon (only about 12% of all individuals). The greatest difficulty was in locating potential subjects, specifically in that many cases (about 30%) were no longer at the same address as they had been at the time of the First Report of Injury. These may have been workers who were more severely injured or who felt that they were treated badly by their employers after the injury (several comments regarding poor treatment were offered spontaneously as interviews were concluded). Whether they were also differentially exposed prior to the injury, as compared with the cases who were interviewed, cannot be determined.

The last issue with respect to subject selection and participation is that cases were identified through the state workers' compensation system. Compensation claims are likely to represent an incomplete sampling of all occupational injuries, possibly a more severe subset of the total number that occur. This sampling is probably unlikely to bias the comparisons with working conditions of randomly selected workers, unless injuries under certain circumstances (eg., on jobs with heavier workloads or less supervisory support) are more likely to lead to claims than others. However, it is not known whether there are limits on the generalizability of the results to unreported injuries. The literature on occupational injury provides mixed evidence as to whether the circumstances are similar between severe (eg., disabling) and non-severe injuries [eg., 20, 33].

With respect to information quality, most of the exposures of interest to this study could only be collected through interviews with workers. Information on physical workload, work pace, and psychosocial strain at work are not routinely collected or recorded for all workers. Even those limited variables entered on the First Report of Injury, including job title and seniority, were not available after 1992 and had to be obtained from interview. Nonetheless, reliance on self-reported data for the primary exposures raises concern about the potential for misclassification or information bias. For a limited number of variables, agreement with other information sources could be evaluated and was found to be high. For some content areas (eg., employer OHS administrative programs), internal consistency within a group of variables could be assessed and was also found to be fairly good.

Stratified and multivariate analysis techniques were used to eliminate confounding, within the limits of the data available. Neither age nor years employed was found to be associated with injury risk, with the exception of being on the current job for one year or less. Both SIC and gender were retained in the multivariate models; it was predicted that each of them would serve primarily as proxies for differences in working conditions, but either this belief was incorrect or those conditions were not measured well enough in the present study.

CONCLUSIONS

Assuming that the findings of this study are valid, they provide evidence for the preventable nature of many work-related injuries occurring in sawmills and other wood processing plants in Maine. High physical work load, including lifting demands and postural stress, can be addressed by numerous engineering and administrative controls, ranging from material handling devices, to installation of jigs and fixtures for tools and materials, to job rotation. Dangerous work methods and materials can be avoided by good industrial safety practices, and noise levels can similarly be reduced by proper engineering, selection and installation of equipment. Inability to stop work for a few minutes when tired and associated work organization features (eg., high work pace, machine-pacing, production quotas, and the nature and quality of supervision) are under the direct control of the employer. Decision latitude and social support are similarly consequences of the engineering and administrative organization of the workplace [26]. The higher risk for workers with one year or less on the current job suggests either a healthy worker effect in the study population or an effect of less experience with actual job conditions, or both; to the extent that the latter is true, employer attention to training and other programs specifically targeting the newer worker may have a beneficial effect. There is also evidence here for the effectiveness of a lockout/tagout program, which is required by OSHA regulations but (according to subjects' responses) has not been instituted in all of these workplaces.

Other risk factors identified are not as easily preventable. Higher risk for male workers is presumably a consequence of their differential employment in jobs with higher hazards, although other factors, such as differences in behavior between male and female workers, cannot be ruled out. Processing of hard wood and SIC 242 (sawmills) are features of the production goals of a company and cannot be eliminated. However, further exploration of the validity of these associations and the specific contributions of these factors to the risk of injury may lead to the identification of additional measures that can reduce some of their attendant safety hazards.

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LIST OF FIGURES

Figure 1. Constituents of physical demand and hazard score variables
(* Variables also used singly in statistical analyses)

Safety Hazards (Range = 0-10)

Dangerous placement of objects
Poor housekeeping or maintenance
Dangerous tools, machinery, or equipment
Exposure to fire hazard, burns, or shocks
Dangerous work methods

Physical Hazards (Range = 1-14)

Safety Hazards
* Noise level

Physical Exertion I (Range = 3-12)

* Lots of physical effort
Move or lift very heavy loads
Rapid and continuous physical activity

Physical Exertion II (Range = 4-16)

* Physical Exertion I
* Physical work intensity on typical day

Physical isometric loads (Range = 2-8)

Work for long periods with the body in physically awkward positions
Work for long periods with the head or arms in physically awkward positions

Postural stress (Range = 7-28)

* Reach up to shoulder height or above (frequency)
* Reach forward with the whole arm (frequency)
* Bend forward at the waist or stoop down (frequency)
* Bend, lean or twist to one side (frequency)
* Twist the arm or forearm (frequency)
* Bend the wrist (frequency)
* Pinch with the fingers (frequency)

Figure 2. Constituents of psychosocial stressor variables

Skill Discretion (12-48)

Learn new things
Little repetitive work
Creative
High level of skill
Variety of different tasks
Develop own special abilities

Created Skill (3-12)

Learn new things
Creative
Develop own special abilities

Decision Authority (12-48)

Make a lot of decisions
A lot of say about what happens
Freedom to decide how to do the work

Decision Latitude (24-96)

Skill Discretion
Decision Authority

Skill Utilization (years)

Required education - subject's actual education

Psychological Job Demands I (12-48)

Work very fast
Work very hard
Asked to do an excessive amount of work
Not enough time to get the job done
Experience conflicting demands from others

Figure 2. Constituents of psychosocial stressor variables (continued)

Psychological Job Demands II (-6 - 21)

Psychological Job Demands I
Long periods of intense concentration
Tasks often interrupted before completed
Hectic job
Slowed down by waiting on work from other people or departments

Job Insecurity I (3-12)

Seasonal work and/or frequent layoffs
Likelihood of losing present job
Poor job security

Job Insecurity II (-1 - 11)

Job Insecurity I
Faced possibility of layoff, or actually laid off, in past year

Total Psychological Stressors (Z-scored)

Psychological Job Demands I
Job Insecurity I

Coworker Support (4-16)

Coworkers are competent
Coworkers take a personal interest
Coworkers are friendly
Coworkers are helpful in getting the job done

Supervisor Support (4-16)

Supervisor concerned about welfare of workers
Supervisor pays attention to worker's input
Supervisor is helpful in getting the job done
Supervisor is successful in getting people to work together

Total Social Support (8-32)

Coworker Support
Supervisor Support

Ratings of work environment and job features by 391 wood processing workers in Maine

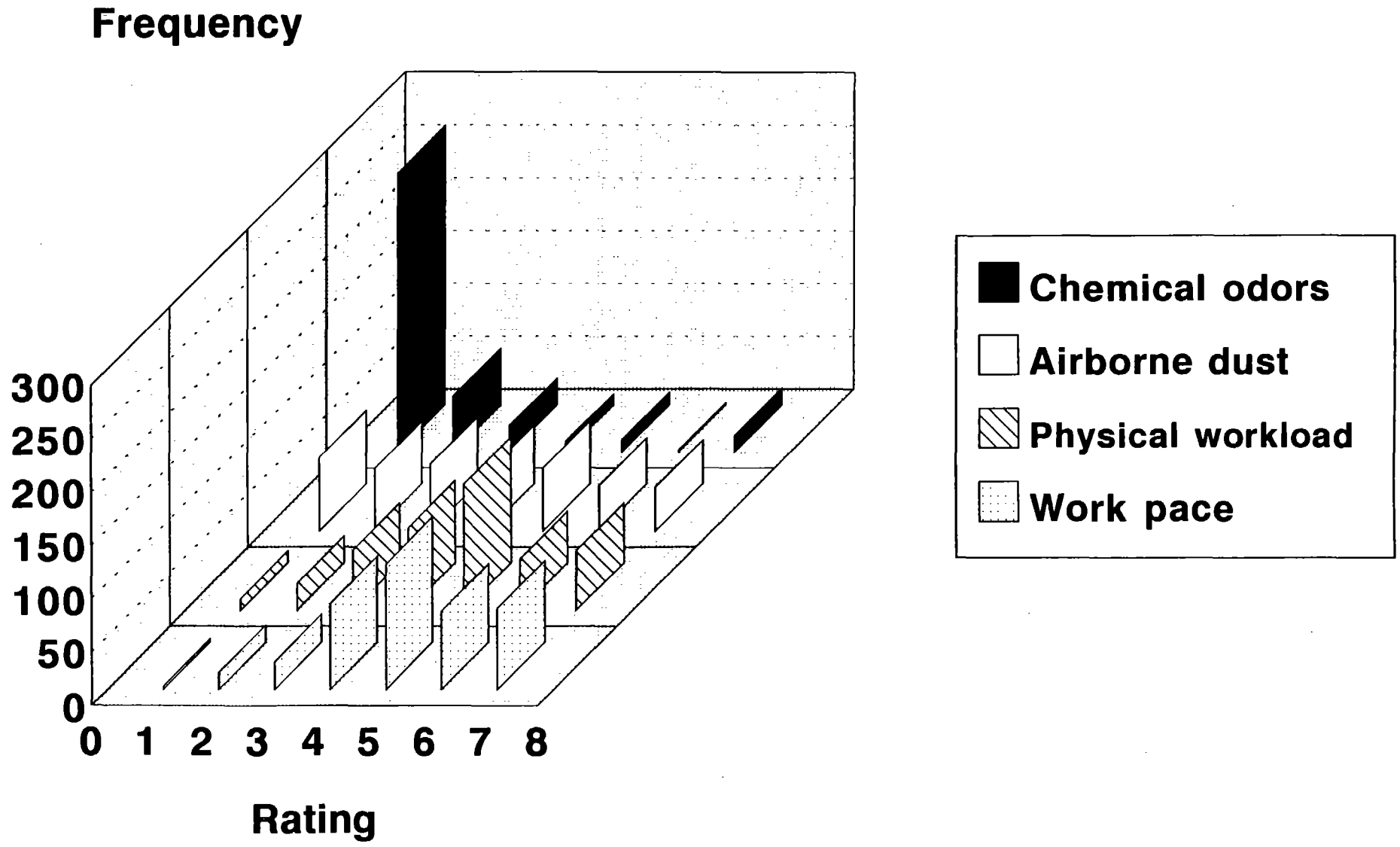

Table 1. Comparison of participating and non-participating employers (data from various sources (see text)).

Workplace characteristic	Participants++			Non-participants++
	Cases & controls (N = 20)	Cases only (N = 31)	All: cases or controls (N = 51)	(N = 321)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Workforce size (1990)	195 ± 342	80 ± 61	** 112 ± 188	24 ± 45
Annual sales, in $ million (1990)	6.9 ± 4.5	4.9 ± 4.7	** 5.6 ± 4.6	2.6 ± 5.1
Injury rate (1990)+	261 ± 231	226 ± 189	** 236 ± 199	62 ± 150
	Number (%)	Number (%)	Number (%)	Number (%)
SIC (1990): 242	5 (63%)	17 (61%)	** 22 (61%)	59 (39%)
243-245	0 (0%)	2 (7%)	2 (6%)	51 (34%)
249	3 (38%)	9 (32%)	12 (33%)	40 (27%)
Wood (1988): Hard	4 (33%)	11 (46%)	* 15 (42%)	23 (21%)
Soft	6 (50%)	7 (29%)	13 (36%)	48 (45%)
Both hard & soft	2 (17%)	6 (25%)	8 (22%)	36 (34%)

\+ Per 1,000 workers per year.

++ Because of missing data, the number of subjects in each column varies for each workplace characteristic.

* $p \leq 0.05$

** $p < 0.001$

Table 2. Outcomes of interview attempts for potential cases and controls.

Outcome of interview attempt	Potential Cases		Potential Controls	
	Number	(%)	Number	(%)
Completed interview	142	(48%)	249	(63%)
Partial interview	15	(5%)	3	(0.8%)
No interview:				
Could not be located+	89	(30%)	65	(16%)
Refused	34	(11%)	52	(13%)
Language comprehension difficulty	0	(0%)	1	(0.3%)
Medical problem prevented	0	(0%)	3	(0.8%)
Not employed in wood products	0	(0%)	9	(2%)
Other	16	(5%)	12	(3%)
Total	296	(100%)	394	(100%)

+ For cases, interviewers stopped telephone contact attempts after 12 months had elapsed since the injury.

Interview complete or partial, vs. not performed:
chi-square on 1 d.o.f. = 17.79, p = 0.00003.

Table 3. Workplace characteristics of participating and non-participating potential cases (data from various sources (see text)).

Workplace characteristics	Participants Mean (SD)	Non-participants Mean (SD)	P-value*
Workforce size (1990)	151 (119)	114 (73)	0.002
Sales, $ million (1990)	12.0 (5.9)	8.0 (5.5)	0.002
Injury rate (1990) +	280 (132)	286 (188)	0.77
	Number (%)	Number (%)	P-value**
SIC (1990): 242	73 (56%)	66 (56%)	
243	4 (3%)	6 (5%)	
249	54 (41%)	46 (39%)	0.70
SIC (FRI): 242	88 (56%)	67 (48%)	
243	2 (1%)	8 (6%)	
244	4 (3%)	6 (4%)	
249	64 (41%)	58 (42%)	0.11
Wood (1988): Hard	64 (47%)	54 (45%)	
Soft	46 (34%)	38 (31%)	
Both hard & soft	27 (20%)	29 (24%)	0.71
No. of subjects ++	158	139	

\+ Per 1,000 workers per year.
++ Because of missing data, the number of subjects varies for each comparison.

* From Student's T-test statistic
** From chi-square test statistic

Table 4. Workplace characteristics of participating and non-participating potential controls (data from multiple sources (see text)).

Workplace characteristics	Participants	Non-participants	P-value*
	Mean (SD)	Mean (SD)	
Workforce size (1990)	171 (128)	824 (36)	0.0001
Sales, $ million (1990)	9.4 (2.1)	9.2 (1.4)	0.55
Injury rate (1990) +	269 (187)	593 (315)	0.0001
	Number (%)	Number (%)	P-value**
SIC (1990): 242	51 (36%)	67 (100%)	
249	91 (64%)	0 (0%)	< 0.001
Wood (1988): Hard	94 (45%)	1 (1%)	
Soft	98 (47%)	89 (86%)	
Both hard&soft	18 (9%)	14 (13%)	< 0.001
No. of subjects	190	78	

+ Per 1,000 workers per year.

* From Student's T-test statistic
** From chi-square statistic

Table 5. Demographics, work history, and injury type for participating and non-participating potential cases (information from subjects' First Report of Injury).

Subject characteristics	Participants	Non-participants	P-value *
	Mean (SD)	Mean (SD)	
Years since hire	7.1 (9.4)	4.3 (5.4)	0.04
Years since duty	5.0 (7.3)	3.5 (5.2)	0.38
Age (years)	36.6 (13.5)	34.8 (11.4)	0.47
	Number (%)[a]	Number (%)[a]	P-value **
Gender: Male	129 (82%)	110 (79%)	0.59
Occup: Precision production	21 (13%)	15 (11%)	
Machine operator	74 (47%)	72 (52%)	
Transportation	7 (4%)	7 (5%)	
Handler/Laborer	45 (28%)	43 (31%)	0.19
Event: Struck against or by	12 (18%)	19 (27%)	
Fall	7 (10%)	8 (12%)	
Caught in or abraded	7 (10%)	14 (20%)	
Overexertion	37 (55%)	25 (36%)	0.17

* From Wilcoxon non-parametric test statistic
** From chi-square test statistic

[a] Percent of 158 participants and 139 participants, respectively.

Table 6. Workplace characteristics of cases and controls (data from multiple sources (see text)).

Workplace characteristics	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Workforce size (1990)	150 (119)	171 (128)	0.13
Sales, $ million (1990)	12.0 (5.9)	9.4 (2.1)	0.001
Injury rate (1990) +	279 (132)	269 (187)	0.54
	Number (%)	Number (%)	P-value**
SIC (1990): 242	72 (55%)	51 (36%)	
243	4 (3%)	0 (0%)	
249	54 (42%)	91 (64%)	< 0.001
Wood (1988): Hard	64 (47%)	94 (45%)	
Soft	45 (33%)	98 (47%)	
Both hard&soft	27 (20%)	18 (9%)	0.003
No. of subjects ++	157	251	

\+ Per 1,000 workers per year

++ Because of missing data, the number of subjects varies for each comparison, from 61 to 139 cases and 76 to 210 controls.

* From Student's T-test statistic

** From chi-square test statistic

Table 7. Work histories and demographic characteristics of cases and controls (interview data).

	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Years with this employer	10.3 (9.4)	9.6 (8.2)	0.46
Years in current job	5.5 (7.4)	5.7 (6.3)	0.79
Years in wood industry	10.7 (10.9)	12.0 (9.0)	0.20
Years working lifetime	19.3 (13.2)	19.3 (10.2)	0.99
Age (years)	37.6 (13.6)	38.2 (10.4)	0.20
	Number (%)	Number (%)	P-value**
Gender: Male	123 (83%)	185 (74%)	0.03
Race: White	147 (99%)	240 (96%)	*** 0.10
No. of subjects +	157	251	

+ The number of subjects varies for each comparison because of missing data.

* From Student's T-test statistic
** From chi-square test statistic
***Fisher's exact p-value (two-tailed)

Table 8. Job titles of cases and controls (interview data).

Job Title Group	Cases		Controls	
	Number	(%)	Number	(%)
Supervisor, Foreman	9	(6%)	20	(8%)
Machine Operator	81	(53%)	126	(50%)
Skilled Trade	15	(10%)	28	(11%)
Heavy Equipment Operator	7	(5%)	17	(7%)
Material Handler, Maintenance	22	(14%)	22	(9%)
Inspector, Grader	11	(7%)	29	(12%)
Non-production; Other; DNK	8	(6%)	9	(4%)

Chi-square statistic on 6 d.o.f., $p = 0.34$.

Table 9. Type of incident and nature of injury for 139 interviewed injury cases (data from First Reports of Injury and interviews).

Type of incident	Number (%)	Nature of injury	Number (%)
Struck against or by	27 (19%)	Amputation, laceration	12 (9%)
Fall	22 (16%)	Contusion	11 (8%)
Caught in or abraded	10 (7%)	Dislocation; fracture	18 (13%)
Overexertion	72 (52%)	Hernia, rupture	7 (5%)
Bodily reaction; misc.	8 (6%)	Sprain/strain, joint inflam.	75 (54%)
		Scratch, abrasion	4 (3%)
		Burn; Multiple; Misc.	12 (9%)

Table 10. Selected workload and work environment conditions in the usual jobs of 273 subjects, by Standard Industrial Classification.[a]

Variable (range)	SIC 242	SIC 243	SIC 249	P-value*
	Mean (SD)	Mean (SD)	Mean (SD)	
Hazardous conditions (0-10)[b]	1.29 (1.57)	6.75 (4.57)	1.15 (1.77)	0.02
Lifting effort (1-7)[b]	4.71 (1.65)	6.50 (0.71)	4.13 (1.80)	0.03
Postural stress (7-28)[b]	17.05 (4.41)	19.50 (3.00)	18.10 (4.24)	0.05
Decision latitude[b]	55.93 (11.22)	56.00 (12.96)	54.72 (11.04)	0.59
Psychological stressors[b]	0.13 (1.64)	1.51 (1.98)	-0.01 (1.47)	0.33
Social support at work[b]	23.73 (3.25)	22.25 (2.99)	25.04 (3.97)	0.01
	Number (%)	Number (%)	Number (%)	P-value**
Wood: Hard	18 (18%)	2 (67%)	77 (61%)	
Soft	61 (61%)	0 (0%)	12 (9%)	
Both	21 (21%)	1 (33%)	38 (30%)	< 0.001
Noise: Have to speak loudly[c]	46 (40%)	1 (25%)	70 (50%)	
Have to shout[c]	41 (36%)	2 (50%)	21 (15%)	0.006
Machine-paced work	71 (62%)	3 (75%)	65 (45%)	< 0.001
Cannot take break if tired	67 (64%)	3 (75%)	38 (30%)	< 0.001
Lockout/tagout program	91 (83%)	4 (100%)	112 (87%)	0.47
Any health & safety training	95 (81%)	4 (100%)	118 (86%)	0.44
Gender: male	114 (93%)	4 (100%)	78 (54%)	< 0.001

* From Wilcoxon non-parametric statistic
** From chi-square test statistic

[a] The number of subjects varies for each comparison because of missing data.
[b] See Figures 1 and 2 for definitions of these variables.
[c] Versus "can be heard at normal speaking voice."

Table 11. General working conditions in usual jobs of cases and controls (interview data).

Variable	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Hours per day	8.6 (1.0)	8.4 (1.2)	0.18
Hours per week	43.7 (6.2)	43.2 (7.6)	0.27
	Number (%)	Number (%)	P-value**
Wood type: Hard	60 (50%)	60 (27%)	
Soft	47 (39%)	90 (41%)	
Both hard & soft	13 (11%)	71 (32%)	< 0.001
Second, third or rotating shift	40 (27%)	72 (29%)	0.64
Machine-paced work	90 (63%)	109 (44%)	< 0.001
Cannot take break if tired	74 (56%)	86 (38%)	0.001
Incentive wage (self)	44 (31%)	71 (29%)	0.73
Incentive wage (self or worker before/behind in line)	75 (52%)	109 (45%)	0.18
Production quota	62 (48%)	95 (40%)	0.16
Supervise others	35 (25%)	78 (31%)	0.16

* From Student's T-test statistic
** From chi-square test statistic

Table 12. Safety hazards and environmental exposures in usual jobs of cases and controls (interview data).

Variable (range or units)	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Safety hazard conditions (0-10) +	1.7 (2.3)	1.1 (1.7)	0.01
Airborne dust levels (1-7)	3.6 (2.0)	3.8 (1.9)	0.40
Chemical odors (1-7)	2.0 (1.7)	1.6 (1.3)	0.02
Hands near saw blade (times/day)	35 (129)	178 (1098)	0.78
Hands near pinch point (times/day)	424 (2773)	157 (1337)	0.0001
	Number (%)	Number (%)	P-value**
Noise: Have to speak loudly[a]	58 (42%)	119 (48%)	
Have to shout [a]	46 (33%)	41 (16%)	0.0005

+ See Figure 1 for list of factors included

[a] Versus "can be heard at normal speaking voice."

* From Wilcoxon non-parametric test statistic
** From Mantel test of linear trend

Table 13. Correlations among indices of physical workload among 391 interviewed subjects.

VARIABLE	Physical effort	Physical exertion I	Physical exertion II	Physical workload scale	Lifting effort scale	Static loading	Postural stress
Work pace	0.33	0.43	0.50	0.52	0.35	0.28	0.32
Physical effort	--	0.82	0.80	0.51	0.45	0.29	0.36
Physical exertion I		--	0.96	0.57	0.55	0.45	0.44
Physical exertion II			--	0.76	0.59	0.45	0.46
Physical workload				--	0.53	0.32	0.35
Lifting effort					--	0.29	0.34
Static loading						--	0.41

P-value $\leq$ 0.0001 for all correlation coefficients shown.

Table 14. Physical work load in usual jobs of cases and controls (interview data).

Variable (range)	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Work pace (1-7)	5.3 (1.4)	4.9 (1.4)	0.006
Overall physical workload (1-7)	5.0 (1.6)	4.4 (1.5)	0.0001
Lifting demands (1-7)	5.1 (1.7)	4.1 (1.5)	0.0001
Postural stress (7-28) +	18.2 (4.2)	16.6 (4.4)	0.0009
Physical effort	3.1 (0.7)	2.8 (0.7)	0.002
Physical exertion I (3-12) +	8.8 (1.9)	7.8 (1.7)	0.0001
Physical exertion II (5-20) +	12.0 (2.4)	10.7 (2.1)	0.0001
Physical isometric loads (2-8) +	5.0 (1.4)	4.3 (1.2)	0.0001
Postural stressors	Number (%)	Number (%)	P-value**
Reach up to shoulder height ++	52 (37%)	64 (26%)	0.03
Reach forward with body ++	103 (73%)	145 (59%)	0.005
Bend forward or stoop ++	88 (62%)	121 (49%)	0.01
Lean to side or twist ++	93 (66%)	126 (51%)	0.005
Twist forearm ++	77 (55%)	109 (44%)	0.04
Bend wrist ++	77 (55%)	138 (56%)	0.84
Pinch ++	88 (62%)	133 (54%)	0.11

+ "Postural stress" = composite score of 7 individual postural stressors shown in lower half of table (each one scored from 1, "rarely," to 4, "constantly.")

++ "Often" or "constantly" versus "rarely" or "sometimes"

* From Wilcoxon non-parametric test statistic
** From chi-square test statistic

Table 15. Psychosocial work environment in usual jobs of cases and controls (interview data).

Factor +	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Skill discretion	24.3 (5.2)	25.3 (5.0)	0.09
Created skill	7.6 (1.8)	7.9 (1.8)	0.15
Decision authority	30.5 (7.5)	33.1 (6.8)	0.0008
Decision latitude	54.8 (11.7)	58.5 (10.3)	0.002
Decision latitude - group	4.4 (2.5)	5.0 (2.3)	0.0008
Decision latitude - macro	4.4 (1.3)	4.6 (1.2)	0.02
Skill utilization	-1.8 (3.0)	-1.9 (1.3)	0.05
Psychological job demands I	32.4 (5.3)	31.5 (4.6)	0.12
Psychological job demands II	6.4 (3.0)	5.8 (2.6)	0.06
Job insecurity I	5.4 (2.4)	4.8 (1.6)	0.22
Job insecurity II	2.0 (2.8)	1.1 (2.0)	0.03
Coworker support	11.8 (1.7)	12.4 (1.6)	0.0008
Supervisor support	11.3 (2.3)	12.6 (2.1)	0.0001
Social support at work	23.1 (3.3)	25.0 (3.4)	0.0001

+ See Figure 2 for constituents of each variable.

* From Wilcoxon non-parametric test statistic
** From chi-square test statistic

Table 16. Physical work load and work environment conditions in usual jobs of 71 overexertion cases versus all controls (interview data).

Variable (range)	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Work pace (1-7)	5.5 (1.5)	4.9 (1.4)	0.006
Physical workload scale (1-7)	5.2 (1.7)	4.4 (1.5)	0.0001
Lifting demands (1-7)	5.2 (1.6)	4.1 (1.5)	0.0001
Postural stress (7-28) +	18.5 (4.0)	16.6 (4.4)	0.0009
Physical isometric loads (2-8) +	5.0 (1.4)	4.3 (1.2)	0.0001
Physical effort (1-4)	3.1 (0.7)	2.8 (0.7)	0.006
Safety hazards (0-10) +	1.8 (2.6)	1.1 (1.7)	0.06
Decision latitude (24-96) +	54.3 (11.8)	58.5 (10.3)	0.003
Total psychological stressors +	0.4 (1.9)	-0.2 (1.3)	0.08
Social support (8-32) +	23.1 (3.9)	25.0 (3.4)	0.0009
Employer effort (4-12)	7.9 (2.3)	9.4 (1.6)	0.0001
Work pace at injury/near miss	5.6 (1.6)	4.7 (1.6)	0.0001
Physical workload at injury/n.m.	5.6 (1.7)	4.3 (1.6)	0.0001
Postural stressors	Number (%)	Number (%)	P-value**
Reach up to shoulder height ++	25 (37%)	64 (26%)	0.08
Reach forward with body ++	49 (72%)	145 (59%)	0.05
Bend forward or stoop ++	38 (56%)	121 (49%)	0.34
Lean to side or twist ++	49 (72%)	126 (51%)	0.002
Twist forearm ++	41 (60%)	109 (44%)	0.02
Bend wrist ++	38 (57%)	138 (56%)	0.93
Pinch ++	43 (63%)	133 (54%)	0.18

+ See Figures 1 and 2 for definitions
++ "Often" or "constantly" versus "rarely" or "sometimes"
* From Wilcoxon non-parametric test statistic
** From chi-square test statistic

Table 17. Physical work load and work environment conditions in usual jobs of 73 acute injury cases versus controls (interview data).

Variable (range)	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Work pace (1-7)	5.2 (1.3)	4.9 (1.4)	0.23
Overall physical workload (1-7)	4.9 (1.5)	4.4 (1.5)	0.02
Lifting demands (1-7)	5.0 (1.8)	4.1 (1.5)	0.003
Postural stress (7-28) +	18.0 (4.5)	16.6 (4.4)	0.04
Physical effort	3.0 (0.7)	2.8 (0.7)	0.04
Physical isometric loads (2-8) +	4.9 (1.4)	4.3 (1.2)	0.004
Safety hazards (0-10) +	1.6 (2.1)	1.1 (1.7)	0.04
Hands near saw blade (times/day)	30 (122)	178 (1098)	0.74
Hands near pinch point (times/day)	101 (347)	157 (1337)	0.05
Decision latitude (24-96) +	55.2 (11.6)	58.5 (10.3)	0.05
Total psychological stressors +	0.3 (1.8)	-0.2 (1.3)	0.21
Social support (8-32) +	23.1 (2.7)	25.0 (3.4)	0.0001
Employer effort (4-12)			
	Number (%)	Number (%)	P-value**
Lockout/tagout program	53 (79%)	223 (92%)	0.003

+ See Figures 1 and 2 for definitions

* From Wilcoxon non-parametric test statistic
** From chi-square test statistic

Table 18. Working conditions on day of injury (cases) and on day of near miss (controls) (interview data).

Variable (range)	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Overtime in preceding week	1.9 (2.3)	2.2 (2.5)	0.46
Days worked since last day off	2.7 (7.0)	2.6 (1.6)	0.004
Temperature (1-7)	4.4 (1.4)	4.3 (1.5)	0.47
Illumination (1-7)	5.3 (1.4)	5.1 (1.4)	0.54
Physical workload (1-7)	5.3 (1.6)	4.3 (1.6)	0.0001
Work pace (1-7)	5.3 (1.7)	4.7 (1.6)	0.006
Airborne dust levels (1-7)	3.2 (2.0)	3.4 (1.9)	0.51
Chemical odor (1-7)	1.5 (1.2)	1.3 (1.0)	0.11
	Number (%)	Number (%)	P-value**
Shift: Second	26 (18%)	10 (10%)	
Third	10 (7%)	11 (11%)	0.13
Noise: Had to speak loudly [a]	52 (37%)	39 (39%)	
Had to shout [a]	48 (34%)	27 (27%)	0.24
At usual job on that day	137 (97%)	89 (90%)	0.02
Floor conditions +	29 (20%)	13 (13%)	0.11
Staffing levels +	28 (13%)	5 (5%)	0.04
Personal protective equipment in use	116 (81%)	95 (94%)	0.004
Number of subjects ++	144	103	

+ "Slight" or "sizeable problem," versus "not a problem."
++ The number of subjects varies for each comparison because of missing data.
[a] Versus "could be heard at normal speaking voice."

* From Wilcoxon non-parametric test statistic
** From chi-square test statistic

Table 19. Tool and equipment use in the usual jobs of cases (n=76) and controls (n=176) (interview data).

Factor (range or units)	Cases		Controls		P-value*
	Mean	(SD)	Mean	(SD)	
Hours operation per day	8.7	(3.7)	8.9	(6.0)	0.72
Tool weight, if hand-held (lb.)	8.3	(4.6)	5.8	(14.1)	0.19
Tool force (1-7) +	3.4	(2.1)	2.4	(1.5)	0.0006
Tool vibration (1-7) +	2.6	(1.7)	2.0	(1.4)	0.009
Stock handling (times/day)	325	(737)	575	(923)	0.06
Weight of stock handled (lb./load)	24.8	(34.3)	11.8	(21.3)	0.006
Use of unguarded tool (hours/day)	2.0	(3.5)	1.8	(3.6)	0.75

* From Wilcoxon non-parametric test statistic

\+ Average of ratings for each tool/machine used, weighted by number of hours of use per day

Table 20. Performance of specific tasks by cases and controls in their usual jobs (interview data).

	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Manual material handling (N)	106	179	
Hours per day	7.8 (3.9)	7.5 (5.9)	0.60
Usual weight per load (lb.) +	24.9 (28.1)	20.4 (29.0)	0.31
Average lifting in typical day ++	69,808 (176,880)	60,259 (331,810)	0.78
Heavy lifting in typical day ++	156,181 (319,756)	25,278 (111,981)	0.02
Total lifting in typical day ++	141,209 (392,371)	73,495 (343,013)	0.17
Vehicle Operation (N)	27	60	
Hours per day	4.0 (3.7)	4.5 (3.7)	0.54
Upper body force (1-7) +	2.2 (1.5)	1.7 (1.0)	0.14
Segmental vibration (1-7) +	2.2 (1.6)	2.1 (1.5)	0.82
Whole-body vibration (1-7) +	2.5 (1.9)	2.5 (1.8)	0.99
Seat comfort (1-7) +	4.0 (1.7)	4.0 (0.9)	0.90
Inspect / Package (N)	24	65	
Hours per day	8.2 (3.2)	6.5 (3.5)	0.03
Items handled per day	31,782 (48,911)	6,635 (13,974)	0.005

\+ Average of weights for each product handled, weighted by number of hours of use per day

++ Average (or heavy or total) weight lifted, multiplied by frequency per day of handling

* Student's T-test statistic

Table 21. Training and other occupational health and safety (OHS) administrative programs in the workplaces of cases and controls (interview data).

Program element	Cases	Controls	P-value*
	Mean (SD)	Mean (SD)	
Hours trained in current job	6.6 (8.8)	6.8 (7.3)	0.86
Total hours of OHS training	22.9 (29.7)	15.1 (42.4)	0.002
Level of effort by employer to prevent injuries +	7.9 (2.2)	9.4 (1.6)	0.0001
	Number (%)	Number (%)	P-value**
OHS training in current job	71 (63%)	144 (75%)	0.03
Training provided: Any safety	107 (74%)	220 (91%)	< 0.001
Right to Know	57 (55%)	138 (64%)	0.13
Ergonomics	88 (65%)	187 (79%)	0.004
Safety committee in plant	93 (73%)	216 (92%)	< 0.001
Lockout/tagout program	95 (75%)	223 (92%)	< 0.001
Injury log posted yearly	95 (81%)	175 (78%)	0.66
Emergency procedures posted	104 (80%)	207 (88%)	0.05
Nurse/EMT on premises	59 (44%)	116 (49%)	0.40
Constructive response by supervisor when informed of potential safety problem	63 (71%)	119 (80%)	0.09

+ See text for constituents of this variable

* From Wilcoxon non-parametric test statistic
** From chi-square statistic

Table 22. Multivariate analysis of working conditions in the usual jobs of 109 cases and 211 controls (logistic regression).[a]

Risk Factor	Model A	Model B	Model C
	OR (95% CI)*	OR (95% CI)*	OR (95% CI)*
Hard wood (vs. soft or both)	2.8 (1.6, 4.8)	2.8 (1.6, 4.7)	2.6 (1.2, 5.5)
SIC 249 (vs. 242 or 243)			0.4 (0.2, 0.9)
Gender: female	0.4 (0.2, 0.8)	0.4 (0.2, 0.7)	0.5 (0.2, 1.2)
Physical demands: moderate	1.3 (0.7, 2.6)		
Physical demands: high	3.0 (1.2, 7.4)	2.5 (1.4, 4.6)	2.0 (0.9, 4.0)
Decision latitude	1.0 (0.9, 1.0)	1.0 (0.9, 1.0)	1.0 (0.9, 1.0)
Psychological stressors	1.0 (0.8, 1.3)		
Social support	0.9 (0.8, 0.9)	0.9 (0.8, 0.9)	0.8 (0.8, 0.9)
Model chi-square (d.o.f.) **	61.27 (7)	62.32 (5)	49.97 (6)
P-value	0.0001	0.0001	0.0001

[a] Number of subjects varies among models because of missing values.

* Exponentiated coefficient with test-based confidence interval
** From Log-Likelihood test of intercept and covariates vs. intercept alone

Table 23. Multivariate analyses of working conditions in the usual jobs of 109 cases and 211 controls (logistic regression).

Risk Factor	Model D	Model E	Model F	Model G
	OR (95% CI)*	OR (95% CI) *	OR (95% CI) *	OR (95% CI)*
Hard wood (vs. soft/both)	2.8 (1.6, 4.9)	2.9 (1.7, 5.0)	3.0 (1.6, 5.7)	2.6 (1.5, 4.4)
Gender: female	0.4 (0.2, 0.8)	0.4 (0.2, 0.8)	0.4 (0.2, 0.8)	0.3 (0.2, 0.7)
Physical exertion II	1.4 (1.2, 1.7)			
Physical work intensity		1.4 (1.2, 1.7)		
Lifting effort			1.4 (1.2, 1.8)	
Isometric loading				1.4 (1.2, 1.8)
Decision latitude	1.0 (0.9, 1.0)	1.0 (0.9, 1.0)	1.0 (0.9, 1.0)	1.0 (0.9, 1.0)
Social support	0.9 (0.8, 1.0)	0.9 (0.8, 1.0)	0.9 (0.8, 1.0)	0.9 (0.8, 1.0)
Model chi-square (dof) **	76.92 (5)	68.10 (5)	52.70 (5)	66.00 (5)
P-value	0.0001	0.0001	0.0001	0.0001

* Exponentiated coefficient with test-based confidence interval

** From Log-Likelihood test of intercept plus covariates versus intercept alone

Table 24. Multivariate analyses of working conditions in the usual jobs of 109 cases and 211 controls (logistic regression).

Risk Factor	Model H	Model J	Model K	Model L	Model M	Model N
	OR *	OR *	OR *	OR *	OR *	OR *
Hard wood (vs. soft/both)	3.1	2.9	3.1	3.6	2.9	2.9
Gender: female	0.4	0.4	0.3	0.5[a]	0.3	0.4
Physical demands: high	2.5	2.1	2.7	2.8	1.9[b]	2.3
New on job ($\leq$ 1 year)	2.3					
Machine-pacing		1.7				
Can't take break when tired			1.9			
Personal protective equip. in use				0.2		
No lockout/tagout program					3.9	
OHS training provided						0.4
Decision latitude	1.0	1.0	1.0	1.0	1.0	1.0
Social support	0.9	0.9	0.9	0.9	0.9	0.9
Model chi-square (d.o.f.) **	70.19 (6)	68.63 (6)	63.14 (6)	41.53 (6)	70.06 (6)	66.19 (6)
P-value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

* $P \leq 0.05$ for all coefficients except where noted otherwise

** From Log-Likelihood test of intercept plus covariates versus intercept alone

[a] $p = 0.07$, [b] $p = 0.06$

Table 25. Multivariate analyses of working conditions of in the usual jobs of 109 cases (51 acute incidents and 51 overexertions) and 211 controls (logistic regression)[a]: "Best fit" models.

Risk Factor	All injuries	Acute incidents	Overexertions
	OR (95% CI)*	OR (95% CI) *	OR (95% CI) *
Hard wood (vs. soft or both)	3.1 (1.7, 5.9)	2.4 (1.1, 5.0)	4.7 (2.2, 9.9)
Gender: female	0.3 (0.2, 0.8)	0.1 (0.0, 0.5)	
Physical effort: high	2.0 (1.0, 4.0)	2.4 (1.1, 5.2)	2.2 (1.0, 4.8)
New on job ($\leq$ 1 year)	1.8 (1.0, 3.3)	2.1 (1.0, 4.2)	2.0 (1.0, 4.2)
Can't take break when tired	1.9 (1.1, 3.5)		2.7 (1.3, 5.7)
Lockout/tagout program	3.2 (1.4, 7.1)	3.2 (1.3, 8.1)	
Social support	0.9 (0.8, 1.0	0.9 (0.8, 1.0)	0.9 (0.8, 1.0)
Model chi-square (d.o.f.) **	65.10 (7)	48.43 (6)	44.91 (5)
P-value	0.0001	0.0001	0.0001

[a] Number of subjects varies among models because of missing values.

* Exponentiated coefficient with test-based confidence interval
** From Log-Likelihood test of intercept plus covariates versus intercept alone

APPENDIX A

Case and Control Questionnaires

WOOD PROCESSING INJURIES: QUESTIONNAIRE #1 (03/12/93)

ID # _____

A. **INTRODUCTION: Begin with reminder to worker that s/he has received a letter explaining this study, and that the mill and/or local union is participating. Read text of letter. Emphasize confidentiality. For all items marked with "*," read information from F.R.I. computer listing and verify. "Is there anything else that you'd like to know before we start?"**

1. As of last month/year *, you were employed at company name *, in town *;
   Is that correct? (1=Yes, 2=No) 1:____
   IF NOT CORRECT: Where were you employed at that time? 1_co:_____
   1_town:_____

2. In month/year *,
   a. What was your job title? (be specific) 2a:_____(___)
   b. Production area or department: 2b:_____
   c. How many people were in your work group or unit, including yourself? 2c:____

3. As of month/year *,
   a. How long had you have been in this job title? 3a, mos:___ OR 3a, yrs:___
   b. How long had you worked for this employer? 3b, mos:___ OR 3b, yrs:___
   c. How long had you worked in the wood processing industry? 3c, mos:___ OR 3c, yrs:___
   d. How many years had you been working altogether? 3d, yrs:___

4. a. In month/year *, you reported an injury at work. Do you recall that injury?
   [Remind (date, part of body, etc.) using F.R.I. information as necessary. If worker denies ANY injury, enter "1" here (4a) and stop the interview.] 4a:____
   b. Were you actually working at the time of the injury? (1=Yes, 2=No) 4b:____
   [If "No" (s/he was entering or leaving premises, on break, at lunch, etc.), enter "2" and stop the interview: "Thank you very much for your assistance."]
   c. Since the time of that injury (report), do you now have the same regular job as before that date? (1=Yes, 2=No) 4c:____
   IF YES: skip to Part B (next page). IF NO, ask #5.

5. Are you still employed by the same company? (1=Yes, 2=No) 5:____

   IF YES: a. In which department do you now work? 5a:_____
   b. What job do you do? 5b:_____(___)
   c. What was the reason for the job change? 5c:____
      1) Disabled from previous work
      2) Not disabled, but concerned about safety/health hazards
      3) Voluntary change, unrelated to injury or safety
      4) Management transfer, unrelated to injury
      5) Other Other:_____

   IF NO: d. When did you leave the company? (mo/yr) 5d:____/____
   e. Why was that? 5e:____
      1) Disabled from previous work
      2) Not disabled, but concerned about safety hazards
      3) Voluntary change, unrelated to injury or safety
      4) Company went out of business
      5) Laid off
      6) Other: _____

f. Do you have a regular job now? (1=Yes, 2=No) 5f:_____

g. IF NO: Why is that? 1) Disabled 2) No work available 5g:_____
3) Not interested in paid work now
4) Other: _____

h. IF YES: Job title (be specific): 5h: _____(___)

i. IF YES: What business is your company in? (be specific, eg., shipbuilding, insurance, etc.)
5i: _____

B. USUAL WORK (BEFORE INJURY): "Now, I'm going to ask you about the usual job that you had before your injury in _____ (month*), and what a typical work day is or was like. I know that it may be difficult to remember some things, but please just give the best answer you can for the working conditions and circumstances at that time."

6. a. How many days did you usually work each week? (days; 9=don't know) 6a:_____

b. How many hours did you usually work each week? (hours; 99=don't know) 6b:_____

7. a. What shift were you working? 1) first 2) second 3) third 4) rotate 7a:_____

b. What rotation schedule? 1) weekly 2) more often per week 3) less often 7b:_____

8. Does this job involve (1) doing one usual task or activity all day; 8:_____
(2) doing a variety of usual tasks each day or week;
(3) doing one or more usual tasks, with others on a "relief" basis or when needed for production scheduling;
or (4) an organized rotation between two or more tasks in one day?

a. IF RELIEF WORK: How often? (hours per week) 8a:_____

b. IF ROTATE: How often? (times: per 1=hour, 2=day) 8b:_____ per:_____

c. IF ROTATE: Organized (1) by supervisor, or (2) by workers on your own? 8c:_____

9. a. On a typical work day, how many hours would you usually:
- sit? (hrs) 9a1:_____
- stand in one place? (hrs) 9a2:_____
- move around from one location to another? (hrs) 9a3:_____

IF SIT:

b. Is/was your chair (1) the right height? (2) too low? (3) too high? 9b:_____

c. Does/did the chair have a back rest? (1=Yes, 2=No, 9=DNK) 9c:_____

d. Is/was the back rest (1) the right height? (2) too low? (3) too high? 9d:_____

e. Are/were you able to rest your back fully and comfortably against the back support? (1=Yes, 2=No, 9=DNK) 9e:_____

10. a. Are/were you paid an (1) hourly wage or (2) incentive wage (piece rate)? 10a:_____

b. Is either the worker (1) ~~before~~ you or (2) after you paid an incentive? (0=Neither) 10b:_____

11. a. Is/was there a production quota? (1=Yes, 2=No, 9=DNK) 11a:_____

b. Is/was your output measured by: 1=weight, 2=count, 3=board feet, 9=DNA 11b:_____

c. Is/was your output measured by the: 1=batch, 2=hour, 3=day, 9=DNA 11c:_____

d. Do you (1) have to keep up with a machine or fixed speed production line,
or (2) do you set your own work pace? 11d:____
or (3) Other: _____

e. If you get tired and would like to slow down your work pace, what happens?

11e: _____

12. a. What type of wood do/did you work with? (Species, if known?)

1=Hardwood 2=Softwood 3=Both 9=DNK 12a:____

13. a. How much training did you receive when you began this job? (hrs) 13a:____
[Enter exact answer, or code for range. If "0," skip to question #14.]

0) No training at all 2) One to 4 hours 12) More than 8 hours
1) Less than 1 hour 6) Four to 8 hours 99) don't know

b. By whom were you trained? by — ? 13b:____

1) Supervisor 2) Co-worker 3) Trainer/personnel officer 9) DNA

c. Did that training include health or safety? (1=Yes, 2=No, 9=DNA) 13c:____

14. Again, for the usual job that you worked before the injury, please describe to me exactly what you are or were required to do on a typical day (or week).

[Enter codes for items "a" through "e:" 0=No; 1=Usual activities; 2=Regular relief work (at least once a week). Also describe any other tasks performed (as specifically as possible) in "f" through "h" and code these 1 or 2 as above.]

	ALSO ASK #	
a. Operate tool, machine, equipment (saw, sander, drill press, etc.)	15-22	14a:____
b. Operate vehicle (forklift, crane, log train, etc.)	23-28	14b:____
c. Manual material handling (lift, push, pull, carry, etc.)	29-34	14c:____
d. Apply paint, varnish, or other finish (liquid or spray)	35-36	14d:____
e. Inspect, sort, package	37-39	14e:____
f. Other: _____	40	14f:____
g. Other: _____	41	14g:____
h. Other: _____	42	14h:____

**IF OPERATE MACHINE (a) OR VEHICLE (b): "While you operate(d) this equipment, would you handle any stock by hand, such as lifting from a pallet to the machine?"
IF YES, code "c" above (1 or 2) and also ask the related questions.**

15. IF OPERATE TOOL/MACHINE: What type(s) of machines and tools do/did you use? **[The last column is for the answer to #16.]**

	TOOL/MACHINE TYPE (Code)	BRAND, SIZE, AGE, ETC.	HOURS/DAY [#16]
a.	_____(____)	_____	_____
b.	_____(____)	_____	_____
c.	_____(____)	_____	_____
d.	_____(____)	_____	_____
e.	_____(____)	_____	_____
f.	_____(____)	_____	_____

16. For each of the tools and machines that you just listed, about how many hours would you use it each day? **[Prompt with each item from list. Enter answer in the last column. If subject is not sure of the exact answer, choose the code for the closest range (below).]**

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

17. For each of the tools and machines that you listed, how much force does it take to use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." **[Prompt from tool/machine list in #15 above.]**

17a:_____ **17b:**_____ **17c:**_____ **17d:**_____ **17e:**_____ **17f:**_____

18. For each of the tools and machines that you listed, how much vibration do you feel when you use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[Prompt from tool list; 9=DNA, no vibration generated]**

18a:_____ **18b:**_____ **18c:**_____ **18d:**_____ **18e:**_____ **18f:**_____

19. For each of the tools that you hold in your hands, how much would you estimate that it weighs? (in pounds) **[Prompt from tool list; 9=DNA, not hand-held]**

19a:_____ **19b:**_____ **19c:**_____ **19d:**_____ **19e:**_____ **19f:**_____

20. For each machine where you feed stock by hand, what would you estimate is the weight of the stock that you would typically hold at one time? (in pounds) **[Prompt from tool list; 9=DNA, no stock feeding]**

20a:_____ **20b:**_____ **20c:**_____ **20d:**_____ **20e:**_____ **20f:**_____

21. For each machine where you feed wood by hand, about how often would you probably handle that stock in a typical hour? (times per hour) **[Prompt from tool list; 9=DNA, no stock feeding]**

21a:_____ **21b:**_____ **21c:**_____ **21d:**_____ **21e:**_____ **21f:**_____

22. For each of those machines and tools that you listed, is there any guarding or safety device on it to prevent injury? (This does not include ventilation or dust capture systems.) If so, what type of guard (if known)? Is the guard in its original condition? If not, in what way has it been altered? By whom and why? **[Prompt subject with items from tool list.]**

	PRESENT?*	TYPE OF GUARD	ALTERED?*	WHY?**	HOW?	BY WHOM?***
a.	_____	_____	_____	(___)	_____	(___)
b.	_____	_____	_____	(___)	_____	(___)
c.	_____	_____	_____	(___)	_____	(___)
d.	_____	_____	_____	(___)	_____	(___)
e.	_____	_____	_____	(___)	_____	(___)
f.	_____	_____	_____	(___)	_____	(___)

(*1=Yes, 2=No, 9=DNK)

**** 1=guard got in the way**
2=to work faster
3=other (specify)
4=DNK

***** 1=self**
2=another worker
3=supervisor
4=other, DNK

23. IF OPERATE A VEHICLE: What type(s) of vehicle do you operate? **[The last column is for the answer to #24.]**

	VEHICLE TYPE (Code)	BRAND, SIZE, AGE, ETC.	HOURS/DAY (#24)
a.	_____(___)	_____	_____
b.	_____(___)	_____	_____
c.	_____(___)	_____	_____
d.	_____(___)	_____	_____

24. For each vehicle that you just mentioned, about how many hours would you operate it each day? **[Prompt from vehicle list in #23 above. Enter answer in the last column for each vehicle that the worker operates. If subject is not sure of the exact answer, choose the code for the closest range (below).]**

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

25. For each of these vehicles, how much upper body force does it take to operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." **[Prompt from vehicle list on previous page.]**

25a:_____ **25b:**_____ **25c:**_____ **25d:**_____

26. For each of these vehicles, how much <u>vibration</u> do you feel in your hands or arms when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[Prompt from vehicle list. "Vibration" means both from the engine and from impact on irregular floor surfaces. 9=DNA, no vibration]**

26a:_____ 26b:_____ 26c:_____ 26d:_____

27. For each of these vehicles, how much <u>vibration</u> do you feel in your back or legs when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[Prompt from vehicle list. 9=DNA, no vibration]**

27a:_____ 27b:_____ 27c:_____ 27d:_____

28. For each of these vehicles, how would you describe the comfort and support of the seat? On a scale from 1 to 7, 1 is "very, very soft; no shape or support at all," 4 is "padded but firm; the shape fits my back well," and 7 is "very, very hard; uncomfortable to lean against." **[Prompt from list on previous page. 9=DNA, no seat]**

28a:_____ 28b:_____ 28c:_____ 28d:_____

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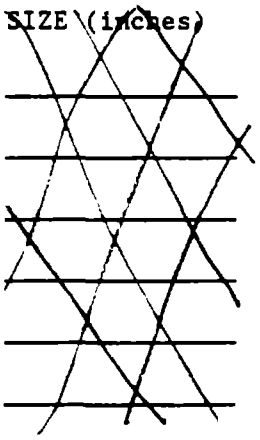
29. <u>IF HANDLE WOOD OR OTHER ITEMS BY HAND:</u> What objects or materials do you handle in a typical day? Please be specific (eg., dimensional lumber, box of furniture pins). **[Ask ~~size (distance between hands when grasped) and~~ weight of each item, <u>bundle</u>, box handled] [The last column is for the answer to #30.]**

	PRODUCT	SIZE (inches)	WEIGHT (lbs)*	HANDLING [#30]	HRS [#31]
a.					
b.					
c.					
d.					
e.					
f.					



*** If exact weight not known:**

2) 5 lb or less
5) 10 lb or less
10) 20 lb or less
25) 50 lb or less
60) more than 50 lb
99) unknown

[If one end is supported by another person or by a work surface, divide the total object weight in half. Try to get a single number for the most usual object lifted.]

30. For each item or load that you listed, <u>how</u> do/did you handle it? **[Prompt from product list in #29 above, and ask for <u>one</u> primary activity. Put the number that applies after each item on the list above.]**

1) lift 2) lower 3) carry 4) push 5) pull 7) drag on ground 8) leverage
6) other: _____

31. In a typical day, for how many hours would you be regularly lifting or handling each of these items or loads? **[Prompt from product list on previous page. Enter answer in the last column. If subject is not sure of the exact answer, choose the code for the closest range (below).]**

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

32. a. On a typical day, which of the above items is the <u>average</u> or <u>usual</u> load that you lift? **[Enter letter "a" through "f" from previous list.]** 32a:_____

b. How often would you lift it (or objects of the same weight)? (times: per 1=hour, 2=day) 32b:_____ per:_____

c. About how many steps would you have to carry it? 32c:_____

d. Is there any lifting device (crane, hoist, dolly, etc.) to help you with this load? (1=Yes, 2=No) 32d:_____

e. If YES: When or why is it <u>not</u> used? 32e:_____

33. a. On a typical day, which is the <u>heaviest</u> object that you lift at work? 33a:_____ **[Enter letter from list. Skip the rest of #33 if this is the same answer as #32.]**

b. How often would you lift it (or objects of the same weight)? (times: per 1=hour, 2=day) 33b:_____ per:_____

c. About how many steps would you have to carry it? 33c:_____

d. Is there any lifting device (crane, hoist, dolly, etc.) to help you with this load? (1=Yes, 2=No) 33d:_____

e. If YES: When or why is it <u>not</u> used? 33e:_____

34. How would you rate the overall intensity of <u>lifting or handling</u> in this job? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very heavy." 34:_____

35. <u>IF PAINT OR SPRAY FINISHES:</u> What type(s) of paints or other finishes do you apply in a typical day?

	PAINT/FINISH TYPE(S)	(Code)	HOURS/DAY
a.	_____	(___)	_____
b.	_____	(___)	_____
c.	_____	(___)	_____
d.	_____	(___)	_____
e.	_____	(___)	_____

36. About how many hours do you apply each one on a typical day? **[Enter exact answer above, or choose code for range.]**
1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

37. IF INSPECT, SORT, OR PACKAGE: What item(s) do you handle in a typical day?

	OBJECT TYPE(S)	(Code)	HOURS/DAY	HOW MANY?
a.	_____	(___)	_____	____ per:____
b.	_____	(___)	_____	____ per:____
c.	_____	(___)	_____	____ per:____
d.	_____	(___)	_____	____ per:____
e.	_____	(___)	_____	____ per:____

38. For each object: About how many hours do you handle this on a typical day? 37:____
[Enter exact answer above, or choose code for range.]

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

39. For each object: About how many of these items do you typically handle per hour or per day? **[Enter exact answer above. Items: per 1=hour, 2=day.]**

40. FOR FIRST OTHER TASK: About how many hours do you do this each day? 40:____
[Enter exact answer, or choose code for range.]

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

41. FOR SECOND OTHER TASK: About how many hours do you do this each day? 41:____
[Enter exact answer, or choose code for range.]

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

42. FOR THIRD OTHER TASK: About how many hours do you do this each day? 42:____
[Enter exact answer, or choose code for range.]
1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

"Now I have some very specific questions about the way you have (or had) to move and hold your body, in the job that you usually worked before the injury. Please listen carefully and think about the specific part of the body that I mean. In your usual job, how often do/did you have to:"

43. Reach up to shoulder height or above? 43:____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 43a:____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 43b:____

44. Reach forward of your body with your whole arm? 44:____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 44a:____

b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 44b:____

45. Bend forward at the waist or stoop down toward the floor? 45:____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 45a:____

b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 45b:____

46. Bend, lean or twist your body to one side or the other? 46:____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 46a:____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 46b:____

47. Twist your arm or forearm, like when you turn a doorknob? 47:____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 47a:____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 47b:____

48. Bend your <u>wrist</u> in any direction? 48:____
[Distinguish from <u>twisting arm</u> in #42: for example, to operate a tool or load a machine? or like when you throw a baseball?]

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 48a:____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 48b:____

49. Pinch your fingers together, for example, to grip a part or operate a tool? 49:____
[To exert pressure with fingertips only, versus holding a handle in the palm of the hand.]

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 49a:____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 49b:____

50. a. On a typical day, how often would you put your hand(s) near a moving saw blade? (times: per 1=hour, 2=day) 50a:____ per:____

b. On a typical day, how often would you put your hand(s) near a moving "pinch point" in a piece of machinery? (times: per 1=hour, 2=day) 50b:____ per:____

"Remember that we are still talking about your usual job at the time of your injury, whether or not it is the same one that you have now. For all of the following questions, please choose the answer that comes closest to describing that job."

51. This job requires that I learn new things. 51:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

52. This job involves a lot of repetitive work. 52:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

53. This job requires me to be creative. 53:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

54. This job allows me to make a lot of decisions on my own. 54:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

55. This job requires a high level of skill. 55:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

56. On this job, I have very little freedom to decide how I do my work. 56:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

57. I get to do a variety of different things on this job. 57:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

58. I have a lot of say about what happens on this job. 58:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

59. I have an opportunity to develop my own special abilities. 59:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

60. I have significant influence over decisions in my work group or unit. 60:____

8) I work alone 1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

61. My work group or unit makes decisions democratically. 61:____

8) I work alone 1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

62. I have at least some chance that my ideas will be considered about company policy (hiring, firing, wage levels, plant closings, new machinery purchases, etc.) 62:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

63. I supervise other people as part of my job. 63:____

1) No 2) Yes, 1-4 people 3) Yes, 5-10 people 4) Yes, 11-20 people 5) Yes, more than 20

64. My job requires working very fast. 64:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

65. My job requires working very hard. 65:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

66. My job requires lots of physical effort. 66:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

67. I am not asked to do an excessive amount of work. 67:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

68. I have enough time to get the job done. 68:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

69. I am often required to move or lift very heavy loads on my job. 69:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

70. My work requires rapid and continuous physical activity. 70:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

71. I am free from conflicting demands that others make. 71:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

72. My job is very hectic. 72:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

73. How would you describe the <u>pace of work</u> on a typical day? On a scale from 1 to 7, 1 is "very, very slow and relaxed" and 7 is "very, very fast and pressured." 73:____

74. How would you describe the <u>physical intensity of work</u> on a typical day? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." 74:____

75. I am often required to work for long periods with my body in physically awkward positions. 75:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

76. I am required to work for long periods with my head or arms in physically awkward positions. 76:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

77. If you needed to change the hour when you start or end your workday, would it be possible? 77:____

1) Very difficult
2) I could get changes aproved for special situations
3) Yes, my schedule is already flexible

78. How steady is your work? 78:____

1) Regular and steady 4) Seasonal 4) Frequent layoffs 9) Other
4) Both seasonal and frequent layoffs

79. My job security is good. 79:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

80. During the year <u>before</u> your injury, how often were you in a situation where you faced job loss or layoff? 80:____

1) Never 2) Faced the possibility once 3) Faced the possibility more than once 4) Actually laid off

81. Sometimes people permanently lose jobs they want to keep. How likely is it, during the couple of years since your injury, that you will lose your job? 81:____

1) Not at all likely 2) Not too likely 3) Somewhat likely 4) Very likely 5) Was laid off from that job

82. On a typical day, how would you describe the <u>amount of dust in the air</u>? On a scale from 1 to 7, 1 is "very, very little; no problem with visibility" and 7 is "very, very thick; hard to see." 82:____

a. Do you know what type(s) of dust is there? 82a:____

1=wood; 2=plastic; 3=other:_____

83. On a typical day, how would you describe the <u>smell of chemicals in the air</u>? On a scale from 1 to 7, 1 is "very, very little at any time during the day" and 7 is "very, very strong; might cause dizziness or headache." 83:____

a. Do you know what type(s) of chemicals they are? 83a:____

1=solvent-based paints/finishes; 2=acrylics; 3=epoxies; 4=other:_____

84. Do you have a problem with exposure to things placed or stored dangerously on this job? 84:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

85. Do you have a problem with exposure to dirty or badly maintained areas at your workplace? 85:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

86. Do you have a problem with dangerous tools, machinery, or equipment? 86:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

87. Do you have a problem with exposure to fire, burns or shocks? 87:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

88. While you are working, how loud would you have to talk to be heard by someone standing next to you? 88:____

1) Whisper 2) Normal voice 3) Loud voice 4) Shout

89. Do you have a problem with exposure to dangerous work methods on this job? 89:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

90. My supervisor is concerned about the welfare of those under him. 90:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

91. My supervisor pays attention to what I am saying. 91:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

92. My supervisor is helpful in getting the job done. 92:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

93. My supervisor is successful in getting people to work together. 93:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

94. People I work with are competent in doing their jobs. 94:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

95. People I work with take a personal interest in me. 95:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

96. People I work with are friendly. 96:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

97. People I work with are helpful in getting the job done. 97:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

98. During the past 12 months (that you were working), how often have/had you experienced becoming tired at work in a very short period of time? 98:____

1) Often 2) Sometimes 3) Rarely 4) Never

99. During the past 12 months, how often have you had trouble with aches in the lower back?

99:____

1) Often 2) Sometimes 3) Rarely 4) Never

100. During the past 12 months, how often have you had trouble with aches in the neck or upper back? 100:____

1) Often 2) Sometimes 3) Rarely 4) Never

101. During the past 12 months, how often have you had trouble with aches in the hands, wrists, or arms?

1) Often 2) Sometimes 3) Rarely 4) Never 101:____

102. My work involves using computer systems or automated equipment. 102:____

1) Not at all 2) Occasionally 3) Often 4) Continuously

If "2" or higher, please describe: _____

_____

"Please answer the next set of questions based on your <u>overall experience</u> with all of the equipment or systems you work with. That is, give your 'average' impression, if you work with several systems that are different."

103. I can control the pace of my work when I work with our equipment. 103:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

104. I often have to wait long intervals before the equipment can process my work. 104:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

105. The equipment checks the speed or accuracy of my work for my supervisor. 105:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

106. I often have to work fast to keep up with the equipment. 106:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

C. **EVENTS AT THE TIME OF INJURY: "Now I have some questions about the day on which you were injured (or reported your injury). First, I'd like you to tell me whether the information we received about your injury is correct."**

[INTERVIEWER: Review each item marked "*" from the FRI computer listing. Record any new or differing information.]

1. a. *Date of injury (mo/day/yr) C1a:____/____/____
   b. *Time of injury (24-hour clock, hour:min) C1b: ____:____

   c. *Type of injury C1c:_____
   d. *Part of body C1d:_____

   e. *Nature of injury C1e:_____
   f. *Source of injury C1f:_____
   g. *Associated object C1g:_____

2. What shift did you work that day? 1) first 2) second 3) third 9) DNK C2:____

3. a. How many days had you worked continuously, since your last day off, before the day of the injury? (days; 9=DNK) C3a:____

   b. How many days did you work any overtime (more than 8 hours per shift) in the week (7 days) before the day of the injury? (days; 9=DNK) C3b:____

4. At the time of the injury, were you working your usual job? C4:____
   1) Usual job => **CONTINUE WITH #5**
   2) Not usual job => **INSERT QUESTIONNAIRE 1B HERE.**

5. **Please describe in your own words what happened when you were injured or when you first felt the pain. [INTERVIEWER: Refer to this narrative as needed in asking the questions that follow.]**

_____

_____

_____

_____

6. **[IF INJURY TYPE is strain/sprain or joint inflammation, ask "a" through "f": Otherwise, skip to #7, next page.]**

   a. When did you first notice the pain? (mo/yr) C6a:____/____

   b. Did the pain start suddenly, or did it develop gradually over time? C6b:____

      1) Sudden onset 2) Gradual onset 3) Gradual first, then sudden aggravation
      4) Other:_____

   c. Were you doing the same job at that time? (1=Yes, 2=No, 9=DNK) C6c:____

      IF NO: Job title? (be specific) C6c_job:_____

d. At the time that you reported the pain, how long had it lasted (or did it usually last)? C6d:____

1) Less than 1 hour
2) Less than 1 day
3) Less than 1 week
4) Less than 1 month
5) Less than 6 months
6) More than 6 months (continuously)

e. How often had you had this pain or discomfort, in the 12 months before you reported it? C6e:____ per:____

(# times: per 1=hour, 2=day, 3=month, 4=year, 9=DNA)
(0=never before; 99=DNK; 88=constantly)

f. During the year before you reported the pain, when you were away from work for one week or more, did the pain: C6f:____

1) get better
2) get worse
3) not change
4) never away that long
9) DNA (came on suddenly)

"I will be asking you some questions about the moment when your injury occurred. If there wasn't any particular moment when something happened, please answer these questions about the moment at work when you decided to report this pain."

7. What were you doing when (or just before) you were injured? C7:____
[Select only one of the choices below; enter code in #7 here.]

	GO TO	
1) Operate machine, tool, equipment	[8]	
2) Operate vehicle	[10]	
3) Manual material handling (lift, push, pull, carry)	[12]	
4) Apply paint, varnish, or other finish (liquid or spray)	[14]	
5) Inspect, sort, package	[15]	
6) Body motion with hands empty (reach, twist, bend, etc.)	[16]	
7) Other (please describe): _____	[17]	C7othr:____
9) Unknown	[17]	

8. IF OPERATING MACHINE/TOOL/EQUIPMENT WHEN INJURED:

a. What was the machine or tool that you were using when you were injured?

If previously described [#15, p. 4], indicate which tool or machine by letter ("a" - "f"); then SKIP to #9. c8a:____

IF NOT: Machine/tool type: _____(____)

Brand, size, age, etc.: _____

b. How much force does it take to use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard:" C8b:____

c. How much vibration do you feel when you use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[9=DNA, no vibn]** C8c:____

d. IF HAND-HELD ONLY: Approximately how much does it weigh? (lbs) [99=DNA] C8d:____

e. IF FEED WOOD BY HAND: What would you estimate is the weight of the lumber or bundle of parts that you hold at one time? (lbs) [99=DNA] C8e:____

f. Describe what guarding, if any, is provided to prevent injury. "Is the guarding in its original condition? If altered, in what way? By whom, how and why?" (*1=Yes, 2=No, 9=DNK)

GUARD?*	TYPE	ALTERED?*	WHY?	HOW?	BY WHOM?
____	_____	____	_____		

9. a. At the time that you were hurt, what exactly were you doing with the tool? C9a:____

1) operate 2) pick up 3) put down 4) hold
5) other: _____
9) don't know

b. What else were you doing at the moment that you were injured? C9b:____

1) bend body forward at waist
2) twist or bend body sideways at waist
3) reach arm up
4) reach arm forward
5) twist arm
6) other: _____
9) no secondary activity; don't know

c. Was this the correct tool to use for the job? (1=Yes, 2=No, 9=DNK) C9c:____

d. Had the tool been properly maintained? (1=Yes, 2=No, 9=DNK) C9d:____

10. IF OPERATING VEHICLE WHEN INJURED:

a. What type of vehicle were you operating when you were injured?

If previously described [#23, p. 5], indicate which vehicle by letter ("a" - "f"); then SKIP to #11. C10a:____

IF NOT: Vehicle type: _____(____)

Brand, size, age, etc.: _____

b. How much upper body force does it take to operate this vehicle? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." C10b:____

c. How much vibration do you feel in your hands or arms when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." ["Vibration:" both engine and impact. 9=DNA, no vibrn] C10c:____

d. How much vibration do you feel in your back or legs when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[9=DNA, no vibration]** **C10d:**____

e. How would you describe the comfort and support of the seat? On a scale from 1 to 7, 1 is "very, very soft; no shape or support at all," 4 is "padded but firm; the shape fits my back well," and 7 is "very, very hard and rigid; I cannot lean back against it." **[9=DNA, no seat]** **C10e:**____

11. a. What exactly were you doing when you were injured? **C11a:**____

1) operate
2) enter
3) leave
4) climb up
5) climb down
6) other:_____

b. Were you doing anything else at that moment? **C11b:**____

1) bend body forward at waist
2) twist or bend body sideways at waist
3) reach arm up
4) reach arm forward
5) twist arm
6) other: _____
9) no secondary activity; don't know

c. Had the vehicle been properly maintained? (1=Yes, 2=No, 9=DNK) **C11c:**____

- - - - - - - - - - - - - - -

12. IF HANDLING MATERIALS WHEN INJURED:

a. What was the object that you were lifting or handling when you were injured?

If previously described [#29, p. 6], indicate which object by letter ("a" - "f"); then SKIP to #13. **C12a:**____

IF NOT: Please describe specifically (eg., dimensional lumber, box of furniture pins). **[Ask size (distance between hands when grasped) and weight of item.]**

PRODUCT TYPE	(Code)	SIZE (inches)	WEIGHT (lbs)*
_____	(___)	_____	_____

* If exact weight not known:
2) 5 lb or less
5) 10 lb or less
10) 20 lb or less
25) 50 lb or less
60) more than 50 lb
99) unknown

13. a. What exactly were you doing at that moment? **C13a:**____

1) lift
2) lower
3) carry (while walking)
4) push
5) pull, drag
6) hold object still
7) try to disentangle from other objects
8) other:_____
9) don't know

b. Were you doing anything else at the same time? C13b: _____

1) walk/carry
2) bend body forward with object in hand
3) twist body or bend sideways at waist with object in hand
4) reach arm up with object in hand
5) reach arm forward with object in hand
6) twist arm with object in hand
7) other: ______________________________
9) none/don't know

14. IF APPLYING PAINT OR OTHER FINISH:

a. What was the paint or finish that you were applying when you were injured?

If previously described [#35, p. 7], indicate which finish by letter ("a" - "f"); then SKIP to #15. **C14a:** _____

b. IF NO, please describe **Type:** ______________________________

15. IF INSPECTING/SORTING/PACKAGING:

a. What was the object that you were handling when you were injured?

If previously described [#37, p. 8], indicate which object by letter ("a" - "f"); then SKIP to #16. **C15a:** _____

b. IF NO, please describe **Type:** ______________________________

16. IF BODILY MOTION WHEN INJURED (NO LOAD IN HANDS):

a. What exactly were you doing when you were injured? **C16a:** _____

1) walk	5) climb up
2) run	6) climb down
3) stand	7) step up
4) sit	8) step down
9) don't know	0) other: ______________________________

b. Were you doing anything else at the same time? **C16b:** _____

1) bend body forward at waist
2) twist or bend body sideways at waist
3) reach arm up
4) reach arm forward
5) twist arm
6) other: ______________________________
7) walk, run
8) climb stairs or ladder
9) no secondary activity; don't know

17. a. Was there a sudden "accident" interruption in the motion (activity) flow just before the injury occurred? (1=Yes, 2=No, 9=DNK)
[INTERVIEWER: Explain if needed or read examples] C17a:____

b. If YES: What was the cause of the interruption? C17b:____

1) slip, trip, misstep
2) lost grip
3) blow
4) wood kickback (from saw)
5) vehicle collision
6) machine repeat, malfunction, failure
7) fire or explosion
8) other: _____
9) DNK

18. On the day that you were injured, was there any problem with the floor conditions (for example, slippery floor from moisture, dust or woodchips)? C18:____

0) Not a problem 1) A slight problem 2) A sizeable or great problem

19. On the day that you were injured, how loud did you have to talk to be heard by someone standing next to you? C19:____

1) Whisper 2) Normal voice 3) Loud voice 4) Shout

20. How would you describe the <u>temperature</u> on the day that you were injured? On a scale from 1 to 7, 1 is "very, very cold" and 7 is "very, very hot." C20:____

21. How would you describe the <u>lighting</u> on the day that you were injured? On a scale from 1 to 7, 1 is "very, very dim" and 7 is "very, very bright." C21:____

22. How would you describe the <u>physical intensity of work</u> on the day that you were injured? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." C22:____

23. How would you describe the <u>pace of work</u> on the day that you were injured? On a scale from 1 to 7, 1 is "very, very slow and relaxed" and 7 is "very, very fast and pressured." C23:____

24. On the day that you were injured, was there any problem with staffing levels (for example, an unusual number of people out of work in your department)? C24:____

0) Not a problem 1) A slight problem 2) A sizeable or great problem

IF YES, Describe: _____

25. How would you describe the <u>amount of dust in the air</u> on the day that you were injured? On a scale from 1 to 7, 1 is "very, very little; no problem with visibility" and 7 is "very, very thick; hard to see." C25:____

26. How would you describe the <u>smell of chemicals in the air</u> on the day that you were injured? On a scale from 1 to 7, 1 is "very, very little at any time during the day" and 7 is "very, very strong; might cause dizziness or headache." C26:____

27. Were you using any form of personal protective equipment at the time that you were injured? (1=Yes, 2=None) [IF NONE, go to #29.] C27:____

[INTERVIEWER: Read from list below, one at a time.
Code "Wearing?" (*) 1=Yes, 2=No. For each "YES," ask for type and description.]

	PPE TYPE	WEARING?*	SPECIFIC BRAND, SIZE, TYPE
a.	Gloves:	_____	_____
b.	Dust mask/respirator:	_____	_____
c.	Safety shoes:	_____	_____
d.	Leather apron, sleeves, leggings:	_____	_____
e.	Hearing protection:	_____	_____
f.	Hard hat:	_____	_____
g.	Safety glasses/goggles:	_____	_____
h.	Other:	_____	_____

28. If you were wearing gloves at that time, how would you rate the fit and thickness of your gloves on a scale from 1 to 7, where 1 is "very, very small and tight," 4 is "fit perfectly," and 7 is "very, very large and bulky:" [9=DNA, no gloves] C28:____

29. Did you lose any days from work at your usual job as the result of this injury? (1=Yes, 2=No, 9=DNK) C29:____

IF YES: a. For how many days were you out of work in the first week following the injury? C29a:____

b. For how many days were you out of work in the first month following the injury? C29b:____

30. Did your injury prevent you from doing your usual household chores, hobbies, or leisure activities? (1=Yes, 2=No, 9=DNK) C30:____

IF YES: a. For how many days were you unable to do them in the first week following the injury? C30a:____

b. For how many days were you unable to do them in the first month following the injury? C30b:____

31. Would it have been possible for even more severe injuries to result from this accident? (1=Yes, 2=No, 9=DNK) C31:____

IF YES: **How?** _____

_____

_____

32. To your knowledge, has the same type of accident occurred <u>before</u>, either to you or to someone else? (1=Yes, 2=No, 9=DNK) C32:____

IF YES: Was that (1) in the same job as yours, or

(2) in a different job or area in the plant? C32a:____

Which job?: _____

33. What could be done to prevent this or similar accidents from occurring in the future?

_____

_____

_____

D. **GENERAL CONDITIONS OF EMPLOYMENT:**
"Now I'd like to verify a few facts about your workplace."

34. a. Are you a member of a union or employee association? C34a:____
0) No 1) UPIU 2) IBCJ 3) Teamsters 4) Other: _____

b. **IF NO:** Is there a labor union in the plant? **[SKIP TO #37]** C34b:____
0) No 1) UPIU 2) IBCJ 3) Teamsters 4) Other: _____

35. My union or employee association is influential in affecting company policy. C35:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) Not a member

36. I have influence over the policies of the union or employee association. C36:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) Not a member

37. a. Have you ever received any training from your current employer about any hazards on your job or how to protect your health and safety? (1=Yes, 2=No, 9=DNK) C37a:____

b. **IF YES:** How much training? (hours; 99=DNA, DNK, don't remember) C37b:____

What did it cover? **Describe:** _____

_____

38. Do you know of any health and safety program or services in your plant? For example (read list):

(1=Yes, 2=No, 9=DNK)

a) Right-to-know training C38a:____
b) Safety or ergonomics training C38b:____
c) Management safety committee C38c:____
d) Joint labor-management safety committee C38d:____
e) Lockout/tagout program C38e:____
f) OSHA injury log posted yearly C38f:____
g) Posted emergency procedures C38g:____
h) Nurse or paramedic on premises C38h:____
i) Other: _____

39. The health and safety training provided by my employer has helped me or other workers to avoid work-related injury or disease. C39:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) No training

40. My employer is willing to spend money to provide a safely engineered workplace, such as guards on machines, workstations that fit the human body, etc. C40:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

41. The plant safety director and/or committee is genuinely concerned and has taken constructive measures to prevent work-related injury or disease. C41:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) Don't know; no program

42. Have you ever reported a safety or health hazard in this plant to a supervisor? (1=Yes, 2=No, 9=DNK) C42:____

IF YES: What was the response? (select closest answer) C42a:____

1) Constructive actions were taken (eg., engineering controls, training)
2) There was no response
3) Told to change "unsafe" behavior or just to "be careful"
4) My job security was threatened (directly or indirectly)
5) Overt reprisals (formal reprimand, involuntary transfer, etc.)
6) Other: _____

43. What do you think would be the most effective way(s) to reduce injuries in sawmills?

_____

_____

_____

_____

"We're almost done. I just need to ask you a few questions about yourself."

44. In what month and year were you born? (mo/yr) C44:____/____

45. Gender: 1) Male 2) Female C45:____

46. Race/Ethnicity: 1) White 2) Black 3) Native Amer. 4) Hispanic C46:____
5) French Canadian 6) Other _____

47. a. Height (feet & inches) C47a:____ft ____in
b. Weight (lbs) C47b:____

48. a. Which hand do you write with? 1) Right 2) Left 3) Either/No pref C48a:____
b. Which hand do you use more at work? 1) Right 2) Left 3) Both/No pref C48b:____

49. What is your education (highest grade completed)? C49:____

6) Elementary school 14) Junior college (1-2 yrs)
9) Junior high (9th grade) 16) College graduate
12) High school 18) Graduate school
12) Vocational/technical school (1=Yes) C49vt:____

50. What level of skill is required on this job, in terms of years of formal training? (This is not necessarily the same as your education.) C50:____

6) Elementary school only 14) Some college education (1-2 yrs)
9) Junior high (9th grade) 16) College graduate (4 years)
12) High school graduate 18) Graduate school
12) Vocational/technical school graduate (1=Yes) C50vt:____

51. One last question: We are interested in learning something about the effect of noise on the risk of injury in the workplace.

a. Have you had your hearing tested at this job? (1=Yes, 2=No, 9=DNK) C51a:____

b. Have you seen any noise measurements taken at this job? (1=Yes, 2=No) C51b:____

c. Would you be willing to sign a release form, authorizing your employer to give us copies of any noise measurements taken in your work locations and copies of any hearing tests that you have been given? (1=Yes, 2=No) C51c:____
[=> INTERVIEWER: Please ask even if s/he says "No" to both "a" and "b".]

IF YES: "Is this address [read from injury report*] the best place to send you the form to sign? If not, to what address should we send it? [enter on cover page] We'll include a stamped, self-addressed envelope, so all that you have to do is to sign it and return it to us immediately."

52. Would you like to receive a written summary of this study when it is completed? (It will probably be a couple of years from now.) (1=Yes, 2=No) C52:____

IF YES: Is this address [read from injury report*] the best place to send it to you? If not, to what address should we send it? [enter on cover page]

* THANK YOU VERY MUCH FOR PARTICIPATING IN THIS SURVEY *

WOOD PROCESSING INJURIES: QUESTIONNAIRE #2 (03/15/93)

ID # _____

A. **INTRODUCTION: Begin by asking worker if s/he has received a letter about this study, and remind that the mill and/or local union is participating. Review text of letter. Emphasize confidentiality. (For all questionnaire items marked with "*," read information from printed page when needed.) "Is there anything else that you'd like to know before we start?"**

1. Recently (within the past year) you have been employed at co. name *, in town *. Is that correct? (1=Yes, 2=No) 1:____

   a. **IF NOT CORRECT**: When were you last employed at that location? 1_mmyy:____/____
   [If not currently working at this plant, ask questions as of last full day there. If more than one year ago, stop the interview: "Thank you very much for your assistance."]

   b. **IF NEVER WORKED THERE**: Where in the wood products industry did you last work?
   1_co:_____
   1_town:_____
   [If within past year, continue. If never in this industry, stop here.]

2. At company, town *,
   a. What is/was your job title? (be specific) 2a:_____(___)

   b. Production area or department: 2b:_____

   c. How many people are/were in your work group or unit, including yourself? 2c:____

3. On your last full day of work at this location,
   a. How long had you have been in this job title? 3a, mos:___ OR 3a, yrs:___
   b. How long had you worked for this employer? 3b, mos:___ OR 3b, yrs:___
   c. How long had you worked in the wood processing industry? 3c, mos:___ OR 3c, yrs:___
   d. How many years had you been working altogether? 3d, yrs:___

4. Do you still have the same regular job? (1=Yes, 2=No) 4:____
IF YES: skip to Part B (next page). IF NO, ask #5.

5. Are you still employed by the same company? (1=Yes, 2=No) 5:____

IF YES: a. In which department do you now work? 5a:_____

b. What job do you do? 5b:_____(___)

c. What was the reason for the job change? 5c:____
   1) Disabled from previous work
   2) Not disabled, but concerned about safety/health hazards
   3) Voluntary change, unrelated to injury or safety
   4) Management transfer, unrelated to injury
   5) Other **Other:**_____

IF NO: d. When did you leave the company? (mo/yr) 5d:____/____

e. Why was that? 5e:____
   1) Disabled from previous work
   2) Not disabled, but concerned about safety hazards
   3) Voluntary change, unrelated to injury or safety
   4) Company went out of business
   5) Laid off
   6) **Other:** _____

f. Do you have a regular job now? (1=Yes, 2=No) 5f:____

g. IF NO: Why is that? 1) Disabled 2) No work available 5g:____
3) Not interested in paid work now
4) Other: _____

h. IF YES: Job title (be specific): 5h: _____(___)

i. IF YES: What business is your company in? (be specific, eg., shipbuilding, insurance, etc.)
5i: _____

B. USUAL WORK: **"Now, I'm going to ask you about the <u>usual</u> job that you have done in the past month (or: when you last worked at this plant, if no longer there), and what a typical work day is (or: was) like. I know that it may be difficult to remember some things, but please just give the best answer that you can."**

6. a. How many <u>days</u> do/did you usually work each week? (days; 9=don't know) 6a:____

b. How many <u>hours</u> do/did you usually work each week? (hours; 99=don't know) 6b:____

7. a. What shift are/were you working? 1) first 2) second 3) third 4) rotate 7a:____

b. What rotation schedule? 1) weekly 2) more often per week 3) less often 7b:____

8. Does this job involve (1) doing <u>one</u> usual task or activity all day; 8:____
(2) doing a <u>variety</u> of usual tasks each day or week;
(3) doing one or more usual tasks, with others on a "relief" basis or when needed for production scheduling;
<u>or</u> (4) an organized <u>rotation</u> between two or more tasks in one day?

a. IF RELIEF WORK: How often? (hours per week) 8a:____

b. IF ROTATE: How often? (times: per 1=hour, 2=day) 8b:____ per:____

c. IF ROTATE: Organized (1) by supervisor, or (2) by workers on your own? 8c:____

9. a. On a typical work day, ~~how many~~ while working, hours would you usually:
- sit? (hrs) 9a1:____
- stand in one place? (hrs) 9a2:____
- move around from one location to another? (hrs) 9a3:____

IF SIT:

b. Is/was your chair (1) the right height? (2) too low? (3) too high? 9b:____

c. Does/did the chair have a back rest? (1=Yes, 2=No, 9=DNK) 9c:____

d. Is/was the back rest (1) the right height? (2) too low? (3) too high? 9d:____

e. Are/were you able to rest your back fully and comfortably against the back support? (1=Yes, 2=No, 9=DNK) 9e:____

10. a. Are/were you paid an (1) hourly wage or (2) incentive wage (piece rate)? 10a:____

b. Is either the worker (1) before you or (2) after you, in the production line, paid an incentive? (0=Neither) 10b:____

11. a. Is/was there a production quota? (1=Yes, 2=No, 9=DNK) 11a:____

b. Is/was your output measured by: 1=weight, 2=count, 3=board feet, 9=DNA 11b:____

c. Is/was your output measured by the: 1=batch, 2=hour, 3=day, 9=DNA 11c:____

d. Do you (1) have to keep up with a machine or fixed speed production line,
or (2) do you set your own work pace? 11d:_____
or (3) Other: _____

e. If you get tired and would like to slow down your work pace, what happens?

11e: _____

12. a. What type of wood do/did you work with?

1=Hardwood 2=Softwood 3=Both 9=DNK 12a:_____

13. a. How much training did you receive when you began this job? (hrs) 13a:_____
[Enter exact answer, or code for range. If "0," skip to question #14.]

0) No training at all 2) One to 4 hours 12) More than 8 hours
1) Less than 1 hour 6) Four to 8 hours 99) don't know

b. By whom were you trained? 13b:_____

1) Supervisor 2) Co-worker 3) Trainer/personnel officer 9) DNA

c. Did that training include health or safety? (1=Yes, 2=No, 9=DNA) 13c:_____

14. Again, for the usual job that you have worked in the past month (or: in your last month at this plant), please describe to me exactly what you are or were required to do on a typical day (or week).

[Enter codes for items "a" through "e:" 0=No; 1=Usual activities; 2=Regular relief work (at least once a week). Also describe any other tasks performed (as specifically as possible) in "f" through "h" and code these 1 or 2 as above.]

	ALSO ASK #	
a. Operate tool, machine, equipment (saw, sander, drill press, etc.)	[15-22]	14a:_____
b. Operate vehicle (forklift, crane, log train, etc.)	[23-28]	14b:_____
c. Manual material handling (lift, push, pull, carry, etc.)	[29-34]	14c:_____
d. Apply paint, varnish, or other finish (liquid or spray)	[35-36]	14d:_____
e. Inspect, sort, package	[37-39]	14e:_____
f. Other: _____	[40]	14f:_____
g. Other: _____	[41]	14g:_____
h. Other: _____	[42]	14h:_____

**IF OPERATE MACHINE (a) OR VEHICLE (b): "While you operate(d) this equipment, would you handle any stock by hand, such as lifting from a pallet to the machine?"
IF YES, code "c" above (1 or 2) and also ask the related questions.**

15. IF OPERATE TOOL/MACHINE: What type(s) of machines and tools do/did you use? **[The last column is for the answer to #16.]**

	TOOL/MACHINE TYPE (Code)	BRAND, SIZE, AGE, ETC.	HOURS/DAY [#16]
a.	_____(____)	_____	_____
b.	_____(____)	_____	_____
c.	_____(____)	_____	_____
d.	_____(____)	_____	_____
e.	_____(____)	_____	_____
f.	_____(____)	_____	_____

16. For each of the tools and machines that you just listed, about how many hours would you use it each day? **[Prompt with each item from list. Enter answer in the last column. If subject is not sure of the exact answer, choose the code for the closest range (below).]**

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

17. For each of the tools and machines that you listed, how much force does it take to use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." **[Prompt from tool/machine list in #15 above.]**

17a:_____ **17b:**_____ **17c:**_____ **17d:**_____ **17e:**_____ **17f:**_____

18. For each of the tools and machines that you listed, how much vibration do you feel when you use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[Prompt from tool list; 9=DNA, no vibration generated]**

18a:_____ **18b:**_____ **18c:**_____ **18d:**_____ **18e:**_____ **18f:**_____

19. For each of the tools that you hold in your hands, how much would you estimate that it weighs? (in pounds) **[Prompt from tool list; 9=DNA, not hand-held]**

19a:_____ **19b:**_____ **19c:**_____ **19d:**_____ **19e:**_____ **19f:**_____

20. For each machine where you feed stock by hand, what would you estimate is the weight of the stock that you would typically hold at one time? (in pounds) **[Prompt from tool list; 9=DNA, no stock feeding]**

20a:_____ **20b:**_____ **20c:**_____ **20d:**_____ **20e:**_____ **20f:**_____

21. For each machine where you feed wood by hand, about how often would you probably handle that stock in a typical hour? (times per hour) **[Prompt from tool list; 9=DNA, no stock feeding]**

21a:_____ **21b:**_____ **21c:**_____ **21d:**_____ **21e:**_____ **21f:**_____

22. For each of those machines and tools that you listed, is there any guarding or safety device on it to prevent injury? (This does not include ventilation or dust capture systems.) If so, what type of guard (if known)? Is the guard in its original condition? If not, in what way has it been altered? By whom and why? **[Prompt subject with items from tool list.]**

	PRESENT?*	TYPE OF GUARD	ALTERED?*	WHY?**	HOW?	BY WHOM?***
a.	_____	_____	_____	(___)	_____	(___)
b.	_____	_____	_____	(___)	_____	(___)
c.	_____	_____	_____	(___)	_____	(___)
d.	_____	_____	_____	(___)	_____	(___)
e.	_____	_____	_____	(___)	_____	(___)
f.	_____	_____	_____	(___)	_____	(___)

(*1=Yes, 2=No, 9=DNK)

**** 1=guard got in the way**
2=to work faster
3=other (specify)
4=DNK

***** 1=self**
2=another worker
3=supervisor
4=other, DNK

23. IF OPERATE A VEHICLE: What type(s) of vehicle do/did you operate? **[The last column is for the answer to #24.]**

	VEHICLE TYPE (Code)	BRAND, SIZE, AGE, ETC.	HOURS/DAY (#24)
a.	_____(___)	_____	_____
b.	_____(___)	_____	_____
c.	_____(___)	_____	_____
d.	_____(___)	_____	_____

24. For each vehicle that you just mentioned, about how many hours would you operate it each day? **[Prompt from vehicle list in #23 above. Enter answer in the last column for each vehicle that the worker operates. If subject is not sure of the exact answer, choose the code for the closest range (below).]**

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

25. For each of these vehicles, how much upper body force does it take to operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." **[Prompt from vehicle list on previous page.]**

25a:_____ **25b:**_____ **25c:**_____ **25d:**_____

26. For each of these vehicles, how much vibration do you feel in your hands or arms when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[Prompt from vehicle list. "Vibration" means both from the engine and from impact on irregular floor surfaces. 9=DNA, no vibration]**

26a:____ **26b:**____ **26c:**____ **26d:**____

27. For each of these vehicles, how much vibration do you feel in your back or legs when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[Prompt from vehicle list. 9=DNA, no vibration]**

27a:____ **27b:**____ **27c:**____ **27d:**____

28. For each of these vehicles, how would you describe the comfort and support of the seat? On a scale from 1 to 7, 1 is "very, very soft; no shape or support at all," 4 is "padded but firm; the shape fits my back well," and 7 is "very, very hard; uncomfor-able to lean against." **[Prompt from list on previous page. 9=DNA, no seat]**

28a:____ **28b:**____ **28c:**____ **28d:**____

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29. IF HANDLE WOOD OR OTHER ITEMS BY HAND: What objects or materials do/did you handle in a typical day? Please be specific (eg., dimensional lumber, box of furniture pins). **[Ask size (distance between hands when grasped) and weight of each item, bundle, box handled.] [The last column is for the answer to #30.]**

	PRODUCT	SIZE (inches)	WEIGHT (lbs)*	HANDLING [#30]	HRS [#31]
a.					
b.					
c.					
d.					
e.					
f.					

*** If exact weight not known:**

2) 5 lb or less	25) 50 lb or less
5) 10 lb or less	60) more than 50 lb
10) 20 lb or less	99) unknown

[If one end is supported by another person or by a work surface, divide the total object weight in half. Try to get a single number for the most usual object lifted.]

30. For each item or load that you listed, how do/did you handle it? **[Prompt from product list in #29 above, and ask for one primary activity. Put the number that applies after each item on the list above.]**

1) lift 2) lower 3) carry 4) push 5) pull 7) drag on ground
6) **other:** _____

(printed 3/15/93)

31. In a typical day, for how many hours would you be regularly lifting or handling each of these items or loads? **[Prompt from product list on previous page. Enter answer in the last column. If subject is not sure of the exact answer, choose the code for the closest range (below).]**

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

32. a. On a typical day, which of the above items is the <u>average</u> or <u>usual</u> load that you lift? **[Enter letter "a" through "f" from previous list.]** 32a:_____

b. How often would you lift it (or objects of the same weight)? (times: per 1=hour, 2=day) 32b:_____ per:_____

c. About how many steps would you have to carry it? 32c:_____

d. Is there any lifting device (crane, hoist, dolly, etc.) to help you with this load? (1=Yes, 2=No) 32d:_____

e. If YES: When or why is it <u>not</u> used? 32e:_____

33. a. On a typical day, which is the <u>heaviest</u> object that you lift at work? 33a:_____ **[Enter letter from list. Skip the rest of #33 if this is the same answer as #32.]**

b. How often would you lift it (or objects of the same weight)? (times: per 1=hour, 2=day) 33b:_____ per:_____

c. About how many steps would you have to carry it? 33c:_____

d. Is there any lifting device (crane, hoist, dolly, etc.) to help you with this load? (1=Yes, 2=No) 33d:_____

e. If YES: When or why is it <u>not</u> used? 33e:_____

34. How would you rate the overall intensity of <u>lifting or handling</u> in this job? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very heavy." 34:_____

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35. <u>IF PAINT OR SPRAY FINISHES:</u> What type(s) of paints or other finishes do/did you apply in a typical day?

	PAINT/FINISH TYPE(S)	(Code)	HOURS/DAY
a.	_____	(___)	_____
b.	_____	(___)	_____
c.	_____	(___)	_____
d.	_____	(___)	_____
e.	_____	(___)	_____

36. About how many hours do you apply each one on a typical day? **[Enter exact answer above, or choose code for range.]**
1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

37. IF INSPECT, SORT, OR PACKAGE: What item(s) do/did you handle in a typical day?

	OBJECT TYPE(S)	(Code)	HOURS/DAY	HOW MANY?
a.	_____	(___)	_____	____ per:____
b.	_____	(___)	_____	____ per:____
c.	_____	(___)	_____	____ per:____
d.	_____	(___)	_____	____ per:____
e.	_____	(___)	_____	____ per:____

38. For each object: About how many hours do/did you handle this on a typical day?37:____
[Enter exact answer above, or choose code for range.]

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

39. For each object: About how many of these items do/did you typically handle per hour or per day? [Enter exact answer above. Items: per 1=hour, 2=day.]

---

40. FOR FIRST OTHER TASK: About how many hours do/did you do this each day? 40:____
[Enter exact answer, or choose code for range.]

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

41. FOR SECOND OTHER TASK: About how many hours do/did you do this each day? 41:____
[Enter exact answer, or choose code for range.]

1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

42. FOR THIRD OTHER TASK: About how many hours do/did you do this each day? 42:____
[Enter exact answer, or choose code for range.]
1) <1 hr 2) 1-2 hrs 3) 2-4 hrs 6) 4-8 hrs 12) >8 hrs 99) don't know

---

"Now I have some very specific questions about the way you have (or had) to move and hold your body, in the job that you usually work(ed). Please listen carefully and think about the specific part of the body that I mean. In your usual job, how often do/did you have to:"

43. Reach up to shoulder height or above? 43:____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 43a:____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 43b:____

44. Reach forward of your body with your whole arm? 44:_____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 44a:_____

b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 44b:_____

45. Bend forward at the waist or stoop down toward the floor? 45:_____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 45a:_____

b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 45b:_____

46. Bend, lean or twist your body to one side or the other? 46:_____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 46a:_____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 46b:_____

47. Twist your arm or forearm, like when you turn a doorknob? 47:_____

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 47a:_____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 47b:_____

48. Bend your <u>wrist</u> in any direction? 48:_____
[Distinguish from <u>twisting arm</u> in #42: for example, to operate a tool or load a machine? or like when you throw a baseball?]

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 48a:_____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 48b:_____

49. Pinch your fingers together, for example, to grip a part or operate a tool? 49:_____
[To exert pressure with fingertips only, versus holding a handle in the palm of the hand.]

1) Rarely 2) Sometimes 3) Often 4) Constantly

a. Do you stay in that position for 5 seconds or more? (1=Yes, 2=No) 49a:_____
b. Do you lift or hold 5 pounds or more in that position? (1=Yes, 2=No) 49b:_____

50. a. On a typical day, how often would you put your hand(s) near a moving saw blade? (times: per 1=hour, 2=day) 50a:_____ per:_____

b. On a typical day, how often would you put your hand(s) near a moving "pinch point" in a piece of machinery? (times: per 1=hour, 2=day) 50b:_____ per:_____

"Remember that we are still talking about your usual job in the past month (or: in the last full month of work at this plant. For all of the following questions, please choose the answer that comes closest to describing that job."

51. This job requires that I learn new things. 51:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

52. This job involves a lot of repetitive work. 52:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

53. This job requires me to be creative. 53:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

54. This job allows me to make a lot of decisions on my own. 54:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

55. This job requires a high level of skill. 55:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

56. On this job, I have very little freedom to decide how I do my work. 56:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

57. I get to do a variety of different things on this job. 57:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

58. I have a lot of say about what happens on this job. 58:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

59. I have an opportunity to develop my own special abilities. 59:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

60. I have significant influence over decisions in my work group or unit. 60:____

8) I work alone 1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

61. My work group or unit makes decisions democratically. 61:____

8) I work alone 1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

62. I have at least some chance that my ideas will be considered about company policy (hiring, firing, wage levels, plant closings, new machinery purchases, etc.) 62:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

63. I supervise other people as part of my job. 63:____

1) No 2) Yes, 1-4 people 3) Yes, 5-10 people 4) Yes, 11-20 people 5) Yes, more than 20

64. My job requires working very fast. 64:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

65. My job requires working very hard. 65:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

66. My job requires lots of physical effort. 66:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

67. I am not asked to do an excessive amount of work. 67:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

68. I have enough time to get the job done. 68:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

69. I am often required to move or lift very heavy loads on my job. 69:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

70. My work requires rapid and continuous physical activity. 70:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

71. I am free from conflicting demands that others make. 71:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

72. My job is very hectic. 72:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

73. How would you describe the <u>pace of work</u> on a typical day? On a scale from 1 to 7, 1 is "very, very slow and relaxed" and 7 is "very, very fast and pressured." 73:____

74. How would you describe the <u>physical intensity of work</u> on a typical day? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." 74:____

75. I am often required to work for long periods with my body in physically awkward positions. 75:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

76. I am required to work for long periods with my head or arms in physically awkward positions. 76:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

77. If you needed to change the hour when you start or end your workday, would it be possible? 77:____

1) Very difficult
2) I could get changes aproved for special situations
3) Yes, my schedule is already flexible

78. How steady is your work? 78:____

1) Regular and steady 4) Seasonal 4) Frequent layoffs 9) Other
4) Both seasonal and frequent layoffs

79. My job security is good. 79:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

80. In your last year of work, how often were you in a situation where you faced job loss or layoff? 80:____

1) Never 2) Faced the possibility once 3) Faced the possibility more than once 4) Actually laid off

81. Sometimes people permanently lose jobs they want to keep. How likely is it, during the next couple of years, that you will lose your job? 81:____

1) Not at all likely 2) Not too likely 3) Somewhat likely 4) Very likely 5) Was laid off from that job

82. On a typical day, how would you describe the <u>amount of dust in the air</u>? On a scale from 1 to 7, 1 is "very, very little; no problem with visibility" and 7 is "very, very thick; hard to see." 82:____

a. Do you know what type(s) of dust is there? 82a:____

1=wood; 2=plastic; 3=other:_____

83. On a typical day, how would you describe the <u>smell of chemicals in the air</u>? On a scale from 1 to 7, 1 is "very, very little at any time during the day" and 7 is "very, very strong; might cause dizziness or headache." 83:____

a. Do you know what type(s) of chemicals they are? 83a:____

1=solvent-based paints/finishes; 2=acrylics; 3=epoxies; 4=other:_____

84. Do you have a problem with exposure to things placed or stored dangerously on this job? 84:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

85. Do you have a problem with exposure to dirty or badly maintained areas at your workplace? 85:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

86. Do you have a problem with dangerous tools, machinery, or equipment? 86:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

87. Do you have a problem with exposure to fire, burns or shocks? 87:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

88. While you are working, how loud would you have to talk to be heard by someone standing next to you? 88:____

1) Whisper 2) Normal voice 3) Loud voice 4) Shout

89. Do you have a problem with exposure to dangerous work methods on this job? 89:____

0) Not exposed 1) I am exposed but it is a slight problem 2) I am exposed and it is a sizeable or great problem

90. My supervisor is concerned about the welfare of those under him. 90:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

91. My supervisor pays attention to what I am saying. 91:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

92. My supervisor is helpful in getting the job done. 92:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

93. My supervisor is successful in getting people to work together. 93:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

94. People I work with are competent in doing their jobs. 94:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

95. People I work with take a personal interest in me. 95:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

96. People I work with are friendly. 96:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

97. People I work with are helpful in getting the job done. 97:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

98. During the past 12 months (that you were working), how often have/had you experienced becoming tired at work in a very short period of time? 98:____
1) Often 2) Sometimes 3) Rarely 4) Never

99. During the past 12 months, how often have you had trouble with aches in the lower back?

99:____

1) Often 2) Sometimes 3) Rarely 4) Never

100. During the past 12 months, how often have you had trouble with aches in the neck or upper back? 100:____

1) Often 2) Sometimes 3) Rarely 4) Never

101. During the past 12 months, how often have you had trouble with aches in the hands, wrists, or arms?

1) Often 2) Sometimes 3) Rarely 4) Never 101:____

102. My work involves using computer systems or automated equipment. 102:____

1) Not at all 2) Occasionally 3) Often 4) Continuously

If "2" or higher, please **describe**: _____

_____

"Please answer the next set of questions based on your <u>overall experience</u> with all of the equipment or systems you work with. That is, give your 'average' impression, if you work with several systems that are different."

103. I can control the pace of my work when I work with our equipment. 103:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

104. I often have to wait long intervals before the equipment can process my work. 104:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

105. The equipment checks the speed or accuracy of my work for my supervisor. 105:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

106. I often have to work fast to keep up with the equipment. 106:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

107. During the last 12 months at work, have/had you experienced any pain of the back, neck, shoulder, wrist/hand, or leg <u>that occurred more than three times OR lasted more than one week</u>?

a. Back? (1=Yes, 2=No, 9=DNK) 107a:____

b. Neck? (1=Yes, 2=No, 9=DNK) 107b:____

c. Shoulder? (1=Yes, 2=No, 9=DNK) 107c:____

d. Wrist or hand? (1=Yes, 2=No, 9=DNK) 107d:____

e. Leg, knee, or ankle? (1=Yes, 2=No, 9=DNK) 107e:____

IF YES TO ANY: Ask #108. If more than one, ask for worst (enter letter, "a" through "e") and refer to that body area for #108. 107_wors:____

IF NO TO ALL: Skip to Section C on page 16.

108. a. When did you first notice the pain? (mo/yr) 108a:____/____

b. Did the pain start suddenly, or did it develop gradually over time? 108b:____

1) Sudden onset 2) Gradual onset 3) Gradual first, then sudden aggravation
4) Other:_____

c. Were you doing the same job at that time? (1=Yes, 2=No, 9=DNK) 108c:____

IF NO: Job title? (be specific) 108c_job:_____

d. At the time when this pain was <u>most severe</u>, how long had it lasted (or: how long did it usually last)? 108d:____

1) Less than 1 hour
2) Less than 1 day
3) Less than 1 week
4) Less than 1 month
5) Less than 6 months
6) More than 6 months (continuously)

e. How often had you had this pain or discomfort, in the last 12 months at work? 108e:____ per:____

(# times: per 1=hour, 2=day, 3=month, 4=year, 9=DNA)

(0=never before; 99=DNK; 88=constantly)

f. During the past year at work, when and if you were away from work for one week or more, did the pain: 108f:____

1) get better 2) get worse 3) not change 4) never away that long 9) DNA or DNK

C. **EVENTS AT THE INDEX TIME:**

1. Since you have worked in this industry, have you ever had a "near miss" at work? That is, can you think of a time when something happened that <u>almost</u> caused you to be injured? (1=Yes, 2=No, 9=DNK) C1:____

IF NO: Ask #2 through #4; then skip to Section D, #35 on page 22.
IF YES: Skip to #5.

---

2. What was the last full day that you worked at <u>company*</u>? (mo/day/yr) C2:____/____/____

3. What shift did you work that day? 1) first 2) second 3) third 9) DNK C3:____

4. a. How many days had you worked continuously, since your last day off, <u>before</u> that day? (days; 9=DNK) C4a:____

   b. How many days did you work any <u>overtime</u> (more than 8 hours per shift) in the week (7 days) <u>before</u> that day? (days; 9=DNK) C4b:____

---

5. What was the day on which that "near miss" occurred? (mo/day/yr) C5:____/____/____

During which this occur?

6. ~~What~~ shift did ~~you work that day~~? 1) first 2) second 3) third 9) DNK C6:____

7. a. How many days had you worked continuously, since your last day off, <u>before</u> that day? (days; 9=DNK) C7a:____

   b. How many days did you work any <u>overtime</u> (more than 8 hours per shift) in the week (7 days) <u>before</u> that day? (days; 9=DNK) C7b:____

8. At the time of the "near miss," were you working your usual job? C8:____
   1) Usual job => **CONTINUE WITH #9**
   2) <u>Not</u> usual job => **INSERT QUESTIONNAIRE 2B HERE.**

9. **Please describe in your own words what happened. [INTERVIEWER: Refer to this narrative as needed in asking the questions that follow.]**

_____

_____

_____

10. What were you doing when (or just before) this "near miss" occurred? C10:____
    [Select <u>only one</u> of the choices below; enter code in #7 here.] <u>GO TO</u>

1) Operate machine, tool, equipment	[11]	
2) Operate vehicle	[13]	
3) Manual material handling (lift, push, pull, carry)	[15]	
4) Apply paint, varnish, or other finish (liquid or spray)	[17]	
5) Inspect, sort, package	[18]	
6) Body motion with hands empty (reach, twist, bend, etc.)	[19]	
7) Other (please describe): _____	[20]	C10oth:____
9) Unknown	[20]	

11. IF OPERATING MACHINE/TOOL/EQUIPMENT WHEN NEAR MISS:

a. What was the machine or tool that you were using when the near miss occurred?

If previously described [#15, p. 4], indicate which tool or machine by letter ("a" - "f"); then SKIP to #12. C11a:____

IF NOT: Machine/tool type: _____(____)

Brand, size, age, etc.: _____

b. How much force does it take to use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard:" C11b:____

c. How much vibration do you feel when you use it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[9=DNA, no vibn]** C11c:____

d. IF HAND-HELD ONLY: Approximately how much does it weigh? (lbs) **[99=DNA]** C11d:____

e. IF FEED WOOD BY HAND: What would you estimate is the weight of the lumber or bundle of parts that you hold at one time? (lbs) **[99=DNA]** C11e:____

f. Describe what guarding, if any, is provided to prevent injury. **"Is the guarding in its original condition? If altered, in what way? By whom, how and why?" (*1=Yes, 2=No, 9=DNK)**

GUARD?*	TYPE	ALTERED?*	WHY?	HOW?	BY WHOM?
____	_____	____	_____		

12. a. At the time of the near miss, what exactly were you doing with the tool? C12a:____

1) operate 2) pick up 3) put down 4) hold
5) other: _____
9) don't know

b. What else were you doing at that moment?

1) bend body forward at waist
2) twist or bend body sideways at waist
3) reach arm up
4) reach arm forward
5) twist arm
6) other: _____
9) no secondary activity; don't know

c. Was this the correct tool to use for the job? (1=Yes, 2=No, 9=DNK) C12c:____

d. Had the tool been properly maintained? (1=Yes, 2=No, 9=DNK) C12d:____

13. IF OPERATING VEHICLE WHEN NEAR MISS:

a. What type of vehicle were you operating when the near miss occurred?

If previously described [#23, p. 5], indicate which vehicle by letter ("a" - "f"); then SKIP to #14. C13a:_____

IF NOT: Vehicle type: _____(____)

Brand, size, age, etc.: _____

b. How much upper body force does it take to operate this vehicle? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." C13b:_____

c. How much vibration do you feel in your hands or arms when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **["Vibration:" both engine and impact. 9=DNA, no vibrn]** C13c:_____

d. How much vibration do you feel in your back or legs when you operate it? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very forceful." **[9=DNA, no vibration]** C13d:_____

e. How would you describe the comfort and support of the seat? On a scale from 1 to 7, 1 is "very, very soft; no shape or support at all," 4 is "padded but firm; the shape fits my back well," and 7 is "very, very hard and rigid; I cannot lean back against it." **[9=DNA, no seat]** C13e:_____

14. a. What exactly were you doing when the near miss occurred? C14a:_____

1) operate
2) enter
3) leave
4) climb up
5) climb down
6) other:_____

b. Were you doing anything else at that moment? C14b:_____

1) bend body forward at waist
2) twist or bend body sideways at waist
3) reach arm up
4) reach arm forward
5) twist arm
6) other: _____
9) no secondary activity; don't know

c. Had the vehicle been properly maintained? (1=Yes, 2=No, 9=DNK) C14c:_____

---

15. IF HANDLING MATERIALS WHEN NEAR MISS:

a. What was the object that you were lifting or handling when the near miss occurred?

If previously described [#29, p. 6], indicate which object by letter ("a" - "f"); then SKIP to #16. C15a:_____

IF NOT: Please describe specifically (eg., dimensional lumber, box of furniture pins). **[Ask size (distance between hands when grasped) and weight of item.]**

PRODUCT TYPE	(Code)	SIZE (inches)	WEIGHT (lbs)*
_____	(___)	_____	_____

* If exact weight not known:

2) 5 lb or less	25) 50 lb or less
5) 10 lb or less	60) more than 50 lb
10) 20 lb or less	99) unknown

16. a. What exactly were you doing at that moment? C16a:____

1) lift
2) lower
3) carry (while walking)
4) push
5) pull, drag
6) hold object still
7) try to disentangle from other objects
8) **other:**_____
9) don't know

b. Were you doing anything else at the same time? C16b:____

1) walk/carry
2) bend body forward with object in hand
3) twist body or bend sideways at waist with object in hand
4) reach arm up with object in hand
5) reach arm forward with object in hand
6) twist arm with object in hand
7) **other:** _____
9) none/don't know

---

17. IF APPLYING PAINT OR OTHER FINISH:

a. What was the paint or finish that you were applying when the near miss occurred?

If previously described [#35, p. 7], indicate which finish by letter ("a" - "f"); then SKIP to #18. C17a:____

b. IF NO, please describe **Type:**_____

---

18. IF INSPECTING/SORTING/PACKAGING:

a. What was the object that you were handling when the near miss occurred?

If previously described [#37, p. 8], indicate which object by letter ("a" - "f"); then SKIP to #19. C18a:____

b. IF NO, please describe **Type:**_____

---

19. IF BODILY MOTION WHEN THE NEAR MISS OCCURRED (NO LOAD IN HANDS):

a. What exactly were you doing when the near miss occurred? C19a:____

1) walk
2) run
3) stand
4) sit
9) don't know
5) climb up
6) climb down
7) step up
8) step down
0) other: _____

b. Were you doing anything else at the same time? C19b:____

1) bend body forward at waist
2) twist or bend body sideways at waist
3) reach arm up
4) reach arm forward
5) twist arm
6) other: _____
7) walk, run
8) climb stairs or ladder
9) no secondary activity; don't know

---

20. a. Was there a sudden interruption in the flow of activity, or "accident," just before the near miss occurred? (1=Yes, 2=No, 9=DNK)
[INTERVIEWER: Explain if needed or read examples] C20a:____

b. If YES: What was the cause of the interruption? C20b:____

1) slip, trip, misstep
2) lost grip
3) blow
4) wood kickback (from saw)
5) vehicle collision
6) machine repeat, malfunction, failure
7) fire or explosion
8) other: _____
9) DNK

21. On the day that the near miss occurred, was there any problem with the floor conditions (for example, slippery floor from moisture, dust or woodchips)? C21:____

0) Not a problem 1) A slight problem 2) A sizeable or great problem

22. On the day that the near miss occurred, how loud did you have to talk to be heard by someone standing next to you? C22:____

1) Whisper 2) Normal voice 3) Loud voice 4) Shout

23. How would you describe the temperature on the day that the near miss occurred? On a scale from 1 to 7, 1 is "very, very cold" and 7 is "very, very hot." C23:____

24. How would you describe the lighting on the day that the near miss occurred? On a scale from 1 to 7, 1 is "very, very dim" and 7 is "very, very bright." C24:____

25. How would you describe the physical intensity of work on the day that the near miss occurred? On a scale from 1 to 7, 1 is "very, very light" and 7 is "very, very hard." C25:____

26. How would you describe the pace of work on the day that the near miss occurred? On a scale from 1 to 7, 1 is "very, very slow and relaxed" and 7 is "very, very fast and pressured." C26:_____

27. On the day that the near miss occurred, was there any problem with staffing levels (for example, an unusual number of people out of work in your department)? C27:_____

0) Not a problem 1) A slight problem 2) A sizeable or great problem

IF YES, **Describe:** _____

28. How would you describe the amount of dust in the air on the day that the near miss occurred? On a scale from 1 to 7, 1 is "very, very little; no problem with visibility" and 7 is "very, very thick; hard to see." C28:_____

29. How would you describe the smell of chemicals in the air on the day that the near miss occurred? On a scale from 1 to 7, 1 is "very, very little at any time during the day" and 7 is "very, very strong; might cause dizziness or headache." C29:_____

30. Were you using any form of personal protective equipment at the time that the near miss occurred? **(1=Yes, 2=None) [IF NONE, go to #32.]** C30:_____

[INTERVIEWER: Read from list below, one at a time.
Code "Wearing?" (*) 1=Yes, 2=No. For each "YES," ask for type and description.]

	PPE TYPE	WEARING?*	SPECIFIC BRAND, SIZE, TYPE
a.	Gloves:	_____	_____
b.	Dust mask/respirator:	_____	_____
c.	Safety shoes:	_____	_____
d.	Leather apron, sleeves, leggings:	_____	_____
e.	Hearing protection:	_____	_____
f.	Hard hat:	_____	_____
g.	Safety glasses/goggles:	_____	_____
h.	Other:	_____	_____

31. If you were wearing gloves at that time, how would you rate the fit and thickness of your gloves on a scale from 1 to 7, where 1 is "very, very small and tight," 4 is "fit perfectly," and 7 is "very, very large and bulky:" **[9=DNA, no gloves]** C31:_____

32. Would it have been possible for an injury to result from this near miss? (1=Yes, 2=No, 9=DNK) C32:____

IF YES: **How?** _____

_____

_____

33. To your knowledge, has the same type of incident occurred at another time, either to you or to someone else? (1=Yes, 2=No, 9=DNK) C33:____

IF YES: Was that (1) in the same job as yours, or

(2) in a different job or area in the plant? C33a:____

Which job?: _____

34. What could be done to prevent this or similar incidents from occurring in the future?

_____

_____

_____

D. **GENERAL CONDITIONS OF EMPLOYMENT**:
"Now I'd like to verify a few facts about your workplace."

35. a. Are you a member of a union or employee association? C35a:____
0) No 1) UPIU 2) IBCJ 3) Teamsters 4) **Other**: _____

b. **IF NO**: Is there a labor union in the plant? **[SKIP TO #37]** C35b:____
0) No 1) UPIU 2) IBCJ 3) Teamsters 4) **Other**: _____

36. My union or employee association is influential in affecting company policy. C36:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) Not a member

37. I have influence over the policies of the union or employee association. C37:____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) Not a member

38. a. Have you ever received any training from your current employer about any hazards on your job or how to protect your health and safety? (1=Yes, 2=No, 9=DNK) C38a:____

b. **IF YES**: How much training? (hours; 99=DNA, DNK, don't remember) C38b:____

What did it cover? **Describe**: _____

_____

39. Do you know of any health and safety program or services in your plant? For example (read list):

(1=Yes, 2=No, 9=DNK)

a) Right-to-know training C39a:_____
b) Safety or ergonomics training C39b:_____
c) Management safety committee C39c:_____
d) Joint labor-management safety committee C39d:_____
e) Lockout/tagout program C39e:_____
f) OSHA injury log posted yearly C39f:_____
g) Posted emergency procedures C39g:_____
h) Nurse or paramedic on premises C39h:_____
i) **Other**: _____

40. The health and safety training provided by my employer has helped me or other workers to avoid work-related injury or disease. C40:_____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) No training

41. My employer is willing to spend money to provide a safely engineered workplace, such as guards on machines, workstations that fit the human body, etc. C41:_____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree

42. The plant safety director and/or committee is genuinely concerned and has taken constructive measures to prevent work-related injury or disease. C42:_____

1) Strongly disagree 2) Disagree 3) Agree 4) Strongly agree 8) Don't know; no program

43. Have you ever reported a safety or health hazard in this plant to a supervisor? (1=Yes, 2=No, 9=DNK) C43:_____

IF YES: What was the response? (select closest answer) C43a:_____

1) Constructive actions were taken (eg., engineering controls, training)
2) There was no response
3) Told to change "unsafe" behavior or just to "be careful"
4) My job security was threatened (directly or indirectly)
5) Overt reprisals (formal reprimand, involuntary transfer, etc.)
6) **Other**: _____

44. What do you think would be the most effective way(s) to reduce injuries in sawmills?

_____

_____

_____

_____

"We're almost done. I just need to ask you a few questions about yourself.".

45. In what month and year were you born? (mo/yr) C45:____/____

46. Gender: 1) Male 2) Female C46:____

47. Race/Ethnicity: 1) White 2) Black 3) Native Amer. 4) Hispanic C47:____
5) French Canadian 6) **Other** _____

48. a. Height (feet & inches) C48a:____ft ____in
b. Weight (lbs) C48b:____

49. a. Which hand do you write with? 1) Right 2) Left 3) Either/No pref C49a:____
b. Which hand do you use more at work? 1) Right 2) Left 3) Both/No pref C49b:____

50. What is your education (highest grade completed)? C50:____

6) Elementary school 14) Junior college (1-2 yrs)
9) Junior high (9th grade) 16) College graduate
12) High school 18) Graduate school
12) Vocational/technical school (1=Yes) C50vt:____

51. What level of skill is required on this job, in terms of years of formal training? (This is not necessarily the same as your education.) C51:____

6) Elementary school only 14) Some college education (1-2 yrs)
9) Junior high (9th grade) 16) College graduate (4 years)
12) High school graduate 18) Graduate school
12) Vocational/technical school graduate (1=Yes) C51vt:____

52. One last question: We are interested in learning something about the relation between noise and safety in the workplace.

a. Have you had your hearing tested at this job? (1=Yes, 2=No, 9=DNK) C52a:____

b. Have you seen any noise measurements taken at this job? (1=Yes, 2=No) C52b:____

c. Would you be willing to sign a release form, authorizing your employer to give us copies of any noise measurements taken in your work locations and copies of any hearing tests that you have been given? (1=Yes, 2=No) C52c:____
[=> INTERVIEWER: Please ask even if s/he says "No" to both "a" and "b".]

IF YES: "To what address should we send it? **[enter on cover page]** We'll include a stamped, self-addressed envelope, so all that you have to do is to sign it and return it to us immediately."

53. Would you like to receive a written summary of this study when it is completed? (It will probably be a couple of years from now.) (1=Yes, 2=No) C53:____

IF YES: To what address should we send it? **[enter on cover page]**

* **THANK YOU VERY MUCH FOR PARTICIPATING IN THIS SURVEY** *

APPENDIX B

Job Title Groupings

Job Title Groupings

Machine Operators/Attendants, Clearers, Sorters

Assembler, Fence Assembler, Assembly Leadman, Automatic Clothespin Assembler
Autostacker Operator, Automatic Operator, Automatic Sorter, Board Sorter Operator
Board Sticker
Boiler Operator
Bulledger Operator, Bulledge Clearer
Chain Operator, Green Chain Operator
Chipper Operator, Chipper Foreman
Converter Operator
Cotton Tipper, Tipper Operator
Debarker Operator, Ring Debarker Operator
Dowel Cutter, Dowel Sorter, Pin Cutter/Clipper
Edger Operator, Horizontal Edger Operator
Equipment Operator
Machine Operator
Finish Sander
Fitter
Grinder Operator
Handle Finish Operator
Laminator
Lathe Operator
Planer Laborer, Planer Operator, Planer Setup Operator
Sawyer, Chop Sawyer, Dowel Sawyer, Resaw Sawyer, Resaw Clearer
Band Saw Operator, Band Saw Helper, Chop Saw Operator, Resaw Operator, Rip Saw Operator, Scragg Saw Operator, Trim Saw Operator,
Setup Operator, Setup Lead Man
Shavings Bagger
Slasher Operator
Spring Man
Stacker, Stacking Machine Operator, Picker Stacker, Unstacker Operator
Sticker Maker
Strapper
Taker
Tallyman
The Wall
Unscrambling Operator
Watchmold Press Operator
Winder Operator
Wood Craft Operator
Wrapper, Wire Wrapper

Job Title Groupings (continued)

Foreman, Supervisor

Crew Leader
Carpenter Foreman, Finish Foreman, Maintenance Foreman, Pallet Shop Foreman, Production Foreman
Assembly & Packing Supervisor, Finish Room Supervisor, Planer Mill Supervisor, Production Supervisor, Temporary Supervisor
Assistant Manager/Assistant Superintendent

Skilled Trades (Use Tools)

Boilermaker
Cabinet Maker, Furniture Builder
Electrician
Knife Grinder, Saw Filer, Apprentice Saw Filer
Machinist
Mechanic's helper, Mechanic
Millwright
Welder

Heavy Equipment Operator

Crane Operator, Hoist Worker
Forklift Operator
Gravel Skidder Driver
Loader Operator
Truck Driver, Truck Driver & Self Loader; Truck Unloader

Maintenance, Material Handler

Cleanup Person
Construction/Maintenance Worker
General Spare, Floor Boy, Floater, Extra Operations
Log Deck Clean-up Operator
Logger
Lumber Yard Worker
Manual Materials Handler, Handler, Senior Materials Handler, MMH & Forklift Operator
Shipper
Warehouse Worker

Job Title Groupings (continued)

Inspector, Grader, Other Skilled Worker (Non Tool User)

Inspector, Panel Flow Inspector
Kiln Operator
Lumber Grader, Certified Lumber Grader, Grader Trainee, Rough Grader, Flooring Grader, Assistant Grader
Packer, Counter Operator, Production Clerk
Painter, Dipper, Finish Painter, Spray Painter
Pond Operator, Pond Attendant
Scaling & Security

Non-wood Industry & Non-production

Autobody Repair
Contractor
Mental Health Resident
Nurse's Aid
Pharmacy
Prototype engineer
Retail clerk
Safety Evaluator
Sales Person
Screen Printer
Secretary
Security Guard; Nightwatchman
Sterile Wrap

APPENDIX C

Workers' Suggestions to Reduce Injuries in Wood Processing Facilities

Automation. The more people involved in certain tasks the more likely someone will get hurt.
Teach people how to be careful
Management and employees have to get invoved w/ these safety problems. They just can't walk away. Things get overlooked until people get hurt. Safety personn
Not much
People don't listen to good advice.
Pay Attention
No Idea
Pay attention better. People don't look out for their co-workers.
Pay attention
Be careful of yourself and respect the equipment you use
Not any one thing, make people aware and educate them about what can happen, have it on your mind what can happen, concentrate.
When you slow the pace improves quality. Lower quality with rkushing and hurrying
People get in routine which sometimes is wrong. Know something is going to happen. Need to slow down production.
Regular meetings, let people know about safety. Proper training knowing first aid, ongoing training
Don't Know
Can't. Accidents happen. Acts of God
Pay attention, use common sense
Specific safety training about specific job safety hazards.
Safety incentives. Safety classes.
Cut less wood.
Air conditioning, climate control in the mill. Flashing lights
Have alert workers and workers willing to learn about safety.
Training, health officials should come into plant to advise us on how not to get hurt.
Effective training, use common sense. Train people to be careful. Wear wrist supports or other things to make hands less stressed.
Slow it down, give more people more time to do their job and they won't get hurt so much. Worker's need to pay attention.
Better training programs
Slow down the pace. Do things right way.
More guards, Safety procedures implemented, fix machinery when broken.
Does not make a difference how safe you make anything, someone will get hurt. The enclosures around machines are a bigger hazard then the way they were in the
When something needs to be made more safe employees should report it right away and it should be fixed right away.
To instill in employees to "pay attention". Most accidents seem to happen when someone doesn't know whats going on around them.
Common sense: safe practice of work habits, knowledge of safety equipment, what is available for their safety.
Need ongoing awareness program. People are apt to get careless with so much repetition and familiarity.
A need to enforce safety rules.
People need to be constantly reminded to use caution around tools and machines. They tend to let their guard down after getting familiar with the equipment. Mo
Kep after people to be careful. Stress safety precautions/measures.
More safety education.
Human error is the biggest cause. Better training, provide a better workplace.
Slow down the work pace; too fast.
Take it easy, get mind straight, work slower, pay attention more, keep mind on work doing, do things right away, dont pu things off.
Company did all they could; people should pay attention and be aware more of their machinery, etc.
When someone has a request for a safety installation or repair, take care of it right away.
Good training, he adds that he hates OSHA;"they dont know what they're doing, make ridiculous rules and putting small businessman out of business, they should g
"Hard to say, very different for each person."
Education and reinforcement, get people involved, "get the other mills to see whats happened at Diamond and make the same changes, this industry would be a lot
Be more alert, dont get bored with routine, be alert for moving parts, be aware.
Combination of training, proper set-up and employer that cares
Slowing down operations, though would not be financially feasible.
Education, follow-up training, regular inspections of equipment, supervisors do not always look at the quality of job.
"Guys being careful"
"Diamond has a really good safety record."
Safety training for temporary workers as well as 'regular employees; temps come into the area without any safety training.
Less pressure
Use protective equipment and do the job in the right procedure, be cautious.

Company takes precautions. Where the safety guard cannot be worn the worker has to be cautious and do the work slowly. If possible, he should get another worke
Rotate people to another task after 2.5 hours doing the same task.
More safety awareness, pay attention to OSHA, slow down, work within rules, keep an open mind. She is very positive about changes that have occured within the c
Make sure people have safety training.
More training, more personnel training
More personal attention to job
hire better qualified people
can't think of anything - considers people around her pretty safety conscious
make sure everything done properly and people aware of how to properly operate equipment they're working with and not get too overconfident
pay attention to safety meetings, work carefully
report the safety hazard like dust on the floor
workers should be allowed to work at their own pace
training
more input from employees
shorter working hours(he has 12 hr shifts)/more stringent enforcement of safety rules they already have(such as hard hats)/listen more to workers
they've done it already
proper training, safety is number one - far above production at Robbins
more training in safety measures
more common sense
screen all applicants, too much carelessness - need to have proper training
they should practice being more careful
more instruction & training
more training for people - basic training
offer incentives/bonus to workers for lowering accidents/injury level. Workers need more training.
people should be reminded to stay alert on the job and not attempt to use equipment that they have not been trained on
more safety training
be careful
don't know, hard to make it 100% safe
slow pace down a little bit, they push too hard
don't work there, be careful
nothing more than what they're doing
don't know
lockout/tagout, without it people would have hands crushed, it is strongly enforced at Robbins
working together, helping each other, reporting hazards, finding safer ways, finding ways that are easier on our bodies
3 minute stretches for people who are carrying heavy loads, this should be allowed every hour
pay attention to what you are doing
bring unions into the plant, better safety committee that enforces the rules
don't know
make people aware of their lifting capabilities/communicate what they are doing and what's going on
training should be given to all employees about all jobs in sawmill, not just their own/workers should rotate so that everyone works some dangerous machines and
make people aware of hazards around them
be careful, watch out for yourself
do not know
job rotation
be careful, be trained fairly well on jobs
pay attention, be alert
more guards
make workman's compensation insurance more expensive/business-wise the company likes to keep people healthy because it's cheaper than retraining and paying costs
show people very carefully how to run machines/more training/let the person know that if they have a problem speak up/don't apply pressure that would prevent spe
pay attention/have more respect for machinery
slow pace down alittle/train 2 people instead of just one so that don't get person who doesn't know what they're doing on ajob
fitness program/peopls injured who are not active after work
no opinion
employee education/see benefits of training & be able to ID hazards

greater safety awareness
no opinion
no opinion
do things the right way/w/o haste/we move too quickly sometimes
analyze lifting problems
departmental meetings to bring up and discuss safety problems
no opinion
no opinion
overall increases safety awareness among employees
pay attention to what you are doing, make sure you have and use PPE
make sure new people who come in are trained well before being left alone with machinery
more training on machines
listen to people who do it everyday - listen to suggestions from workers
don't know
more careful attention to what you are doing
don't know, the company has a work-out center
safeguard things you're doing
eye and foot and hearing protection/he's half deaf from past exposures/how to lighten the lifting if possible
be careful
in her department allow more leeway on end of the wood, allow them to discard more so hand doesn't come so close to saw
"end the ignorance campaign" - people need to be more award about how they do their jobs
proper training
no opinion(s)
must be better ways to lift/most accidents around here from lifting/splinters are a hazard in this plant
adequate training/compliance with rules from employer/everyone is in charge of what he or she does/it's your own responsibility
be more aware of thngs around you/watch/don't put your hands where you can't see them
watch where you put your hands/reduce carelessness
more training on machines
99
that's a hard one/99/pay attention
right to know about where you're working in the mill/specific instruction about dangers where you are working
9, very good that way/they've covered everything on my job and adjusted the machine ergonomically
better communication between mgt & workers/listen and act on workers' ideas/make communication 50:50 - not power-oriented/listen to workers that do the jobs and
main thing is to think before you move/don't do something foolish and hurt somebody else/don't hurry/pay attention, keep your eyes open, take time/moving big fa
rotation/as a floater she has very few aches & pains/when she was a trimmer the job got to her/then started rotating and helped immensely
9/injuries caused by carelessness/people should be more careful/can't blame the industry
pay attention
make sure people wear PPE, pay attention
stricter enforcement of no horseplay/most injuries happen when people horsing around or because person so busy & trying to do 3-4 things at one time
make sure floors are clean/there are dowels on the floor/all in all it's pretty good here
people need to be careful, better training on alot of machines
immediate maintenance on broken guards on machines
if wrist is bothering you job rotation would be good/avoids people getting injured because stressed in some way/when work in same way for long times likely to g
rotation would help but very seldom do it/people aren't cooperating even though mgt is trying to get it in place
make sure everyone knows what you're doing/especially when working w/machinery/get away, get off jobs every hour for 1-2 minutes/seen alot of careless accidents
pay attention, be careful, machine is the boss
rotate people to prevent CTS and tendonitis
good communication between mgt & workforce/know what rules are & enforce them/communication is a big problem wherever you go/people have trouble communicating
doing good job now, dangerous place to work/this is an accepted thing/don't know
just be cautious/pay attention/most important
be more cautious about stuff dropped on floor/could help themselves alot by listening to the foreman/pick up dowels/less goofing off
be careful, stop and think/be reminded/and remind each other/one gets careless
Drive slow and pay attention
Pay attention

Have machines do it, but you have to have human element, can only make so safe, "stay alert".
Slow down the work pace, you can look around and see things should be slowed down, see guys doing things too quickly.
Training on machines should be extensive. Have to know details of machines
Guards on machines where they are needed.
Train people about respect for equipment. Make sure guards are on sawblades even when not in use.
Adequate Training
Slow pace down
Always keep an eye on the people you are working with. Stay alert and pay attention to what you are working on and don't fool around.
MOST EFFECTIVE WAY- CLOSE THE MILLS. ALWAYS GOING TO BE SOMEONE GETTING HURT. TRAINING PEOPLE BETTER MAY HELP.
TRAINING APPRENTICESHIP PROGRAMS
WATCH OUT FOR THE SAFETY FOR EVERYONE WHO WORKS AROUND YOU.
MORE AUTOMATION
reduce overworking employees--accidents are more likely to happen when people work double shifts.
IT IS TOO DANGEROUS MACHINERY, JUST THE NATURE OF THE JOB
>1 SAFETY DIRECTOR SHOULD BE THERE, NEED SOMEONE TO WALK AROUND AND CHECK UP ON PEOPLE- THINK SAFETY DIRECTORS SHOULD COME AROUND MORE OFTEN.
give more training - show more - boss should show how to do things - and not the coworkers.
slow pace down---clean up areas more.
having a safety committee and training.
pay attention to work, most injuries occur when people are not paying attention to their work.
consciously engineered and maintained equipment.
continous safety training /reinforcement.
pay attention
think what you do, this is a dangerous industry/ pay attention/ you must have training.
pay attention to what you are doing.
train workers better, longer training.
not too much overtime- 8 hours a day bearable, but 9 is too much.
99
listen to workers, not foremen or supervisors. pay attention, human nature falls into it.
common sense
pay more attention to the job.
ruduce being overtired.
training is the key.
99
99
more training, listen to the people doing the work.
use common sense.
reduce lifting, find easier way to lift boxes.
less rushing around, keep things as organized and as clean
employ people working with experience into the dangerous jobs.
pay attention to what you are doing.
let people know how to protect against getting hurt-----more training.
staying alert, keeping mind on job.
reduce boredom, stop having incentive program.
more automation, less physical labor.
educate, and observation/ input from more experienced employees.
alert your supervisor of hazards.
reduce heavy lifting
listen to those working on machines = best input.
pay more attention and understand what you are doing.
99
take time, do exercises.
safety committee, have employees do job safety analysis, and...be aware.
get rid of piece rate
99

keep hands out of machines.
be aware of what you are working with and follow procedcures.
don't overdo it.
99
thorough training before workers do the job.
when starting a person, go over training thoroughly.
99
Not really

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15. Supplementary Notes

16. Abstract (Limit: 200 words) An epidemiological study of risk factors for injury in the wood processing industry in Maine was conducted to identify ergonomic and other specific work environmental factors. The study design was that of a case/control project in which potential cases were identified from the First Reports of Injury to the Maine Workers' Compensation commission. About half of the interviewed cases indicated that the injuries resulting in lost time were acute traumatic incidents and one half involved musculoskeletal disorders. Altogether, 157 cases and 251 controls were interviewed. Cases were more likely than controls to be employed in machine paced jobs, to be exposed to dangerous work methods and materials, to experience louder noise levels and faster work pace, to have higher lifting demands and more frequent postural stress, and to experience lower decision latitude and social support at work. The three strongest risk factors in the logistic regression models were processing of hard wood, employment in sawmills and planing mills versus wood products not elsewhere classified, and high physical demands. Decision latitude and social support had small protective effects, although the social support ratings obtained may have been affected by case experiences after their injuries. Other variables that were significantly associated with injury occurrence in the multivariate analyses were being male, having 1 year or less on the current job, inability to take a break when tired, and a lockout/tagout program in effect in the facility.

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