Job hazards underscored in woodworking study

Buoyed by surging markets for new housing and home remodeling, millwork manufacturing is on the upswing; the downside, though, is persistent safety and health problems facing the industry's workers

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"A man builds a fine house; and, now he has a master, and a task for life. . ."
—Ralph Waldo Emerson
Society and Solitude (1870)

Emerson concludes his discourse on house responsibilities in terms all too familiar to today's homeowner: ". . .to furnish, watch, show it, and keep it in repair the rest of his days." For many, repairs now include residential upkeep and improvement, such as replacing well-worn windows, adding on a garage, or even remodeling to create new rooms. Clearly, structural improvements such as these are designed to make a fine house even finer.

This article profiles the work and working conditions in millwork manufacturing—an industry whose output of fabricated wood products is primarily used both in maintaining, remodeling, and renovating existing residences and in constructing new homes. The industry's three major product categories—doors (including garage doors) and related parts, windows and window parts, and standard molding and trim—account for about four-fifths of the total value of millwork shipments (about $8.4 billion in 1987). Other millwork products include staircases and stairs, blinds and shutters, and ornamental woodwork, such as cornices and mantels. Almost all millwork manufacturers specialize in a particular class of product, for example, wood window units. In addition to their primary products, however, these plants typically fabricate secondary woodwork items.[1]

In 1987, millwork manufacturers employed about 100,000 workers nationwide. Seven major millworking centers—the States of California, Wisconsin, Texas, Minnesota, Oregon, Ohio, and Washington—accounted for one-half of the industry's employment that year.[2] Small millwork firms (fewer than 20 workers) are numerically important, constituting a clear majority of the industry's more than 2,000 plants; small firms, however, are but a fraction (about one-tenth) of the millwork employment total.

Through the years, much of the industry has experienced rates of workplace injuries and illnesses well above those for all manufacturing. Not uncommonly, millwork cases resulted in lost worktime or restricted work activity. Many of these disabling cases took the form of back sprains from lifting heavy lumber, doors, and windows or serious finger or hand injuries incurred in the operation of stationary saws and other machines. The following sections examine the injury and illness record of millwork manufacturing in more detail and link that

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Footnotes

[1] The policy of paying greater benefits for accidental death than for natural death is debated in Leonard L. Berekson, "Group Accidental Death Benefits: An Inherent Contradiction," *Benefits Quarterly*, First Quarter 1985, pp. 65-68.

[2] Key findings of the 1988 survey are reported in *Employee Benefits in Medium and Large Firms, 1988*, Bulletin 2336 (Bureau of Labor Statistics, 1989). In addition to examining life insurance and accidental death and dismemberment plans, the survey explores the incidence and detailed characteristics of health, short-term disability, and long-term disability insurance; retirement and capital accumulation plans; and a variety of paid time-off items. It also reports on eligibility for numerous other benefits.

[3] Employer-provided life insurance was introduced in 1911, but did not become widespread until after World War II. AD&D coverage became a regular feature of employer-provided life insurance benefits beginning in the 1950's, after the Federal Government began offering such benefits to its employees. For more details on life insurance history, see *1988 Life Insurance Fact Book* (Washington, American Council of Life Insurance, 1988).

[4] Major findings of the 1987 survey are reported in *Employee Benefits in State and Local Governments, 1987*, Bulletin 2309 (Bureau of Labor Statistics, 1988). For comparisons of public- and private-sector practices, see William J. Wiatrowski, "Comparing employee benefits in the public and private sectors"; Allan P. Blostin, Thomas P. Burke, and Lora M. Lovejoy, "Disability and insurance plans in the public and private sectors"; and Lora Mills Lovejoy, "The comparative value of public and private pensions," *Monthly Labor Review*, December 1988.

The work-family dilemma

Working parents are involved in two vital enterprises: the production of goods and services and the "production" of human beings. Each requires a substantial investment of time, energy, and personal commitment. The critical challenge confronting government, employers, and unions in the 1980's and beyond will be the development of strategies to foster both activities so that neither flourishes at the expense of the other.

There can be no doubt that the problems being experienced by working parents will not disappear of their own accord. By now, more than half of the mothers of preschoolers have joined the labor force, with the most rapid increase in labor force participation occurring among mothers of children under 1 year of age. The myth of "separate worlds"—one of work and the other of family life—long harbored by employers, unions, and even workers themselves has been effectively laid to rest. Their inseparability is undeniable, particularly as two-earner families have become the norm where they once were the exception and as a distressing number of single parents are required to raise children on their own. The import of work-family conflicts—for the family, for the workplace, and, indeed, for the whole of society—will grow as these demographic and social transformations in the roles of men and women come to be more fully clarified and appreciated.

—PHYLLIS MOEN

"New Patterns of Work," *Work & Family: A Changing Dynamic* (Washington, The Bureau of National Affairs, Inc., 1986), p. 217.

record with certain industry characteristics, such as staffing (including work experience) and work requirements, that appear to be accident related.

Safety and health measures

As a group, millwork plants are hazardous workplaces. At 19.4 per 100 full-time workers, the 1987 incidence rate for injuries and illnesses in millwork was three-fifths again as much as that for all manufacturing (11.9) and more than double that for the private sector (8.3).[3] The industry's workplace accidents and exposures, however, were centered in plants with medium and large work forces: the injury and illness rate was 20.0 per 100 full-time workers for plants with at least 20 workers, compared with 14.3 for smaller millwork plants. Furthermore, a large majority of these small plants reported no recordable injuries or illnesses in 1987.

Over a recent 10-year period, injury and illness rates generally trended lower in the private sector, but rates for the millwork industry remained essentially unchanged. Table 1 shows, for example, that the 1983–87 average rate for all manufacturing (10.7 per 100 full-time workers) was 12 percent lower than the 1978–82 rate for the same sector (12.1); in contrast, the corresponding rates for millwork manufacturing were stable at 19.3 and 19.2, respectively. Similarly, the broader industry group comprising millwork, kitchen cabinets, veneers/plywoods, and structural wood members apparently fared no better and, in fact, experienced an increase in its occupational injury and illness rate from the one period to the other. (This group includes one of the Nation's highest risk industries—manufacturing fabricated roof trusses and other large structural products of lumber.)[4]

Other Bureau safety and health measures reflect the incidence of injuries severe enough to require workers to take time off from work or to be restricted in work activity. (See appendix for definitions.) In 1987, these measures recorded mixed results for the millwork industry. While the industry's rates for lost workday cases and lost workdays were relatively high, its average number of days lost per case was slightly lower than that for the private sector and for all manufacturing. (See table 2.) In addition, the proportion of total cases that involved lost workdays (almost one-half) was the same in millwork as in all manufacturing.

Separate data in the table for three west coast centers of millwork manufacturing show considerable variation in workplace risk levels. The overall 1987 injury and illness rate for California (18.5), for example, was substantially below the corresponding millwork rate for Oregon (28.2) and for Washington (30.2). In contrast, certain measures of accident severity, namely, the proportion of cases involving lost workdays and the average lost workdays per lost workday case, were higher in California than in the other two States that same year (table 2). Rate variations among the three States did not appear to be directly related to differences in the types of millwork they produced.[5]

Injury and illness characteristics

The Bureau's Supplementary Data System (SDS) categorizes, in considerable detail, injury and illness case characteristics made available through State workers' compensation systems. Unlike the annual survey, the SDS does not produce nationwide estimates and lacks a uniform

Table 1. **Occupational injury and illness rates, BLS annual surveys, 1978–87**

Industry	SIC Code[1]	Incidence rates per 100 full-time workers[2]		
		Annual average		1987
		1978–82	1983–87	
Private industry[3]	—	8.7	7.9	8.3
Manufacturing	—	12.1	10.7	11.9
Millwork, plywood, and structural members	243	17.5	17.9	18.0
Millwork	2431	19.2	19.3	19.4
Wood kitchen cabinets	2434	16.0	16.7	15.7
Hardwood veneer and plywood	2435	17.3	16.5	18.4
Softwood veneer and plywood	2436	13.2	12.5	13.2
Structural wood members, n.e.c.[4]	2439	26.6	27.4	25.6

[1] *Standard Industrial Classification Manual*, 1972 edition, 1977 supplement.

[2] See footnote 3 to text for method of calculation.

[3] Excludes farms with fewer than 11 employees.

[4] n.e.c. = not elsewhere classified.

treatment among States of what is a recordable workplace injury or illness.[6] However, despite several analytical and statistical limitations, the SDS does help in spotting general patterns (or a lack thereof) in the characteristics of work-related injuries and illnesses.

In 1986, nearly 3,300 current cases in millwork manufacturing were reported to 22 State agencies and the Virgin Islands, the participants in the SDS program. (Current cases are injuries or illnesses which involved at least 1 lost workday and which either occurred in 1986 or were reported to the State agencies that year.)[7] An analysis of the millwork file and the file for all SDS cases in manufacturing points up several similarities and differences in case characteristics. (Such comparisons, however, are subject to the same types of limitations previously ascribed to the SDS.)

The leading sources of injury and illness in millwork were wood items, machines, and building structures.

Overexertion, mostly while lifting objects, was the leading *type of workplace accident or exposure*, constituting about one-third of all SDS cases reported for manufacturing in general and for millwork in particular. In millwork, being struck by falling, flying, or swinging objects was next in frequency (one-fifth of the cases), followed by striking against stationary or moving objects (one-eighth). Together, being struck by or against an object was a somewhat more common accident type in millwork than in all manufacturing.

The leading *sources of injury and illness* in millwork were wood items (particularly lumber), machines (especially stationary power saws), and building structures (including doors and windows). Combined, the three sources were cited in one-half of the industry's SDS-recorded cases, compared with one-fifth of those in all manufacturing. A wide variety of other sources, ranging from unidentified particles to industrial vehicles, were cited in millwork injury and illness cases, but none was common.

Sprains and strains was the most frequent category under *nature of injury or illness* sustained in the workplace. The category accounted for about two-fifths of the millwork cases and a similar proportion in all manufacturing. Next in frequency were cuts (including lacerations and punctures), cited in one-fifth of the millwork cases and one-eighth of those in all manufacturing. Other "nature" categories, such as fractures, occurred infrequently in millwork operations.

The upper extremities and the trunk were the most common *major parts of the body affected* by injuries or illnesses. Each was involved in slightly more than one-third of the reported millwork cases—roughly the same proportion as in manufacturing as a whole. By specific body part, back injuries were the most prevalent (one-fourth of the millwork case total), closely followed by finger injuries (one-fifth).

In almost one-half of the millwork cases, the *major occupational group* of the injured or ill worker was "operators, fabricators, and inspectors." An additional one-fourth were classified as "handlers, helpers, and laborers," and most of the rest as production workers in other categories. Woodworking machine operator was the leading individual occupational grouping affected, constituting about one-fifth of SDS-recorded cases in millwork manufacturing.

The major parts of the body sustaining injury or illness in millwork manufacturing varied little by occupation. To illustrate, most cases relating to sawing machine operators and to industrial laborers were about equally divided

Table 2. **Occupational injuries and illnesses by type of case, BLS annual survey, 1987**

Industry	Incidence rates per 100 full-time workers[1]				Average lost workdays per lost workday case
	Total cases[2]	Nonfatal cases without lost workdays	Lost workday cases	Lost workdays	
Private industry[3]	8.3	4.4	3.8	69.9	18
Manufacturing	11.9	6.7	5.3	95.5	18
Millwork, U.S. total[4]	19.4	10.6	8.9	152.7	17
California	18.5	8.7	9.8	190.6	19
Oregon	28.2	13.9	14.3	235.7	16
Washington	30.2	17.1	13.1	222.3	17

[1] See footnote 3 to text for method of calculation.

[2] Includes fatalities. Because of rounding, the difference between the total and the sum of the rates for lost workday cases and nonfatal cases without lost workdays may not reflect the fatality rate.

[3] Excludes farms with fewer than 11 employees.

[4] Includes data for States in addition to the three States shown separately.

between those affecting the upper extremities and those involving the trunk. One notable exception to this pattern relates to the following jobs with widely disparate duties: The fingers and other upper extremities accounted for three-fifths of the cases involving carpenters, compared with one-sixth of those pertaining to truckdrivers. By contrast, back injuries and other injuries to the trunk made up two-fifths of the truckdrivers' cases, compared with one-fifth of the carpenters'.

Characteristics of workplace injuries and illnesses are useful to State and Federal agencies and to safety and health professionals in developing and maintaining work standards, in targeting accident and disease prevention efforts, in identifying areas for enforcement activities, and in developing educational and training materials for employers and employees. To illustrate, using the SDS files, the Bureau has conducted several small-scale studies of specific work injuries to assist the Occupational Safety and Health Administration (OSHA) in evaluating its safety standards on woodworking machinery and personal protective equipment.[8]

In the BLS cross-industry study on power saw accidents, almost one-half of the injured workers interviewed said that their stationary saw did not have a point-of-operation guard to help prevent contact with the blade. The same study also found that one-third of the injured were wearing no safety gear when their accidents occurred and that slightly more than one-half received no safety training on the type of saw they were using.[9] Obviously, a separate, broad-based study of millwork manufacturing would be required to track the underlying causes of and attitudes toward the current safety and health problems in the industry, including not only accidents involving saws but also those related to manual lifting and other activities.

Industry characteristics

Several other BLS data series (and a few outside the Bureau) contain information that is useful in profiling the millwork industry. In many instances, this information sheds some light on the industry's safety and health problems.

First, the Bureau's employment and earnings series posted substantial gains in payroll employment for millwork manufacturing since the last recession ended. Sustained by buoyant housing and home repair/remodeling markets, the millwork work force in 1987 was half again as high as its 1982 recessionary level of 64,000. Predictably, the industry's injury and illness rate jumped in 1983, from 16.8 to 19.4 per 100 full-time workers, as 10,000 workers, many of them inexperienced in woodworking, were added to industry payrolls during the first of several years of sharply higher construction activity. With some annual fluctuations, the incidence of safety and health cases in millwork manufacturing has remained at this post-recession level.

Second, millwork manufacturing continues to be more labor intensive than manufacturing as a whole and has an above-average proportion of production workers. In 1986, the industry's employers required 72 percent more production worker hours than did all manufacturing to produce an additional $1 in value-added sales.[10] And, the BLS employment and earnings series currently shows that production workers account for 81 percent of the millwork work force, compared with 70 percent of the all-manufacturing total. Also, the industry's production work force is increasingly found in establishments without labor-management agreements: almost seven-tenths of the millwork work force covered by the Bureau's Industry Wage Survey was in nonunion plants in 1984, up from slightly more than one-half recorded in the 1979 study of the industry.[11]

Third, although part of a labor-intensive process, most millworking occupations are machine aided. The Bureau's 1984 wage survey of millwork counted 16 machine operator titles—covering sanding, sawing, and shaping, to name a few woodworking functions—among its 23 occupations selected for separate study. The same study also found that some jobs required that operators not only feed stock into their machines but also handle setup preparations, including sharpening or changing dull blades and, at times, aligning "blank" stock and millwork patterns.

High labor turnover exacerbates the safety and health problems in millwork.

Fourth, labor turnover rates, as tracked by the Bureau through 1981, typically were higher in millwork than in all manufacturing. Looking at the last 5 years for which data are available, the 1977–1981 accession rates, which include new hires and recalls, averaged 4.8 per 100 employees in millwork, compared with 3.8 for all manufacturing. The separation rate, which includes quits and layoffs, was also higher, averaging 5.4 per 100 employees a year, compared with 3.9 for all manufacturing. Another Bureau study on millwork summed up the effects of work force movement this way: "High turnover rates mean a loss of trained and experienced workers and more break-in periods required for newly-hired workers, which may contribute to retarding productivity."[12] And, more to the point of this article, high labor turnover exacerbates the safety and health problems associated with "green" workers.[13]

Accident prevention

Most types of industrial accidents are considered preventable—through classroom and on-the-job training and by following safety standards prescribed by Government, industry, and labor. Heavy lifting and other manual exertions that commonly lead to many millwork accidents, however, are difficult to control.[14] The Bureau's cross-industry study of back injuries associated with lifting, for example, showed that most workers lifted without mechanical assistance, and that a clear majority of those studied were injured while lifting objects weighing at least the same as the heaviest weight normally lifted on the job.[15]

Outside of accidents incurred through manual lifting, the industry's biggest safety problem, by far, involves machinery and machine guarding—topics specifically addressed by established industry and Government standards.[16] Many of the hazards involved can be avoided by various preventive actions, such as providing secure anchoring for fixed machinery, supplying special tools for handling materials that are being machine processed, placing machine guards around all "nonworking" portions of saw blades, and providing easily accessible power controls. These and other preventive measures, such as installing proper wiring and other electrical system protection, are effective ways to minimize safety and health hazards, especially those facing workers in highly mechanized industries like millworking. □

Footnotes

[1] See *1982 Census of Manufactures: Millwork, Plywood, and Structural Wood Members, N.E.C.* (U.S. Department of Commerce, Bureau of the Census, 1985), table 5a, and *Industry Wage Survey: Millwork, September 1984*, Bulletin 2244 (Bureau of Labor Statistics, 1985), p. 2.

[2] *Employment and Wages, Annual Averages, 1987*, Bulletin 2314 (Bureau of Labor Statistics, 1988), p. 151.

[3] *Incidence rates* represent the number of injuries or illnesses, or both, per 100 full-time workers and were calculated as

$$\frac{N}{EH} \times 200{,}00$$

where

N = number of injuries and/or illnesses;
EH = total hours worked by all employees of the industry during the calendar year; and
200,000 = base for 100 full-time equivalent workers (working 40 hours per week, 50 weeks per year).

A variety of useful incidence rates may be computed by making N equal to the number of injuries only, or the number of lost workday cases, or the number of lost workdays, and so forth. In each instance, the result is an estimate of the number of cases or days per 100 full-time workers.

[4] The millwork industry has been designated number 2431 in the *Standard Industrial Classification Manual*, 1972 edition, 1977 supplement of the Office of Management and Budget. The industry accounts for about two-fifths of the one-quarter million workers in the broader industry group, designated number 243. The balance of 1987 employment in the latter group is distributed as follows: One-fourth each in wood kitchen cabinets and in veneers/plywoods and one-tenth in structural wood members, not elsewhere classified. The latter industry ranked among the five most hazardous, as measured by the Bureau's injury and illness incidence rate, in 6 of the last 7 years.

[5] See *Millwork, September 1984*, table 2, for employment characteristics of States included in that study. Under "primary product," the table shows that for California and for Oregon, about one-half of the production workers were in establishments primarily making interior woodwork (standard moldings, for example), and another one-fourth were employed by wood door manufacturers; for Washington, however, door producers accounted for about seven-tenths of the millwork work force and interior woodwork firms for about one-fifth.

[6] The Supplementary Data System (SDS) is not statistically representative of the Nation as a whole because the data cover only the jurisdictions participating in the system. In 1986, the latest year for which detailed information is available, these were the Virgin Islands and the following 22 States: Alaska, Arizona, California, Colorado, Hawaii, Indiana, Iowa, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Missouri, Nebraska, New Mexico, Ohio, Oregon, Tennessee, Virginia, Washington, Wisconsin, and Wyoming.

States differ, moreover, in the kinds of cases they require by law to be reported to workers' compensation agencies. While some States require reports for all occupational injuries and illnesses, regardless of the length of disability, others require reports only for cases of sufficient duration to qualify for indemnity compensation payments, and still other States require reporting of cases involving a specific number of lost workdays, regardless of the indemnity "waiting period." Thus, the SDS file is not a complete census of all "disabling" injuries and illnesses in the jurisdictions studied.

The SDS, however, does standardize the classification of data by using the *1972 Standard Industrial Classification Manual*, the *1980 Census of Population, Alphabetical Index of Industries and Occupations*, and the 1962 *American National Standard Method of Recording Basic Facts Relating to the Nature and Occurrence of Work Injuries*, published by the American National Standards Institute (ANSI) and often referred to as the Z16.2-1962 Standards, or simply, Z16.2.

[7] The total for the 23 SDS jurisdictions is two-fifths of the annual survey estimate of 8,000 lost workday cases in millwork manufacturing in 1986. See footnote 6 for some limitations pertaining to the range of cases included in SDS.

[8] See, for example, *Work-related Hand Injuries and Upper Extremity Amputations*, Bulletin 2160 (Bureau of Labor Statistics, 1982) and *Accidents Involving Eye Injuries*, Report 597 (Bureau of Labor Statistics, 1980).

[9] The survey of power saw accidents was conducted by the BLS during the period from September through November 1978. Highlights and tabular results are available upon request.

[10] *1986 Annual Survey of Manufactures* (U.S. Department of Commerce, Bureau of the Census, 1988).

[11] See *Millwork, September 1984* and the previous bulletin for June 1979 (Bulletin 2083). Both studies only covered millwork establishments employing eight workers or more.

[12] Jack Veigle and Horst Brand, "Millwork industry shows slow growth in productivity," *Monthly Labor Review*, September 1982, pp. 21–26.

[13] The 1986 SDS data files for current cases in 15 States that code for work experience show that about two-fifths of disabled workers had one year's time or less with their employer (or on the job) when injured. See also Norman Root and Michael Hoefer, "The first work injury data available from new BLS study," *Monthly Labor Review*, January 1979, pp. 76–80; footnote 3 in their article lists studies that relate work injuries to work experience.

[14] For a compendium of research papers on manual materials handling, see *Safety in Manual Materials Handling*, DHEW (NIOSH) Publication 78–185 (National Institute for Occupational Safety and Health, 1978).

[15] *Back Injuries Associated with Lifting*, Bulletin 2144 (Bureau of Labor Statistics, 1982).

[16] See, for example, *General Industry: OSHA Safety and Health Standards (29 CFR 1910)*, OSHA 2206 (Occupational Safety and Health Administration, Revised 1981), pp. 430–75. Many millwork plants did not fully comply with one or more of these machinery and machine-guarding standards, based on 397 inspections conducted by the U.S. Department of Labor's Occupational Safety and Health Administration between April 1987 and March 1989.

APPENDIX: Work injury definitions

In this article, definitions of occupational injuries and illnesses and lost workdays conform to the recording and reporting requirements of the Occupational Safety and Health Act of 1970 and Part 1904 of Title 29, Code of Federal Regulations. Supplemental information pertaining to these definitions is in the booklet, *Recordkeeping Guidelines for Occupational Injuries and Illnesses* (Bureau of Labor Statistics, 1986).

Recordable occupational injuries and illnesses are:

1. occupational deaths, regardless of the time between injury and death, or the length of the illness; or
2. nonfatal occupational illnesses; or
3. nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid).

Occupational injury is any injury, such as a cut, fracture, sprain, amputation, and so forth, which results from a work accident or from exposure involving a single incident in the work environment.

Occupational illness is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or disease which may be caused by inhalation, absorption, ingestion, or direct contact.

Lost workday cases are cases which involve days away from work, or days of restricted work activity, or both.

1. *Lost workday cases involving days away from work* are those cases which result in days away from work, or a combination of days away from work and days of restricted work activity.
2. *Lost workday cases involving restricted work activity* are those cases which result in restricted work activity only.

Lost workdays—away from work are the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness.

Lost workdays—restricted work activity are the number of workdays (consecutive or not) on which, because of injury or illness:

1. The employee was assigned to another job on a temporary basis; or
2. The employee worked at a permanent job less than full time; or
3. The employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of days away from work or days of restricted work activity does not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.