Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Motor vehicle assembly, various jobs	371	Introduction of an ergonomics program, including engineering controls, work practice controls, job rotation/job enlargement, medical management, education, and training. Controls implemented included counterbalanced tools, lift tables, and workstation redesign to prevent awkward postures and excessive reaches.	Lost-time workday rate decreased 65%, and the lost-time case rate decreased 48%.	Over a 3 year period, the injury and illness rate decreased 11% and the severity rate decreased 39%.	OSHA Site Visit, Case Study No. 10 (Ex. 26–1180).
Truck manufacturing, various jobs	3711	Introduction of company ergonomics program in 1990. Engineering controls: substituted machine riveting for manual riveting, introduced raised work heights, and installed lifting devices. Introduction of job rotation for 85% of the workforce.	• Lost-time injuries fell from 80 to 28 in 2 years. • Lost workdays fell from 1,402 to 193.	CTD cases fell from 105 to 54 in 2 years.	Mandelker (1993) (Ex. 26–1063).
Auto assembly	3711	Introduced variable height car conveyer belt, articulating arms to move large parts, like dashboards, into place. Also redesigned tools.	Not Reported.	50% decline in ergonomic related injuries in the first year. 35% decline in second and third years.	LaBar (1992) (Ex. 26–1053).
Auto assembly line worker	3711	28 projects were redesigned to change specific jobs, making them ergonomically less troublesome.	Reduced from 3,134 lost days per year to 1,355 lost days per year after project completion.	Not Reported.	Brandon (1992).
Auto body assembly, fixing side mouldings to body	3711	Replaced pneumatic nut runner with a lighter model. Used a stepped ramp that allowed workers to select an appropriate position relative to the work piece.	Not Reported.	Upper-body MSDs were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 50.
Spot welding onto auto frame	3711	Fixed a large-diameter circular handle to the welding frame, which allowed the frame to be moved into any position while keeping the wrist in a straight posture.	Not Reported.	Wrist injuries were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 51.
Spray painting auto bodies	3711	Lengthened spray gun trigger to increase gun's grip diameter and allow the trigger to be operated with three fingers.	Not Reported.	Cases of hand tendinitis were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 52.

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Auto instrument panel assembly, manual handling	3714	Installed a hoist system to remove panels from conveyor and transport them to shipping containers.	Lost-time back injuries associated with this operation were eliminated.	Not Reported.	Oxenburgh (1994) (Ex. 26–1041), Case 40.
Pneumatic screw feeder operation, auto instrument panel assembly	3714	Installed a counter-balanced articulated arm to reduce the weight of the tool.	Not Reported.	Upper-body MSDs were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 46.
Computer operator	3714	The company instituted a biannual training program to emphasize good lifting and pushing techniques as well as good posture. Also instituted a stretching exercise program and encouraged the CAD operators to take frequent short breaks. Engineering controls included: • Purchased 27 back cushions, 71 lumbar supports in three different sizes, 24 keyboard/mouse rests, and 12 document holders in the past five years; • Provided adjustable chairs; and • Provided foot rests for shorter workers.	Saved 20,000 hours lost time per year since eliminating CTD-related complaints.	Not Reported.	''Communication drives process at Siemens.'' CTD News, (1997) (Ex. 26–1077).
Manufacturing of electronic components, various jobs	3714	Introduction of an in-plant ergonomics program, engineering controls including hand tool and workstation redesign, and lift devices. Job rotation and other administrative controls, work practice controls, medical management, and training also implemented.	Decrease of 50% from 116 lost-time days/100 workers (1990) to 58/100 workers (1991) for MSDS. Additional 50% decrease in 1992 to 29 lost-time days/100 workers.	The incidence rate of ergonomic disorders decreased by 67% from 37/100 workers (1990) to 12/100 workers (1992).	OSHA Site Visit, Case Study No. 8 (Ex. 26–1178).
Automotive engine assembly	3714	A hoist was replaced by a conveyer belt set at waist height and part of the assembly process was automated.	70 days lost time and over 1,000 days on restricted duty were reduced to no lost days and no personnel on restricted duties.	Not Reported.	Oxenburgh (1994) (Ex. 26–1041), Case 2.

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Small parts assembly machine operation	3714	Jammed machine required operator to climb a bar ladder while carrying a heavy load. A correctly designed ladder and catwalk were installed along with a chute to dispose of damaged parts without the need for carrying them.	Not Reported.	Foot and ankle MSDs associated with the operation were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 47.
Automotive air conditioner manufacture, material handling	3714	Installed overhead conveyor belt that moves the condenser cores through the various procedures, minimizing manual handling. Also installed box tilers to assist in packaging and scissor lift for stacking.	Prior to program, plant averaged 50 lost-time injuries per year, many of those back injuries. After program implementation, 2 back injuries have been recorded over a 4-year period.		LaBar (1991) (Ex. 26–1078).
Auto instrument panel subassembly	3714	Spring clips were pushed into position using a hand tool that required excessive force to operate. New tool was designed to reduce force and awkward positioning of the hand and wrist.	Not Reported.	Wrist and hand injuries were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 49.
Trimming mouldings with hand cutter	3714	Hand cutters were replaced with automated or air-powered cutters.	Not Reported.	Hand and wrist injuries associated with this operation were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 54.
Manufacture of jet aircraft engine parts, various jobs	372	Implementation of ergonomics program, including engineering control measures, work practice controls, medical management, education, and training. Controls implemented included redesigning workstations to provide employees with more room to perform tasks, adding anti-fatigue mats and adjustable footrests, removed or padded tables and shelves to reduce contact stress, and installed vibration-absorbing pads onto grinding wheels.	Not Reported.	Decrease in carpal tunnel syndrome cases from 26 in 1988, 11 of which required surgery, to 1 case in 1992 which did not require surgery.	OSHA Site Visit, Case Study No. 9 (Ex. 26–1179).

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Shipbuilder	3731	Initiated training classes covering the nature of CTDs, anthropometry, work physiology, back and wrist anatomy and proper work techniques, In-depth training course covered tool selection, work habits, alternating trigger fingers and hands. Workers participated in evaluating and developing interventions for the welding department, and selecting pistol grip and in-line based tools so as to keep the wrists in a neutral posture. Installed scaffolding at the right height and distance from the work, and used ladders or installed scaffolding to higher positions for the work above shoulder height.	Decreased to only 6 lost-time ergonomics wrist injuries through November 1996, since training completed in June 1995. Eliminated lost time back injuries since July 1995.	Eliminated wrist injury in the welding department until March 1996. Reduced ergonomics case rates about 30 percent during 1996.	''Training a 'limbsaver' at Newport News.'' CTD News (1997) (Ex. 26–1079).
Motorcycle manufacturing, flywheel milling operations	3751	Introduction of lighter flywheel castings and an overhead lift; introduction of a customized deburring machine eliminating vibration exposures; introduction of a customized 40-ton press eliminating the use of the brass hammer.	MSDs involving lost or restricted workdays dropped from 27.6 per 100 workers in 1989 to 12.5 per 100 workers in 1993. The severity rate of MSDs dropped from 610 lost or restricted workdays per 100 workers in 1989 to 190 days in 1993.	Not Reported.	McGlothlin and Baron (1991) (Ex. 26–1080).
Assembly of pressure-sensing instruments	3823	Forceful turning actions were required to fit an O-ring in place. Cordless screwdrivers were used with a custom attachment to bring wrists into stronger position and allow hand to employ a power grip.	Not Reported.	Wrist and arm MSDs were eliminated.	Oxenburgh (1994) (Ex. 26–1041), Case 44.
Medical needle manufacture, inspection station	384	Used task forces to identify jobs involving worker exposures to risk factors. Identified problems on quality control line and implemented design changes to the workstations.		Achieved 75% reduction in upper extremity MSD cases.	Benden (1994) (Ex. 26–1081).

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Manufacture of suction canisters used in surgical procedures	3841	Introduction of an ergonomics program utilizing a medical management program, employee training program, job rotation, and engineering controls. Controls implemented include replacing old wooden supply stations with ergonomically designed stations, and automating various processes.	Not Reported.	Decrease in the ergonomic injury rate from 5.2/100 workers (1989) to 2.8/100 workers (1993).	OSHA Site Visit No. 16 (Ex. 26–1183).
Manual handling of bulk paper	386	Two operators manually lifted large wads of paper from a trolley. Manual lifting was eliminated by installing a scissor lift. In addition, the trolley's runners were replaced by roller bearings that enabled the paper to be loaded onto the scissor lift without manual lifting.	Not Reported.	There were 18 back injuries in one year prior to implementing changes. There have been no back injuries in the 3 years since modifications were made.	Oxenburgh (1994) (Ex. 26–1041), Case 36.
Manufacturing board games, inspection and packing	3944	Job analysis and problem solving involving employees to redesign packing workstations. Design changes included raising the height of conveyors, slowing conveyor speed (no effect on throughput), placing roller conveyors on an incline to facilitate carton removal, and changes in work procedures.		Eliminated all cumulative trauma injuries associated with job.	Cook and Marcotte (1990) (Ex. 26–1082).
Railroad repairmen	40	Introduced storage of tools and materials off the ground between knee and shoulder height; devised winches to lift and handle heavy equipment; and redesigned work tables, dollies, and carts to more easily handle train car parts.	Lost-work days reduced to zero for back injuries.	Low-back injuries reduced to zero.	McMahan (1991) (Ex. 26–1083).
VDT operator, package delivery service	42	Introduced sit-stand workstations that permit workers to adjust workstation to meet specific needs.		Reduced MSD cases by half in 12 months.	Nerhood and Thompson (1994) (Ex. 26–1084).

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Freight truck terminal operations	4213	Established ergonomics program in esponse to rising number of back injuries. Program elements include analysis of injury records to identify hazardous operations, extensive use of lifting and carrying devices, providing extra personnel to handle heavy or awkward freight, employee training, and medical management of injured workers.	There were 7 lost-time injuries in 1989, followed by 4 in 1990 and 5 in 1991.	Total number of MSD cases decline from 13 in 1989 to 7 in 1990.	OSHA Site Visit No. 5 (Ex. 26–1177).
VDT operation, telecommunications establishment	481	Retrospective study of the impacts of an ergonomics program on 500 VDT operators. Program included job task analyses, workstation redesign, and worker education and training.		Number of upper extremity disorders over the 6 months prior to implementation of the program was 52; this was reduced to 29 for the 6 months following intervention.	Tadano (1990).
Materials handling, electrical utility	4911	Redesigned equipment: • Weight of the water coolers reduced from 10 lbs to 5 lbs. • Rotating platform for transformers. Step and grab handles added to trucks. • New shovel handle and new pry bars. • Position of the kegs on trucks was lowered to minimize twisting of the back.	Lost time injuries reduced to 0.42 per 100 employees in 1989.	Injuries due to getting in and out of trucks reduced from 9 to 0 in year following redesign. No injuries from lifting the water kegs since the changes.	''Foiling field injuries with ergonomics.'' Electrical World (1990) (Ex. 26–1085).
Data entry operator, gas and electric utility	4932	• Engineering controls: workstation design. • Administrative controls implemented.	Lost time due to work-related injuries decreased from 1,008 hours/month to 584 hours one year later.	Not Reported.	Couch (1990) (Ex. 26–1086).
Sewing machine operator	5137	Installed padded, swivel chairs with adjustable backs and improved materials handling methods. Also instituted an exercise program.	Not Reported.	Incidence rate of tendinitis decreased from 12% to less than 1% in some plants.	Hammond-Smith (1990) (Ex. 26–1087).

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Material handling, grocery distribution center	514	Implemented comprehensive program that included hazard identification and job hazard analysis, medical management and reassignment of injured employees, worker training, and implementation of engineering and work practice controls. Controls included making minor modifications to some forklift equipment, replacing other equipment, and providing ergonomically designed workstations for data entry personnel.	Number of MSD workers compensation claims decline from 14 in 1989 to 8 in 1991.	Not Reported.	OSHA Site Visit No. 4 (Ex. 26–1176).
Restaurant worker	5812	Reduced the amount of food served by the workers, and heavy porcelain crockery was replaced with plastic.	Not Reported.	Reported injuries decreased 40%.	Oxenbrugh (1994) (Ex. 26–1041), Case 17.
Pricer—clothing store	5932	Staples were reduced to one per tag and job rotation was introduced so that no one person stapled for more than 45 minutes at a time.	Not Reported.	In 1994–1995, 23% of pricers had CTDs; 2 had bilateral carpal tunnel releases and were unable to return to work. In 1996–1997, 10% of pricers were affected, but all have returned to their jobs without surgery or impairment.	''ARC takes thrifty approach to ergonomics.'' CTD News (1998) (Ex. 26–1089).
Data entry	6021	Adjusted workstations and lighting.	Not Reported.	Reduced neck tension syndrome from 54% to 16%.	Luopajarvi *et al.* (Undated) (Ex. 26–1090).
Nursing assistants, nursing home	805	Implemented program to determine patient lifting tasks that were the most stressful; evaluate alternative devices for acceptability among assistants; train assistants in use of devices; and modifying shower rooms and patient care techniques to facilitate patient handling. Used walking belts and mechanical hoists for lifting aids.	Decrease of 634 lost workdays/100 FTEs before intervention to 317 lost workdays/100 FTEs post intervention.	Incidence for back injuries decreased from 83 to 47 per 200,000 work-hours.	Garg and Owen (undated) (Ex. 26–1093).

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Nursing aides, nursing home	805	Committee of employees determined the types of mechanical devices that were needed, installed in 1993. Implemented employee training and modified duty programs.	Decrease in lost work days 38 in 1991 to 4 in 1994 (as of Nov), is largely attributed to the implementation of a no lifting greater than 50 pounds policy.	Not Reported.	Comments to OSHA from Kennebec, (undated) (Ex. 26–1094).
Nurse, hospital	8062	Professional lifting team of 2 performs 95% of all patient lifts; nurses freed to do more nursing activities.	Not Reported.	Back injuries reduced 94% first year after teams were implemented.	Charney *et al.* (1991) (Ex. 26–1091).
Nursing and laundry workers, hospital	8062	Worker education and training were provided. Employees were encouraged to take breaks. A regular maintenance program for equipment was initiated. New hand tools and lifting equipment were provided. Handles were installed onto tool carts. X-Ray cassettes were reorganized to avoid repetitive bending and back problems.	Lost-time hours in nursing ward fell 83 percent in 4 years. Lost-time hours among laundry workers fell 83 percent in 2 years.	Back injury rates in nursing wards fell 39 percent in 4 years. Back injury rates among laundry workers fell 71 percent in 2 years.	''Giving healthcare workers a helping, mechanical hand.'' CTD News (1995) (Ex. 26–1092).
Nursing, hospital	8062	Ergonomic assessment of 14-room surgical suite, implemented changes in procedures for moving patients, maneuvering carts and equipment, using gall bladder boards, walking on wet floors, and accessing power outlets. Workers are periodically retrained in procedures to maintain awareness.	Not Reported.	Back injury rates reduced by 25% in 18 months since program was implemented.	Garb and Dockery (1995) (Ex. 26–1095).
Prescription filling using a syringe, hospital	8062	A manual assist for syringe actuation was developed to reduce the thumb and pinch grasp forces required while using a standard syringe. The system, about the size of a hot dog bun, accommodates standard syringe sizes from 10 cc to 60 cc.	Not Reported.	Upper extremity CTD cases were reduced from six to one.	''Case study 60: Hospital pharmacy liquid IV prescription filling using a syringe.'' ErgoWeb Inc., 1998 (Ex. 26–1096).
Hospital workers	8062	Patient Air Lift Systems introduced.	Not Reported.	Reduced injuries at second hospital by 94%.	Brigham (1994) (Ex. 26–1097).

Appendix VI–B.—Summary of Case Studies Demonstrating Effectiveness of Ergonomic Programs/Interventions—Continued

JOB TITLE OR ACTIVITY	SIC CODE	ERGONOMIC SOLUTIONS	REPORTED REDUCTION IN INJURY RATES		SOURCES
			LOST WORK-DAY MSDs	TOTAL MSDs	
Nursing, hospital	8062	Redesigned work process: Mechanical lifting equipment, slide boards, and patient transfer belts.	Lost-time injuries reduced to 49 (down 35%), with 426 lost days (a 57% decrease), and 1,851 restricted days (a 54% decrease).	In 1994 total back injuries decreased to 85 (a 43% reduction).	Hospital Employee Health (1995) (Ex. 26–1098).
Government employees	91	Introduction of program of ergonomic improvements, education, training, and physical fitness activities.	Not Reported.	1-year prevalence of back pain fell from 65 to 53 percent.	Shi (1993) (Ex. 26–1099).

VII. Significance of Risk

In this section of the preamble, OSHA conducts several analyses and presents data and information to demonstrate, first, that work-related musculoskeletal disorders (MSDs) constitute a material impairment of health or functional capacity under the Occupational Safety and Health Act (OSHAct or Act). This discussion demonstrates that MSDs are painful, often disabling injuries and illnesses that cause lost work time, require medical treatment, involve restricted work, and, all too often, result in surgical interventions.

The Agency then demonstrates the significance of the risk of incurring these material health impairments confronting workers in the industries and occupations covered by the scope of the proposed ergonomics standard. As OSHA's analysis shows, over a working lifetime, workers in these jobs face risks ranging roughly from 24 cases per 1,000 workers to 813 cases per 1,000 workers, risks that are clearly significant by any reasonable measure. Even on an annual rather than lifetime basis, many of the workers who would be covered by the proposed standard are at great risk: nursing aides and truck drivers, for example, can expect to suffer between 20 and 40 lost-workday musculoskeletal disorders for every 1,000 workers in every year that they work. Again, that risks of this magnitude are significant within the meaning of the Act is not disputable.

Sections A and B below thus demonstrate unequivocally that the first two tests OSHA must meet before it can regulate—that the hazard regulated by the standard constitutes material impairment of health or functional capacity and that the risk posed to workers covered by the standard is significant, as that term has been defined in OSHA case law—have been met.

A. Material Impairment

As part of OSHA's threshold determination of significant risk for standards issued under section 6(b)(5) of the Act, OSHA must determine whether exposure to the hazard in question results in ''material impairment of health or functional capacity.'' 29 U.S.C. 655(b)(5). As discussed above in the Health Effects section, the risks posed by exposure to workplace (ergonomic) risk factors are serious and can result in musculoskeletal disorders (MSDs) that cause substantial impairment and permanent disability.

Musculoskeletal disorders represent a set of pathological conditions that impair the normal function of the soft tissue of the musculoskeletal system, such as tendons, muscles, cartilage, ligaments, and nerves. MSDs arise when musculoskeletal soft tissue is subjected to repeated physical stress, usually from repetitive movements, static postures, or continuous loading of tissue structures, which in turn causes gradually accumulating tissue damage. The physical stresses that can contribute to or cause MSDs are called ''risk factors.'' The initial symptoms of MSDs may include fatigue, discomfort, and pain; as tissue damage worsens, other symptoms, such as weakness, numbness, or restricted movement, may also appear. Work-related MSDs occur when the risk factors that cause or contribute to musculoskeletal system pathology are associated with a person's job duties. The disorders represented by the term ''MSDs'' have been referred to by various other names, including ''cumulative trauma disorders,'' ''repetitive strain injury,'' and ''occupational overuse syndrome.'' MSDs do not include musculoskeletal injuries that are clearly caused by accidents, such as a torn Achilles tendon that results from stepping in a hole. Instead, MSDs reflect tissue damage and functional loss that occurs over time from prolonged or frequent exposure to risk factors.

However, some MSDs, particularly those of the back, may appear to be related to acute exposure events although they are actually the result of prolonged exposure to risk factors that has caused gradual tissue deterioration that ultimately led to injury. In other words, although some work-related MSDs may appear to be caused by an acute event (such as a particular lift or movement), the likelihood is high, if such lifts or movements are a routine part of the worker's job, that what appears to be an injury of sudden onset is in fact one of gradual onset. Thus, injuries associated with acute exposure events cannot simply be ruled out as MSDs without determining whether exposure to workplace risk factors may in fact have contributed to the injury. Table VII–1 lists some of the injuries and illnesses that comprise the group of disorders known as MSDs.

Based on the evidence discussed in this and other sections of the preamble, as well as all other evidence gathered by OSHA and placed in the public docket of this rulemaking, OSHA has preliminarily concluded that the musculoskeletal disorders associated with workplace exposure to workplace risk factors constitute material impairments of both health and functional capacity. OSHA recognizes that these disorders are not life-threatening and that some of these disorders may be reversible, particularly if early intervention is provided. Nonetheless, evidence in the record shows that these disorders are debilitating (Brisson *et al.* 1989, Ex. 26–47; Vingård *et al.* 1991, Ex. 26–44; Berg *et al.* 1988, Ex. 26–46; Liss *et al.* 1992, Ex. 26–55; Webster and Snook 1994, Ex. 26–33; Binder and Hazleman 1983, Ex. 26–45; Boshuizen *et al.* 1990, Ex. 26–40; Blanc *et al.* 1996, Ex. 26–42; Liberty Mutual Research Center for Safety and Health, 1998, Ex. 26–54). These disorders cause persistent and severe pain, lost worktime, reduction or loss of the worker's normal functional capacity both in work tasks and in other of life's major activities, loss of productivity, and significant medical expenses. Where preventive action or early medical intervention is not provided, these disorders can result in permanent damage to musculoskeletal tissues, causing such disabilities as the inability to use one's hands to perform even the minimal tasks of daily life (*e.g.*, lifting a child), permanent scarring, and arthritis.

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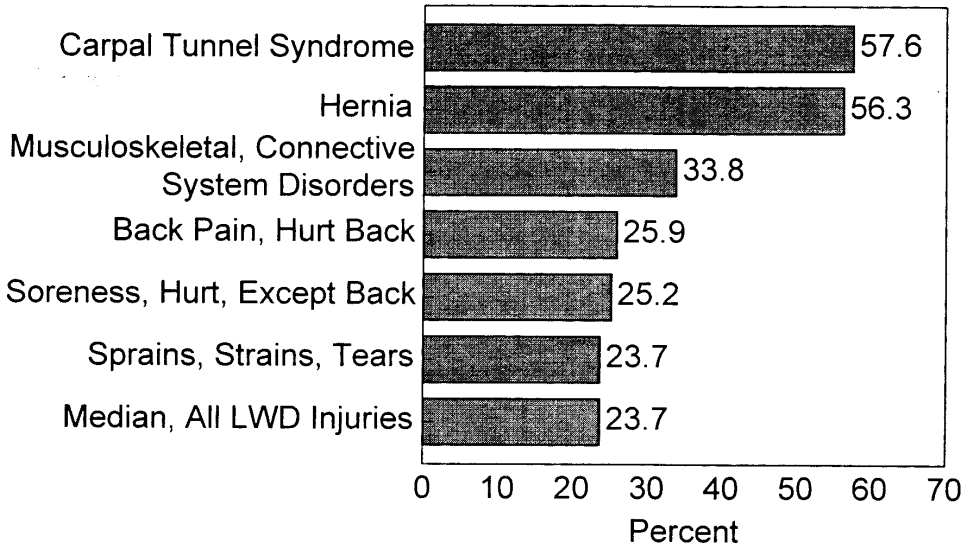
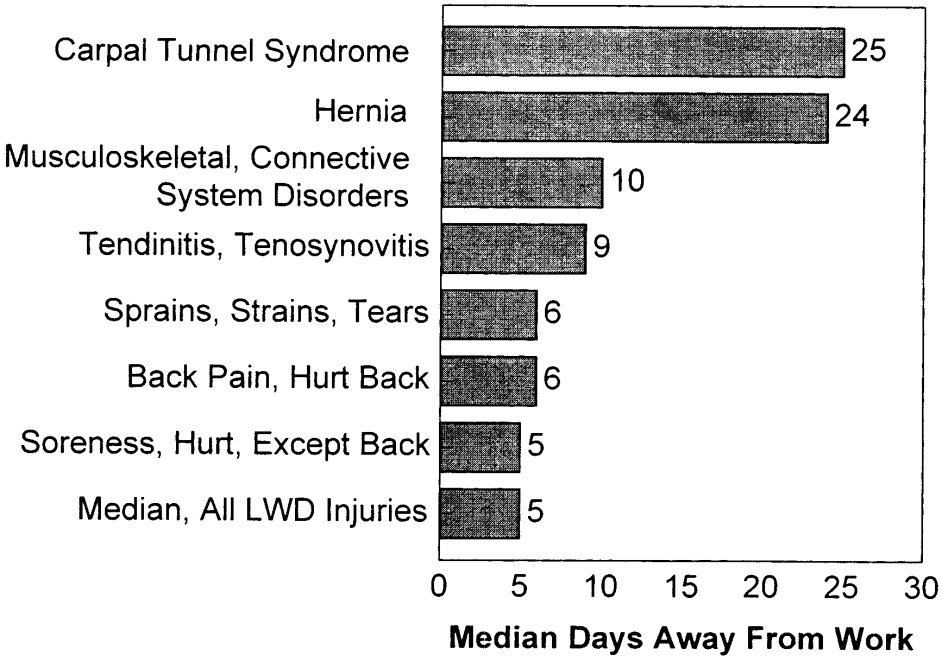
Figure VII-1

Percent of Injuries With More Than 20 Lost Work Days



Median Days Away From Work for Each MSD Category



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The painful and debilitating nature of MSDs is illustrated by several letters from workers who have told the Secretary of Labor and OSHA that they have experienced severe pain, limited work capacity, lost work time, loss of income, and permanent impairment due to overexposure to workplace risk factors (Ex. 26–1263). In addition, these workers have said that the damage and pain have left many of them unable to perform other major life activities, such as walking, cooking, holding children, lifting or grasping objects, or writing (Ex. 26–1263). The pain referred to by these workers is not the normal muscle soreness associated with job break-in or conditioning, or temporary muscle strain due to doing new or unusual tasks. Instead, the pain is severe and persistent. Many employees must be placed on medication to alleviate or at least reduce the intensity of their pain. The pain of MSDs may also continue or may even manifest after the employee is removed from exposure at the end of the workshift (Ex. 26–1263).

Table VII–1.—Examples of Some Types of Musculoskeletal Disorders That are Often Work-Related

—Tension-neck syndrome
—Thoracic outlet syndrome
—Shoulder tendinitis (rotator cuff, bicipital)
—Epicondylitis (elbow)
—Carpal tunnel syndrome (hand-wrist)
—Wrist tendinitis
—Hypothenar hammer syndrome (hand)
—Hand-arm vibration syndrome
—Tenosynovitis
—de Quervain's tendinitis
—Trigger finger
—White finger
—Sciatica, low back pain
—Knee bursitis (carpet layer's knee)

In addition, the pain usually increases if exposure to the ergonomic risk factors continues (Ex. 26–1263). OSHA believes that this type of severe and persistent pain, and the tissue damage underlying this pain, clearly constitutes a material impairment of health under the OSH Act.

Musculoskeletal disorders of most kinds are recognized as compensable under virtually all State workers' compensation plans, and these disorders imposed nearly $20 billion in medical costs and industry payments on the U.S. economy in 1994 (see the Preliminary Economic Analysis section of this preamble). Under workers' compensation, however, employees are reimbursed only where their work-related injury or disorder requires medical treatment and/or results in lost workdays. Moreover, payments for lost wages are not provided unless the employee's injury or disorder results in a certain number of lost workdays (the number varies across the States and ranges from one to seven days). According to evidence presented in the Preliminary Economic Analysis, a significant number of musculoskeletal disorder workers' compensation claims result in lost workdays. For example, according to a study by Webster and Snook (1994, Ex. 26–33) based on workers' compensation data from Liberty Mutual Insurance Company, the largest underwriter of workers' compensation insurance in the country, more than 45 percent of all low back pain cases involved indemnity payments for lost workdays. This study also indicated that, on average, more than 65 percent of the workers' compensation costs for musculoskeletal disorders represented indemnity payments for lost workdays. Overall, work-related low back pain accounts for 15 percent of all Liberty Mutual workers' compensation claims and 23 percent of their costs (Liberty Mutual Research Center for Safety and Health, 1998, Ex. 26–54).

Further evidence of the disabling nature of MSDs comes from the Bureau of Labor Statistics (BLS) data for 1996, which show that the median number of lost workdays (LWD) per recordable lost-time MSD is higher than the median across all lost workday injuries (see Figure VII–1). For example, the median number of lost workdays for cases classified by BLS as carpal tunnel syndrome, tendinitis or tenosynovitis, or musculoskeletal and connective tissue disorders, is 25, 9, and 10 days, respectively. More than one-half of all carpal tunnel LWD cases and one-third of musculoskeletal and connective tissue disorder LWD cases result in more than 20 lost workdays, compared to less than one-fourth of all LWD injuries. Among workers who received compensation awards in 1994 for upper-extremity disorders, the average length of disability was 87 days, with 6.8 percent of the claims covering one-year or more of disability (Liberty Mutual Research Center for Safety and Health, 1998, Ex. 26–54).

Finally, several individual studies provide additional evidence demonstrating the disabling nature of MSDs. A study of female sewing machine operators showed an increased prevalence of disability among both retired and active workers compared to national rates of disability (Brisson *et al.*, 1989, Ex. 26–47). Operators who had left their jobs had a greater rate of severe disability when compared to workers who had left other types of employment. Vingard *et al.* (1991, Ex. 26–44) found an increased risk of early retirement among workers exposed to heavy or medium work loads due to disorders of the lower back, neck/shoulder, hip, or knee. An elevated incidence of long-term absenteeism and disability due to intervertebral disc disorders was found among tractor drivers, with the incidence appearing to increase with whole-body vibration dose and duration (Boshuizen *et al.* 1990, Ex. 26–40). An analysis of data from the National Health Interview Survey showed that repetitive bending of the hand or wrist on the job was significantly associated with the frequency of self-reported carpal tunnel syndrome (CTS), and that work-related disability was common among the 544 subjects reporting CTS. The persistence of symptoms associated with MSDs is illustrated by two other studies. Berg *et al.* (1988, Ex. 26–46) studied the prevalence of MSD symptoms among 327 retired shipyard workers who had been engaged in heavy physical work and found that the prevalence of symptoms remained unchanged over a three-year period. In another study, Binder and Hazleman (1983, Ex. 26–45) followed the health status of 125 patients with lateral epicondylitis over a 1- to 5-year period after initial presentation of the disorder. Over the follow-up period, 40 percent of the patients continued to have discomfort that affected some daily activities.

OSHA has promulgated a wide range of health standards where the adverse health effects associated with exposure to substances or conditions are serious but not necessarily life-threatening, such as health effects that interfere with normal daily life or job performance, or that require substantial medical intervention. *See* Cotton Dust (29 CFR 1910.1046), Occupational Noise Exposure (29 CFR 1910.95), Occupational Exposure to Lead (29 CFR 1910.1025), Occupational Exposure to Formaldehyde (29 CFR 1910.1048). For example, in promulgating the Hearing Conservation Amendment, OSHA determined that ''* * * material impairment of hearing is directly related to people's ability to understand speech as it is spoken in everyday social conditions.* * *'' (46 FR 46236), including being able to understand speech in noisy environments. In the Formaldehyde standard, OSHA based its permissible exposure limit (PEL) and ancillary provisions, in part, on

evidence that employees were at significant risk of developing sensory irritation (*e.g.*, burning and tearing of the eyes, severe irritation of the nose and throat) and skin diseases at the existing PEL, and that these effects were sufficiently severe to interfere with the employee's ability to perform job functions (52 FR 46168, 46234–37).

The proposed ergonomics rule is similar to these other OSHA standards in this respect. Work-related musculoskeletal disorders also result in material impairment of functional capacity by causing temporary or permanent physical damage to the body. Such damage can include severe inflammation of joints and tissues; reduced conduction velocity in peripheral nerves; partial or total loss of strength in an extremity; tearing of muscles and tendons; numbness; decreased range of motion; arthritis; and pain. When this damage occurs, employees are unable to perform their jobs at all or at normal performance levels without experiencing pain or causing further damage. Accordingly, OSHA preliminarily concludes that work-related MSDs constitute a material impairment of health.

B. Significant Risk

Section 6(b)(5) of the OSH Act gives the Secretary of Labor authority to issue standards dealing with toxic substances and harmful physical agents. This section provides, in part:

> The Secretary, in promulgating standards dealing with toxic materials or harmful physical agents under this subsection, shall set the standard which most adequately assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life. 29 U.S.C. 655(b)(5).

The Supreme Court has said that OSHA may promulgate a standard only if it makes a threshold finding that it is at least more likely than not that the risk OSHA seeks to regulate is ''significant'' and that the change in practices required by the standard would reduce or eliminate that risk. *Benzene,* 448 U.S. at 642. This ''significant risk'' determination constitutes a finding that, absent the change in practices mandated by the standard, the workplaces in question would be unsafe in the sense that workers would be threatened with a significant risk of harm. *Id.* This finding is not unlike the threshold finding that a substance is toxic or that a physical agent is harmful. *Id.,* at 643 n. 48.

In the *Benzene* decision, the Court provided some guidance as to when a reasonable person might consider a risk significant and take steps to decrease it. The Court said:

> Some risks are plainly acceptable and others are plainly unacceptable. If, for example, the odds are one in a billion that a person will die from cancer by taking a drink of chlorinated water, the risk clearly could not be considered significant. On the other hand, if the odds are one in a thousand that regular inhalation of gasoline vapors that are 2 percent benzene will be fatal, a reasonable person might well consider the risk significant and take the appropriate steps to decrease or eliminate it. *Id.,* at 655.

In *Benzene,* the issue before the Court was worker exposure to a cancer-causing agent. OSHA has used the guidelines provided by the Court in setting standards for other carcinogens, such as methylene chloride, butadiene, and ethylene oxide. However, OSHA believes that the Court's guidance is not limited to cancer-causing agents. Material impairment of health refers not only to health outcomes that cause certain death or threaten life, but also to impairment of the employee's ability to engage in the normal activities of life, including work, as a result of workplace events or exposures causing a serious reversible or permanent disorder. Accordingly, OSHA has used the Court's guidelines in setting standards that address such toxic materials and harmful physical agents as cotton dust, occupational noise, and formaldehyde.

The Court indicated that a significant risk finding does not require mathematical precision or anything approaching scientific certainty if the ''best available evidence'' does not allow that degree of proof. *Id.,* at 655–56. The Court also ruled that ''a reviewing court [is] to give OSHA some leeway where its findings must be made on the frontier of scientific knowledge.'' *Id.,* at 656. The Agency is free to use conservative assumptions in interpreting the data, ''risking error on the side of overprotection rather than underprotection.'' *Id.*

> [T]he requirement that a ''significant'' risk be identified is not a mathematical straitjacket. It is OSHA's responsibility to determine, in the first instance, what it considers to be a ''significant'' risk. *Id.*

Thus, the Court said that ''while the Agency must support its findings that a certain level of risk exists with substantial evidence, we recognize that its determination that a particular level of risk is 'significant' will be based largely on policy considerations.'' *Id.,* at 656. The court also said OSHA has considerable leeway in the kinds of assumptions it applies in interpreting the data supporting such a determination. *Id.*

There is no need, in the case of musculoskeletal disorders, for OSHA to engage in risk modeling, low-dose extrapolation, or other techniques of projecting theoretical risk to identify the magnitude of the risk confronting workers exposed to ergonomic risk factors. The evidence of significant risk is apparent in the annual toll reported by the Bureau of Labor Statistics, the vast amount of medical and indemnity payments being made to injured workers and others every year (nearly $20 billion in direct costs and as much as $60 billion more in indirect costs), and the lost production to the U.S. economy imposed by these disorders. Similarly, there is no need for OSHA to turn to complex theoretical projections of reductions in risk to demonstrate that the standard as proposed will substantially reduce this significant risk. Again, the evidence is there for all to see, in the form of hundreds of epidemiological analyses, meta-analyses, and case studies reporting the effectiveness of ergonomic programs in reducing risk. The following discussion, and the analyses presented below, demonstrate the significance of the risk confronting workers in the industries and occupations targeted in the proposed standard and make the case for the standard's effectiveness.

In this rulemaking there are, as mentioned above, extensive data on the adverse effects on the human musculoskeletal system of exposure to workplace risk factors such as repetitive motions; static or awkward postures; and the use of excessive force. As described in the Health Effects and Preliminary Quantitative Risk Assessment sections of this preamble, studies and national statistics are available to demonstrate the high incidence and prevalence of work-related musculoskeletal disorders occurring or existing among workers exposed to ergonomic risk factors. Estimates of the risk of harm confronting exposed workers can be based directly on the rates of work-related musculoskeletal disorders currently being reported, and BLS survey data can be used to demonstrate the degree to which work-related musculoskeletal disorders have occurred across nearly all major industrial sectors and in numerous occupations.

The data used by OSHA to support the proposed ergonomics program rule are similar to the data used to

support OSHA safety standards, in that both base their estimates of risk and their case for the effectiveness of the standard on data on injuries being reported in the current workforce. The availability of such data makes it possible to go directly from current rates of injury among workers to an estimate of the likelihood of future harm which could be prevented if a standard were promulgated. In other words, it is not necessary either in the case of OSHA safety standards or in the case of this ergonomics standard to project or estimate risk based on the use of risk models derived from animal data or epidemiological studies. Thus, in the present case, no modeling is needed to make a quantitative assessment of the risk of harm posed to workers exposed to ergonomic risk factors on the job.

The data discussed in the Preliminary Risk Assessment and Health Effects sections of the preamble demonstrate that the risk of work-related musculoskeletal disorders meets the Court's definition of significant risk. For example, OSHA estimates, based on the 1996 BLS data, that more than 647,000 lost-workday (LWD) musculoskeletal disorders were recordable and reported by employers in 1996; these disorders account for more than one-third of all employer-reported LWD injuries. The estimated annual incidence of employer-reported MSDs, defined as the number of MSDs occurring in a given year per 1,000 workers employed in an industry sector or occupation, exceeded 1 LWD case per 1,000 workers for all but a few of the 2-digit SIC general industry groups in 1996; the incidence exceeded 10 LWD cases per 1,000 workers in 15 of these industry sectors (see Table VI–5 in the Preliminary Quantitative Risk Assessment section of the preamble). Further, OSHA estimates that the annual incidence of employer-reported LWD MSDs reached 1 case or more per 1,000 workers for 79 percent of all of the occupational groups for which BLS estimated the numbers of MSDs and employees. For 37 of these occupations, the estimated annual incidence of LWD MSDs exceeded 10 cases per 1,000 workers. For some high risk occupations, such as practical nurses, nursing aides and attendants, laborers, public transportation attendants, and truck drivers, annual incidence rates are on the order of 20 to 40 LWD MSD cases per 1,000 workers per year. These shocking incidence rates, however, are underestimates of the true incidence of MSDs, because they are based only on lost workday cases. OSHA estimates that the number of MSDs that do not result in lost workdays is about twice that of LWD MSDs.

Under section 6(b)(5) of the Act, OSHA has the duty to ensure that no employee suffers material impairment even if that employee has regular exposure to the hazard ''for the period of his working life.'' 29 U.S.C. 655(b)(5). The probability that an employee will suffer at least one musculoskeletal disorder due to workplace risk factors over a 45-year working lifetime is much higher than the risk reflected in the one-year rates presented above. Therefore, in the Preliminary Quantitative Risk Assessment section of this preamble, OSHA also evaluated the risk to exposed employees of incurring a LWD MSD over a 45-year working lifetime. The results are presented by 2-digit SIC industry group in Table VI–7 of the Preliminary Risk Assessment. The probability of experiencing at least one LWD MSD during a working lifetime ranges from 24 per 1,000 workers (in SIC 62, Security and Commodity Brokers, Dealers, Exchanges, and Services) to 813 per 1,000 workers (in SIC 45, Air Transportation). Among the 58 industry groups for which BLS provided estimates of the number of MSDs reported in 1996, the median lifetime risk of experiencing at least one LWD MSD is 255 per 1,000 workers, and for only 8 of these industry groups is the estimated lifetime risk below 100 cases per 1,000 workers. The expected number of MSDs that will occur in a cohort of workers all entering an industry at the same time and working for 45 years ranges from 24 per 1,000 workers to 1,646 per 1,000, depending on the industry sector, since it possible for a worker to experience more than one MSD in a working lifetime.

Although these data indicate that the risk of experiencing an MSD is clearly significant, OSHA believes that these data seriously understate the true risk. First, the BLS data capture only those MSD injuries reported by employers as lost workday injuries. MSDs that force an employee to be temporarily assigned to alternate duty, as well as those work-related MSDs not reported to employers by employees or not recorded by employers, are not included in these risk estimates. In addition, OSHA's estimated incidences of MSDs, which are derived from the BLS data, do not reflect the true risk posed to employees who are exposed to risk factors at work because the BLS-based incidence estimates are based on the risk confronting the entire working population, both exposed and non-exposed. Clearly, the risk of experiencing a work-related MSD is considerably higher among that subset of workers exposed to risk factors in their jobs than it is for the rest of the working population (the ''unexposed'' population). In other words, the risk posed to workers in the operations and jobs targeted by OSHA's proposed ergonomics standard is much higher, in general, than the risk posed to workers in non-targeted jobs and occupations. The method used by BLS to calculate the incidence of MSD's (*i.e.*, using the full working population as the denominator) is not unique to these kinds of injuries, but is the standard approach used by BLS to report the incidences of all kinds of injuries and illnesses.

There is also evidence that the actual risks attributable to occupational exposure to ergonomic risk factors may be much higher than is indicated by the BLS statistics. Many peer-reviewed studies have been published in the scientific literature in the last 18 years that document underreporting of MSDs in OSHA logs (McCurdy *et al.*, 1999, Ex.; Cannon *et al.*, 1981; Mazlish *et al.*, 1995; Silverstein *et al.*, 1997; Biddle *et al.*, 1998; Fine *et al.*, 1986; Pransky *et al.*, 1999; Park *et al.*, 1992; Park *et al.*, 1996; Nelson *et al.*, 1992). Table VII–2 below summarized these studies. These studies document extensive and widespread underreporting on the OSHA log of occupational injuries and illnesses (McCurdy *et al.*, 1999) and of MSDs (Silverstein *et al.*, 1997; Biddle *et al.*, 1998; Fine *et al.*, 1986; Pransky *et al.*, 1999; Park *et al.*, 1992; Park *et al.*, 1996; Nelson *et al.*, 1992). They also demonstrate that a large percentage of workers whose MSDs were identified as work-related by health care providers do not file workers' compensation claims (Biddle *et al.*, 1998; Cannon *et al.*, 1981; Fine *et al.*, 1986). In one early study, only 47 percent of workers with medically diagnosed cases of carpal tunnel syndrome (CTS) filed claims (Cannon *et al.*, 1981). Fine and his co-authors (1986) demonstrated that, in two large automobile manufacturing plants, workers' compensation claims were filed in less than 1 percent of medically confirmed cumulative trauma cases in one plant and in only 14 percent of such cases in another. A recent study of 30,000 Michigan workers who were identified by a healthcare provider as having a work-related injury showed that only 9 to 45 percent of workers filed a workers' compensation claim for their injuries (Biddle *et al.*, 1998). The reasons why as many as 50 percent of injured workers are not reporting their musculoskeletal injuries and other injuries and illnesses to their employers or seeking compensation for their work-related conditions are many. According to the authors of these studies, workers feared reprisal for reporting, were discouraged from reporting by

their supervisors or managers, were discouraged from making a workers' compensation claim by the high rates of claims rejection for MSDs, wanted to avoid the ''hassle'' of filing a workers'' compensation claim, or preferred (or were encouraged by their employers) to use the employer's or their own health insurance rather than the workers' compensation insurance system. Because of this evidence pointing to the substantial underreporting of MSDs, and given that the BLS data derives from employers' reports of lost-time injuries and illnesses, OSHA believes that the risk of lost-time, work-related MSDs as quantified from the BLS data are understated by at least a factor of two.

Table VII–2.—Summary of Underreporting Studies

STUDY	MEASURE OF UNDER-REPORTING	EXTENT OF UNDER-REPORTING OBSERVED	COMMENTS
McCurdy, Schenker, and Samuels, *Am. J. Public Health.* 81:85 (1999, Ex. 2–2)	Percentge of cases meeting OSHA reporting criteria not recorded on OSHA log	40% of all reportable cases not recorded; for illnesses, 56% not recorded	10 manufacturing facilities in 6 states from semiconductor industry with approx. 50,000 employees; 24% of cases met OSHA criteria.
NIOSH. Health Hazard Evaluation Report, HETA 93–0233–2498, (1995, Ex. 26–1255)	Failure to report lost workdays and restricted work OSHA 200	Not quantified; ''several'' employees had surgeries for WMSDs in 5-year period and ⅓ of employee were on restricted work, but no LWDIs reported on Log over 5-year period	Winding and taping department of an instrument transformer manuacturer; 27 employees in department.
NIOSH. Health Hazard Evaluation Report, HETA 93–0860–2438, (1994, Ex. 26–1256)	Percent of medically confirmed WMSD cases not recorded on OSHA log or not reported to employer	5 employees reported to NIOSH that they had been diagnosed with carpal tunnel syndrome (CTS); of these, 2 did not report their illness to the employer. 1 of the 5 reported cases were not reported on log	News department of large metropolitan TV-news station; video tape editing and other employees.
Cannon, Bernacki, and Walter, *JOM.* 23:255 (1981, Ex. 26–1212)	Percent of employees diagnosed with work-related carpal tunnel syndrome (CTS) over 2 years not filing workers' compensation claims	16/30 diagnosed employees received workers' compensation benefits for CTS. Others did not file	Four aircraft manufacturing plants; approx. 20,000 employees.
Mazlish, Randolph, Dervin, and Sankaranarayan, *Am. J. Ind. Med.* 27:715 (1995, Ex. 26–1186)	A new survellance system for work-related carpal tunnel syndrome (CTS) was implemented in Santa Clara county, California under the NIOSH SENSOR program. Its findings were compared to physicians' first reports filed under a State of California surveillance system in place since 1973	For the years 1987–1989, SENSOR identified 141 cases. Of these, only 19 cases could be found in doctors' first reports	The population at risk for CTS covered by SENSOR is the entire working population of Santa Clara county. The working population was not reported in the article, but the total population in the county was 1.4 million in 1987.
California Department of Health Services. Surveillance Report SR–88–002 (1990, Ex. 26–1257)	Telephone and mail survey of 515 health care providers in Santa Clara County, California, who estimated carpal tunnel syndrome (CTS) caseloads. Estimates were compared to physicians' first reports filed under a State of California surveillance system in place since 1973	For 1987, respondents estimated that they cared for 3,413 cases of work-related CTS. Only 71 occupational CTS cases were reported in the county through doctor's first reports	The working population in Santa Clara county was not reported in the document, but the total population in the county was 1.4 million in 1987.

Table VII–2.—Summary of Underreporting Studies—Continued

STUDY	MEASURE OF UNDER-REPORTING	EXTENT OF UNDER-REPORTING OBSERVED	COMMENTS
Silverstein, Stetson, Keyserling, and Fine, *Am. J. Ind. Med.* 31:600 (1997, Ex. 26–28)	Incidence (per 100 worker years) of work-related MSDs reported on OSHA 200 logs compared with cases that received medical treatment, as identified by self-administered questionnaire	Plant/year: OSHA 200 log: Self-report Plant 1 1986: 1.0: 30.9 1987: 2.7 1988: 6.9 Plant 2 1986: 0.9: 40.9 1987: 11.9 1988: 21.4 Plant 3 1986: 20.3: 47.8 1987: 14.6 1988: 19.3 Plant 4 1986: 0.7: 24.5 1987: 2.1 1988: 9.9	Four automobile manufacturing plants. 713 out of 948 workers selected for the study completed the questionnaire.
Biddle, Roberts, Rosenman, and Welch, *JOEM.* 40:325 (1998, Ex. 26–1258)	Percentage of workers identified by a health care provider (HCP) as having a known or suspected occupational illness who filed for workers' compensation	Percentage of HCP-identified cases for which corresponding workers' compensation claim was identified ranged from 9% (almost certain match between HCP case and claims case) to 45.6% (possible match between HCP case and claims case)	Study of 30,000 Michigan workers identified as having work-related illness by an HCP.
	Percentage of workers with sprains or strains who filed for worker's compensation	Percentage of HCP-identified cases for which corresponding workers' compensation claim was identified ranged from 11.6% (almost certain match between HCP case and claims case) to 46.9% (possible match between HCP case and claims case)	
	Percentage of workers with carpal tunnel syndrome (CTS) who filed for workers' compensation	Percentage of HCP-identified cases for which corresponding workers' compensation claim was identified ranged from 22.6% (almost certain match between HCP case and claims case) to 62.5% (possible match between HCP case and claims case)	

Table VII–2.—Summary of Underreporting Studies—Continued

STUDY	MEASURE OF UNDER-REPORTING	EXTENT OF UNDER-REPORTING OBSERVED	COMMENTS
Fine, Silverstein, Armstrong, Anderson, and Sugano, *JOM,* 28:674 (1986, Ex. 26–920)	Incidence (per 100 worker-years) of upper-extremity MSDs reported in OSHA 200 logs compared with workers' compensation (WC), medical absence records (MAR) and medical case records (MCR)	Plant OSHA 200 WC MAR MRC B 0.03 0.29 3.04 2.03 C 0.15 0.45 1.85 13.98	Data from two large automobile manufacturing plants (total employment not reported).
Pransky, Snyder, Dembe, and Himmelstein, *Ergonomics,* 42:171 (1999, Ex. 26–922)	Percent of workers reporting musculoskeletal symptoms caused or aggrevated by work, compared to OSHA log entries	Work-related Symptom: % reporting / % in log Hand/Wrist 86% 6% Arm 33% 1% Neck 21% 0 Back/legs 28% 2% 9% of workers reported that symptoms resulted in lost work days over the past year. 6% reported they were formally assigned light-duty work by plant nurse. 15% reported sumptoms resulted in informal light-duty work arranged by co-workers	Questionnaire administered to 110 packers, of whom 98 reponded. Plant produces variety of children's products.
Park, Krebs, and Mirer, *JOEM*, 38:1111 (1996, Ex. 26–1261)	Number of claims made in a sickness and accident (S&A) disability (sick leave) system compared to lost-work-day (LWD) injuries and illnesses recorded in OSHA log	Only 7 of an estimated 47 (15%) S&A upper extremity LWD cases in 1992 were recorded on the OSHA log. For LWD back injuries, 27 of an estimated 36 (75%) S&A cases were recorded	Study of an automotive assembly and stamping complex employing 10,000 workers.
Park, Nelson, Silverstein, and Mirer, *JOM.* 34:731. (1992, Ex. 26–1259)	Medical insurance claims linked to work histories compared to OSHA logs	From 1984 to 1987, OSHA logs failed to record between 20 and 80 percent of occupational MSDs	Conclusion based on authors' own unpublished data from insurance records of five automotive manufacturing plants. These records identified 11,577 MSD health claims made by 3,204 workers.
Nelson, Park, Silverstein, and Mirer, *Am. J. Public Health.* 82:1550 (1992, Ex. 26–1260)	Medical insurance claims linked to work histories compared to OSHA logs	From 1985 through 1986, OSHA logs identified 59 hand/wrist MSD cases compared to 150 cases identified in health insurance records. For all MSDs from 1984 through 1987, only 9% of cases identified through insurance claims were recorded on OSHA logs (the authors cite data from Parks *et al.* (1992) indicating that about half of upper extremity MSD cases from insurance claims are attributable to work)	

In addition to the BLS data, epidemiologic studies comparing the prevalence or incidence of MSDs in exposed populations with the prevalence or incidence in referent groups with lesser or no such exposure also document the elevated risk confronting employees exposed to workplace risk factors. These studies also identify the types of workplace risk factors associated with the development of work-related musculoskeletal disorders, as well as the duration of exposures found to be associated with the disorders. This information further supports the occupational origin of the reported disorders.

For example, the odds of having an upper extremity disorder like carpal tunnel syndrome or tendinitis/peritendinitis of the shoulder or wrist are 5–30 times greater among workers exposed to combinations of risk factors such as high force, repetition and awkward postures (*e.g.*, overhead work) compared either to unexposed workers or workers who are exposed to a single risk factor (*e.g.*, Luopajarvi *et al.*, 1979, Ex. 26–56; Armstrong *et al.*,1987, Ex. 26–48; Silverstein *et al.*, 1987, Ex. 26–34; deKrom *et al.*, 1990, Ex. 26–41; Herberts *et al.*, 1984, Ex. 26–51). The odds of experiencing a low back disorder increased 3–8 fold among those workers exposed to frequent or forceful manual handling, awkward trunk postures (such as severe forward flexion), or to whole body vibration (Liles *et al.*, 1984, Ex. 26–33; Kelsey *et al.*, 1990, Ex. 26–52; Punnett *et al.*, 1991, Ex. 26–39; Wikstrom *et al.*, 1994, Ex. 26–61; Tanaka *et al.*, 1995, Ex. 26–59). Hip and knee disorders are associated with heavy physical work and awkward postures, such as kneeling and squatting, or using the knee as a kicker. Thun *et al.* (1987, Ex. 26–60) reported an increased risk of bursitis in carpet-layers that was 5 times higher than that of the unexposed workers. In a review of 4 studies, Hagberg and Wegman (1987, Ex. 26–32) estimated the work-attributable fraction of shoulder tendinitis in the exposed population to be 90%. In a review of 15 cross-sectional and 6 case control studies of carpal tunnel syndrome, Hagberg *et al.* (1992, Ex. 26–50) estimated the work-attributable fraction in the population exposed to high force, high repetition, vibration or awkward wrist/hand postures to be 50–90%. Olsen *et al.* (1994, Ex. 26–57) estimated that 40% of the cases of coxarthrosis (osteoarthrosis of the hip) seen in the exposed working population was due to heavy physical workload. Thus, in general, strong and consistent associations have been identified in the epidemiologic literature, primarily in cross-sectional and case control studies, but also in prospective studies (*e.g.*, Kurppa *et al.*, 1991, Ex. 26–53; Riihimaki *et al.*, 1994 Ex. 26–58; Felson *et al.*, 1991, Ex. 26–49). Exposure-response relationships have been identified in a number of studies, although precise quantitative modeling is not yet available.

Based on the various data and studies discussed in the Preliminary Risk Assessment and Health Effects sections of the preamble, OSHA preliminarily finds that workers exposed to workplace risk factors are at significant risk of developing work-related musculoskeletal disorders, which are harmful and often disabling conditions. This is particularly true for workers who are exposed to a combination of risk factors over most of the workshift.

The data indicate that this proposed rule would, if promulgated, cause employers to implement, for their problem jobs, interventions that would reduce the exposure of at-risk workers to workplace risk factors, and thus would substantially reduce significant risk. Specifically, the proposed requirements to conduct job analyses and implement controls where exposure to risk factors is high (*i.e.*, for manufacturing jobs, manual handling operations, and other jobs where a work-related MSD has occurred) would help to ensure that employees are exposed to fewer risk factors over time, or to a combination of risk factors for a lesser amount of time, than is now the case. A large body of data demonstrates that workplace interventions, such as job analysis to identify risk factors and implementation of controls to reduce exposures to these risk factors, can be very effective in reducing those forces responsible for musculoskeletal disease and injury; this has been shown in studies that have quantitatively examined the impact of ergonomic interventions on exposures to risk factors, as well as studies and reports that have documented actual reductions in injury prevalence following the implementation of ergonomics programs. Several of the proposed standard's ancillary provisions, such as MSD management and training, will provide additional protection against the significant risk that will remain after controls are implemented in problem jobs.

C. Preliminary Conclusions

OSHA preliminarily concludes, based on the evidence discussed above and elsewhere in the record, that the scientific data are sufficient to demonstrate that exposure to work-related risk factors is associated with the development of musculoskeletal disorders of the upper extremities, back, and lower extremities. Risk factors identified from this body of literature include repetitive motions; use of excessive force; segmental and whole-body vibration; maintaining awkward postures of the neck, wrists, arms, trunk, and lower-extremities; lifting, lowering, pushing, carrying, and pulling loads of excessive weight; and exposing extremities to temperature extremes. Depending on the specific combinations of risk factors encountered in the workplace, musculoskeletal disorders identified as being work-related include nerve entrapments such as carpal tunnel syndrome (hand, wrist), trigger finger (hand), De Quervains' disease (wrist), tendinitis (hand, wrist, shoulder, ankle), epicondylitis (elbow), rotator cuff tendinitis (shoulder and neck), sciatica (lower back), osteoarthritis (hip, knee), bursitis (knee), and tarsal tunnel syndrome (foot).

The evidentiary base on which OSHA relies in making these preliminary conclusions is described fully in the Health Effects section of the preamble. This evidence is comprised of several hundred cross-sectional, case-control, prospective and case series reports of working populations in a variety of industrial settings. Supplementing these reports is a large body of scientific literature that provides data on the mechanisms by which exposure to these risk factors causes musculoskeletal disorders; these data demonstrate the biological plausibility of the relationship between exposure to workplace risk factors and an elevated risk of MSD injury and illness.

MSDs have been recognized as compensable under virtually all State workers' compensation plans, although some states limit the kinds of MSDs considered compensable. Workers' compensation system recognition of the work-relatedness of many MSDs further demonstrates the link between these disorders and risk factors on the job. Taken together, OSHA believes that the scientific and other evidence described in the preamble to this proposed rule constitute an evidentiary base of unusually depth and quality.

Accordingly, OSHA preliminarily concludes that musculoskeletal disorders associated with workplace exposure to workplace risk factors constitute material impairments of health under the OSH Act. Further, as demonstrated by the evidence discussed in Section B above, the data available to the Agency demonstrate clearly that

workers in the occupations and industries covered by the proposed ergonomics program standard are at significant risk of experiencing a work-related MSD over their working lifetime; for many occupations and industries, they are at significant risk of experiencing a work-related MSD even in a single year of work in their job.

VIII. Summary of the Preliminary Economic Analysis and Regulatory Flexibility Analysis

A. Introduction

OSHA's Preliminary Economic and Regulatory Flexibility Analysis addresses issues related to the costs, benefits, technological and economic feasibility, and the economic impacts (including small business impacts) of the Agency's proposed ergonomics program rule. The analysis also evaluates regulatory and non-regulatory alternatives to the proposed rule. This rule is a significant rule under Executive Order 12866 and has been reviewed by the Office of Information and Regulatory Affairs in the Office of Management and Budget, as required by the executive order. In addition, this economic analysis meets the requirements of both Executive Order 12866 and the Regulatory Flexibility Act (as amended in 1996). The complete Preliminary Economic and Regulatory Flexibility Analysis has been entered into the rulemaking docket as Exhibit 28–1. The remainder of this section of the Preamble summarizes the results of that analysis.

The purpose of this Preliminary Economic and Regulatory Flexibility Analysis is to:

- Identify the establishments and industries potentially affected by the proposed rule;
- Estimate the benefits of the rule in terms of the reduction in musculoskeletal disorders (MSDs) employers will achieve by coming into compliance with the ergonomics program standard and some of the direct cost savings associated with those reductions;
- Evaluate the costs, economic impacts and small business impacts establishments in the regulated community will incur to establish ergonomics programs to achieve compliance with the proposed standard;
- Assess the economic feasibility of the rule for affected industries;
- Evaluate the principal regulatory and non-regulatory alternatives to the proposed rule that OSHA has considered;
- Present the Initial Regulatory Flexibility analysis for the proposed rule; and
- Respond to the findings and recommendations made to OSHA by the Small Business Regulatory Enforcement Fairness Act (SBREFA) Panel convened for this proposed standard.

The Preliminary Economic Analysis contains the following chapters:

Chapter I, Introduction
Chapter II, Industrial Profile
Chapter III, Technological Feasibility
Chapter IV, Benefits
Chapter V, Costs of Compliance
Chapter VI, Economic Feasibility
Chapter VII, Economic Impacts and Initial Regulatory Flexibility Analysis
Chapter VIII, Assessment of Non-Regulatory Alternatives.

B. Introduction and Industrial Profile (Chapters I and II)

The proposed ergonomics program standard was developed by OSHA in response to the large number of work-related musculoskeletal disorders of the upper extremities, back, and lower extremities that are threatening the health and well-being of many U.S. workers. Musculoskeletal disorders affect workers in almost every occupation and industry, regardless of establishment size, nature of work (clerical, professional, skilled, or unskilled), or industry sector. This is the case because work-related musculoskeletal disorders are caused or aggravated by risk factors—such as repetitive motion, forceful exertion, vibration, and awkward postures—that are present, either alone or in combination, in many jobs. The large number of musculoskeletal disorders—647,000 MSDs resulting in at least one day away from work in 1996, according to Bureau of Labor Statistics (BLS) data [5]—is largely explained by the continued reliance on unassisted lifting, carrying, and pushing/pulling of loads; the increasing specialization of work; and the faster pace of work (Ex. 26–1413).

Because these characteristics of work are not unique to the United States, countries of every size and on every continent are also experiencing significant numbers of musculoskeletal disorders among their workforces. Many of these countries—ranging from the United Kingdom and Sweden to Pakistan, Ecuador, and South Africa—have already established regulatory requirements designed to address some or all of the workplace risk factors giving rise to these disorders. A table summarizing the ergonomics rules and guidelines issued by other countries and organizations can be found in Chapter I of the Preliminary Economic Analysis.

To reflect the ubiquitous nature of MSD hazards in the workplace, the scope of the proposed standard potentially encompasses all workplaces within general industry. However, the scope of the proposed standard is tiered in a way that matches the extent of the ergonomics program required to the extent of the risk in different establishments.

The proposed ergonomics program standard allows employers whose employees are engaged in manual handling or manufacturing operations but have not experienced an MSD that is covered by the standard to implement only a basic program, while employers whose employees work in jobs where there has been at least one covered MSD must implement the full program. The full program requirements apply to any employer in general industry whose employees experience a covered MSD, not just to those whose establishments engage in manual handling or manufacturing operations. Many employers have found that ergonomics programs that have certain elements and provide a framework to systematically consider and address work-related MSDs can substantially reduce the number and severity of these MSDs, as well as the costs associated with them. There is widespread agreement that successful ergonomics programs include the following elements in some form:

- Management leadership and employee participation
- Hazard information and employee reporting
- Medical management (called ''MSD management'' in the proposed rule)
- Job hazard analysis and control
- Training
- Program evaluation.

The proposed standard adopts a tiered approach to program implementation and is job-based. This means that

[5] BLS reports that, in 1997, this number has fallen by about 3% since 1996, to 626,000 lost workday cases. However, in this analysis, OSHA relies on the BLS data for 1996, because the detailed breakdowns of the 1997 data needed for this economic analysis are not yet available.

general industry establishments whose employees work in jobs that have a lower probability of incurring an MSD would not be required to take any action until an MSD has occurred. Moreover, further action would only be triggered if the MSD is determined to be one that is recordable under the OSHA recordkeeping standard and, in addition, is determined by the employer to be the kind of MSD associated with risk factors that are a core element or significant part of the employee's regular job duties. Establishments whose employees have a higher probability of incurring a covered MSD, *i.e.*, those with employees engaged in manufacturing production operations or manual handling jobs, would be required to implement a basic ergonomics program for those jobs. The basic program essentially sets up an ergonomics surveillance system by establishing a way for employees to report MSDs as early as possible, providing them with the information they need to recognize MSDs and MSD hazards, and putting in place the management structure and employee participation mechanisms of an effective ergonomics program.

The full program requires the employer to analyze and control the ''problem'' job (*i.e.,* the job held by the injured employee and other jobs in the workplace that involve the same physical work activities), to provide affected employers and their supervisors with training, and to evaluate their programs periodically. The full program is only required for those jobs where a covered MSD has occurred and those jobs that are essentially the same, with respect to physical work activities, as the job held by the injured employee. In addition, if no covered MSD occurs in a previously controlled job for three years, the establishment is permitted by the standard to drop back to the basic program (if the establishment has employees who are engaged in manufacturing or manual handling operations) or to a program involving only maintenance of the controls in the problem job and any associated employer training (if the establishment does not have employees engaged in manufacturing operations or manual handling).

The basic program includes those elements that are appropriate to workplaces where problem jobs have not yet been identified:

- Management leadership, including allocation of resources, information and training for responsible managers or supervisors, and assignment of program responsibilities;
- Establishment of an employee reporting system and protection against discrimination for employees participating in the program or reporting MSD hazards;
- Providing employees with the information they need to recognize the signs and symptoms of MSDs and MSD hazards; and
- Employer determination of the recordability of the MSD and the relatedness of the MSD to the particular employee's job (to determine whether the MSD is one covered by the standard at all).

Once a covered MSD has been identified, a full program is required. However, even the full program may not be necessary in some circumstances when such an MSD is identified. For example, if the means of controlling the job giving rise to the MSD are obvious and the MSD hazard can be eliminated entirely, the employer may choose the standard's Quick Fix option and is not required to implement the full program for that job.

To determine the number of establishments within the scope of the standard, OSHA needed to obtain data on the number of establishments with employees engaged in manufacturing operations or manual handling, and the number of establishments without employees engaged in these activities who would be brought under the standard as a result of having an MSD. OSHA assumed that all establishments in the manufacturing sector would have employees engaged in manufacturing operations. OSHA estimated the number of establishments engaged in manual handling on the basis of responses to a question on a 1993 ergonomics survey conducted by OSHA. The question asked general industry employers whether any of their employees engaged in lifting more than 25 pounds. Because lifts of 25 pounds or more would not necessarily qualify as a manual handling job under the proposed standard, reliance on the survey responses to estimate the number of establishments with manual handling jobs may mean that OSHA's estimates of the number of such establishments may be high. To determine the likelihood that an establishment would have an employee who would incur an MSD, OSHA needed to determine the rate of MSDs by industry. BLS provided OSHA with data on the rates of lost workday MSDs by industry but does not have data on the rates of all MSDs, including MSDs involving restricted work only and those involving no lost worktime (Ex. 26–1413). In this analysis, OSHA estimates the rate of all MSDs on an industry-by-industry basis. To obtain the total MSD rate for each industry (including lost workday MSDs, restricted work MSDs, and non-lost workday MSDs), OSHA multiplied the reported rate of MSDs involving days away from work by the industry-specific ratio of the rate of all injuries and illnesses involving days away from work to the rate of all injuries and illnesses. The number of reported lost workday MSDs in each industry was then multiplied by this ratio to obtain the total MSD rate for each industry.

Table VIII–1, based on data from *County Business Patterns* for 1996, shows the three-digit industries covered by the standard and the number of employees and establishments in each covered industry within the general industry sector (Ex. 28–2). Table VIII–1 also shows the estimated annual incidence rates for all MSDs (lost workday, restricted work, and non-lost workday) for each industry. (These rates differ from those shown in the risk assessment section of the Preamble because they include an estimate of all MSDs, rather than lost workday MSDs only, and because they use *County Business Patterns* estimates of industry employment in computing MSD rates.) Table VIII–1 shows that the total MSD incidence rates in general industry range as high as 3,434 per 10,000 workers (in Truck Terminal and Joint Terminal Maintenance Facilities for trucks (SIC 423)). A total of about 6 million establishments and 93 million employees are present in general industry.

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Table VIII-1: Estimated Number of Establishments and Employees and Estimated Annual Incidence of All MSD's, by 3-Digit SIC

SIC	Industry	Total Number of Establishments	Total Number of Employees in all Establishments	Total MSD Incidence Rate (per 10,000 workers)
Agriculture, Forestry, and Fishing, Excluding 01 and 02				
710	Soil Preparation Services, 0710	641	5,415	238
720	Crop Services, 0720	4,133	46,943	412
740	Veterinary Services, 0740	22,807	174,576	112
750	Animal Services Except Veterinary, 0750	10,369	42,832	71
780	Landscape & Horticultural Services, 0780	68,157	345,871	268
810	Timber Tracts, 0810	862	7,025	202
830	Forest Nurseries, 0830	137	2,082	234
850	Forestry Services, 0850	1,568	12,265	135
910	Commercial Fishing, 0910	1,947	8,850	167
920	Fish Hatcheries & Preserves, 0920	95	1,465	167
970	Hunting, Trapping, & Game Propagation, 0970	339	1,650	172
Oil and Gas Extraction				
1310	Crude Petroleum & Natural Gas, 1310	7,758	83,909	74
1320	Natural Gas Liquids, 1320	560	12,814	110
1380	Oil Gas Field Services, 1380	8,764	159,639	152
Manufacturing				
2010	Meat Products, 2010	3,080	458,861	761
2020	Dairy Products, 2020	1,881	134,051	496
2030	Canned, Frozen, Preserved Fruits, Vegetables, Specialties	2,016	183,797	410
2040	Grain Mill Products, 2040	2,603	109,406	520
2050	Bakery Products, 2050	3,523	230,724	402
2060	Sugar & Confectionery Products, 2060	1,098	86,710	357
2070	Fats & Oils, 2070	507	26,512	311
2080	Beverages, 2080	2,286	144,328	703
2090	Miscellaneous Food Preparations & Kindred Products	4,007	165,889	453
2110	Cigarettes, 2110	15	20,498	319
2120	Cigars, 2120	47	2,737	119
2130	Chewing & Smoking Tobacco & Snuff, 2130	26	2,479	288
2140	Tobacco Stemming & Redrying, 2140	32	5,055	331
2210	Broadwoven Cotton Fabric Mills, 2210	412	50,459	844
2220	Broadwoven Manmade Fiber & Silk Mills, 2220	458	79,013	257
2230	Broadwoven Wool Fabric Mills, 2230	99	13,628	224
2240	Narrow Fabric Mills, 2240	277	17,608	558
2250	Knitting Mills, 2250	1,945	177,354	355
2260	Dyeing & Finishing Textiles Except Wool, 2260	852	53,437	372
2270	Carpets & Rugs, 2270	484	52,137	246
2280	Yarn & Thread Mills, 2280	588	82,102	322
2290	Miscellaneous Textile Mills, 2290	1,010	54,492	329
2310	Men'S & Boys' Suits, Coats, & Overcoats, 2310	293	30,229	338
2320	Men'S & Boys' Furnishings, Work Clothing, Etc., 2320	2,112	211,208	455
2330	Women'S, Misses', & Juniors' Outerwear, 2330	8,954	249,317	206
2340	Women'S, Misses', Children'S & Infants' Undergarments	372	35,283	365
2350	Hats, Caps, & Millinery, 2350	381	18,675	273
2360	Girls', Children'S, & Infants' Outerwear, 2360	585	36,315	233
2370	Fur Goods, 2370	133	550	273
2380	Miscellaneous Apparel & Accessories, 2380	933	30,771	317
2390	Miscellaneous Fabricated Textile Products, 2390	8,797	220,100	310
2410	Logging, 2410	14,273	86,675	67
2420	Sawmills & Planing Mills, 2420	6,103	167,103	401
2430	Millwork, Veneer, Plywood, & Structural Wood Members	9,548	254,660	553
2440	Wood Containers, 2440	2,830	48,027	401
2450	Wood Buildings & Mobile Homes, 2450	1,044	82,857	678
2490	Miscellaneous Wood Products, 2490	3,536	91,967	367
2510	Household Furniture, 2510	5,500	263,791	460

Table VIII-1: Estimated Number of Establishments and Employees and Estimated Annual Incidence of All MSD's, by 3-Digit SIC (Continued)

SIC	Industry	Total Number of Establishments	Total Number of Employees in all Establishments	Total MSD Incidence Rate (per 10,000 workers)
2520	Office Furniture. 2520	1,033	70.867	509
2530	Public Building & Related Furniture, 2530	449	34.886	1,448
2540	Partitions, Shelving, Lockers, & Office & Store Fixtures, 2540	2,996	80.751	507
2590	Miscellaneous Furniture & Fixtures, 2590	1,412	45.588	319
2610	Pulp Mills, 2610	62	15.349	138
2620	Paper Mills, 2620	344	121.373	360
2630	Paperboard Mills, 2630	228	54.165	155
2650	Paperboard Containers & Boxes, 2650	2.809	206.643	327
2670	Convrtd Paper & Pprbrd Prods, Excpt Containers & Boxes	3,033	227.539	303
2710	Newspapers: Publishing, Or Publishing & Printing, 2710	8,878	395.716	196
2720	Periodicals: Publishing, Or Publishing & Printint, 2720	5,781	117.880	117
2730	Books, 2730	3,559	135.942	206
2740	Miscellaneous Publishing, 2740	3,259	61,716	122
2750	Commercial Printing, 2750	34.435	587,534	226
2760	Manifold Business Forms, 2760	911	45.341	359
2770	Greeting Cards. 2770	143	19.958	434
2780	Blankbooks, Binders, & Bookbinding & Related Work	1,583	63.356	317
2790	Service Industries For The Printing Trade, 2790	3,436	56.387	113
2810	Industrial Inorganic Chemicals, 2810	1,390	85,705	163
2820	Plastics Materials & Synthetic Resins, Except Glass, 2820	876	117,868	163
2830	Drugs, 2830	1.637	207,295	193
2840	Soaps, Detergents, Cleaning Preparations, Perfumes, etc.	2,434	120.815	237
2850	Paints, Varnishes, Lacquers, Enamels, 2850	1,479	52,183	264
2860	Industrial Organic Chemicals, 2860	946	121,918	120
2870	Agricultural Chemicals, 2870	938	40.431	152
2890	Miscellaneous Chemical Products, 2890	2,566	86.431	263
2910	Petroleum Refining, 2910	275	70,045	107
2950	Asphalt Paving & Roofing Materials, 2950	1,368	24,390	294
2990	Miscellaneous Products Of Petroleum & Coal, 2990	466	13.874	101
3010	Tires & Inner Tubes, 3010	171	65,902	686
3020	Rubber & Plastics Footwear, 3020	61	8,895	319
3050	Gaskets, Packing Devices, Rubber & Plastics Hose & Belts	826	59,475	578
3060	Fabricated Rubber Products Nec, 3060	1,767	111,074	574
3080	Miscellaneous Plastics Products, 3080	13,648	751,503	420
3110	Leather Tanning & Finishing, 3110	343	14.843	552
3130	Boot & Shoe Cut Stock & Findings, 3130	70	2,103	594
3140	Footwear, Except Rubbeer, 3140	378	38,768	480
3150	Leather Gloves & Mittens, 3150	69	2,349	532
3160	Luggage, 3160	261	10.231	229
3170	Handbags & Other Personal Leather Goods, 3170	343	9.382	385
3190	Leather Goods Nec, 3190	418	8,414	580
3210	Flat Glass, 3210	81	13.203	749
3220	Glass & Glassware, Pressed Or Blown, 3220	589	61,911	562
3230	Glass Products Made Of Purchased Glass, 3230	1,640	61.300	507
3240	Cement, Hydraulic, 3240	231	16,283	311
3250	Structural Clay Products, 3250	593	29,093	532
3260	Pottery & Related Products, 3260	1,200	39.441	625
3270	Concrete, Gypsum, & Plaster Products, 3270	9,498	190,188	360
3280	Cut Stone & Stone Products, 3280	1,071	13.867	399
3290	Abrasive, Asbestos, & Misc. Nonmetallic Mineral Products	1,599	69,785	411
3310	Steel Works, Blast Furnaces, & Rolling & Finishing Mills	1,284	225.373	438
3320	Iron & Steel Foundries, 3320	1,160	133.111	794
3330	Primary Smelting & Refining Of Nonferrous Metals, 3330	201	34,534	444
3340	Secondary Smelting & Refining Of Nonferrous Metals,	299	15,013	543
3350	Rolling, Drawing, & Extruding Of Nonferrous Metals, 3350	1,105	153,482	503
3360	Nonferrous Foundries, 3360	1,662	89,402	629
3390	Miscellaneous Primary Metal Products, 3390	947	31.444	231

Table VIII-1: Estimated Number of Establishments and Employees and Estimated Annual Incidence of All MSD's, by 3-Digit SIC (Continued)

SIC	Industry	Total Number of Establishments	Total Number of Employees in all Establishments	Total MSD Incidence Rate (per 10,000 workers)
3410	Metal Cans & Shipping Containers, 3410	435	35,214	431
3420	Cutlery, Handtools, & General Hardware, 3420	2,446	133,392	476
3430	Heating Equipment & Plumbing Fixtures, 3430	688	46,295	920
3440	Fabricated Structural Metal Products, 3440	13,334	428,117	450
3450	Screws, Bolts, Nuts, Screws, Rivets, & Washers, 3450	2,602	99,345	491
3460	Metal Forgings & Stampings, 3460	3,694	258,010	704
3470	Coating, Engraving, & Allied Services Nec, 3479	5,529	124,099	383
3480	Ordnance, Accessories Excpt Vehicles & Guided Missiles	438	39,859	339
3490	Miscellaneous Fabricated Metal Products, 3490	7,266	296,592	452
3510	Engines & Turbines, 3510	371	75,184	561
3520	Farm & Garden Machinery & Equipment, 3520	1,761	98,072	501
3530	Construction, Mining, & Materials Handling Machinery	3,324	195,304	508
3540	Metalworking Machinery & Equipment, 3540	11,811	295,152	376
3550	Special Industrymachinery Except Metalworking, 3550	4,790	190,365	348
3560	General Industrial Machinery & Equipment, 3560	4,378	260,600	413
3570	Computer & Office Equipment, 3570	2,112	227,720	213
3580	Refreigeration & Service Industry Machinery, 3580	2,246	199,595	566
3590	Miscellaneous Industrial & Commercial Machinery	25,875	377,370	304
3610	Electric Transmission & Distribution Equipment, 3610	875	68,623	369
3620	Electrical Industrial Apparatus, 3620	2,260	162,510	440
3630	Household Appliances, 3630	474	106,685	677
3640	Electric Lighting & Wiring Equipment, 3640	2,117	154,073	474
3650	Househod Audio & Video Equipment & Recordings, 3650	815	50,938	408
3660	Communications Equipment, 3660	2,110	254,639	170
3670	Electronic Components & Accessories, 3670	6,570	594,638	196
3690	Misc. Electrical Machinery, Equipment, & Supplies	1,788	152,482	499
3710	Motor Vehicles & Equipment, 3710	5,049	785,168	1,221
3720	Aircraft & Parts, 3720	1,693	400,899	358
3730	Ship & Boat Building & Repairing, 3730	2,676	52,904	630
3740	Railroad Equipment, 3740	213	35,344	630
3750	Motorcycles, Bicycles, & Parts, 3750	370	16,400	615
3760	Guided Missiles & Space Vehicles & Parts, 3760	105	78,710	141
3790	Miscellaneous Transportation Equipment, 3790	1,135	53,849	569
3810	Search, Detection, Navigation, Related Systems	696	184,871	124
3820	Laboratory Apparatus & Analytical Instruments	4,755	265,806	257
3840	Surgical, Medical, & Dental Instruments &Supplies, 3840	4,471	267,624	221
3850	Ophthalmic Goods, 3850	587	26,417	312
3860	Photographic Equipment & Supplies, 3860	721	62,716	377
3870	Watches, Clocks, Clockwork Operated Devices, & Parts	141	5,765	167
3910	Jewelry, Silverware, & Plated Ware, 3910	2,813	45,819	236
3930	Musical Instruments, 3930	550	13,562	549
3940	Dolls, Toys, Games, & Sporting & Athletic Goods, 3940	3,515	106,609	534
3950	Pens, Pencils, & Artists' Materials, 3950	1,038	28,540	233
3960	Costume Jewelry, Costume Novelties, Buttons, & Notions	1,092	22,970	189
3990	Miscellaneous Manufacturing Industries, 3990	8,803	171,667	338
Transportation, Communication, Electric, Gas, & Sanitary Services, Excluding 40				
4110	Local & Suburban Passenger Transportation, 4110	9,536	194,756	419
4120	Taxicabs, 4120	3,304	27,944	67
4130	Intercity & Rural Bus Transportation, 4130	481	20,621	292
4140	Bus Charter Service, 4140	1,432	29,190	97
4150	School Buses, 4150	4,248	143,919	81
4170	Terminal Facilities For Vehicle Passenger Transport	57	477	364
4210	Trucking & Courier Services Except Air, 4210	116,861	1,725,748	257
4220	Public Warehousing & Storage, 4220	11,856	121,344	441
4230	Terminal & Joint Terminal Maintenance Facilities	80	766	3,434

Table VIII-1: Estimated Number of Establishments and Employees and Estimated Annual Incidence of All MSD's, by 3-Digit SIC (Continued)

SIC	Industry	Total Number of Establishments	Total Number of Employees in all Establishments	Total MSD Incidence Rate (per 10,000 workers)
4510	Air Transportation, Scheduled, & Air Courier Services	6,608	621,649	1,171
4520	Air Transportation, Nonscheduled, 4520	1,831	28,845	175
4580	Airports, Flying Fields, & Airport Terminal Services, 4580	4,014	104,581	322
4610	Pipelines, Except Natural Gas, 4601	963	15,065	47
4720	Arrangement Of Passenger Transportation, 4720	33,106	223,624	27
4730	Arrangement Of Transportation Of Freight & Cargo, 4730	14,771	137,522	148
4740	Rental Of Railroad Cars, 4740	116	2,326	88
4780	Miscellaneous Services Incidental To Transportation, 4780	2,681	42,104	269
4810	Telephone Communications, 4810	27,277	927,967	101
4820	Telegraph & Other Message Communications, 4820	466	5,782	97
4830	Radio & Television Broadcasting Stations, 4830	8,833	238,078	36
4840	Cable & Other Pay Television Services, 4840	4,786	170,300	172
4890	Communications Services Nec, 4890	1,488	22,405	36
4910	Electric Services, 4910	6,278	382,861	187
4920	Gas Production & Distribution, 4920	3,941	135,670	219
4930	Combination Electric & Gas, & Other Utility Services, 4930	1,871	199,685	125
4940	Water Supply, 4940	3,701	26,045	227
4950	Sanitary Services, 4950	6,491	130,347	532
4960	Steam & Air-Conditioning Supply, 4960	69	1,400	280
4970	Irrigation Systems, 4970	366	1,785	225
Wholesale Trade				
5010	Motor Vehicles & Motor Vehicle Parts & Supplies, 5010	45,779	520,711	218
5020	Furniture & Home Furnishings, 5020	16,693	169,720	249
5030	Lumber & Other Construction Materials, 5030	23,678	264,739	411
5040	Professional & Commercial Equipment & Supplies, 5040	51,941	725,137	139
5050	Metals & Minerals, Except Petroleum, 5050	11,416	154,821	296
5060	Electrical Goods, 5060	41,707	508,202	156
5070	Hardware & Plumbing & Heating Equipment & Supplies	26,119	269,607	303
5080	Machinery, Equipment, & Supplies, 5080	76,249	762,397	223
5090	Miscellaneous Durable Goods, 5090	40,029	354,068	190
5110	Paper & Paper Products, 5110	18,712	291,514	129
5120	Drugs, Drug Proprietaries, & Druggists' Sundries,5120	7,316	173,960	147
5130	Apparel, Piece Goods, & Notions, 5130	21,766	209,032	145
5140	Groceries & Related Products, 5140	43,314	846,803	387
5150	Farm-Product Raw Materials, 5150	10,680	98,112	82
5160	Chemicals & Allied Products, 5160	15,171	163,603	152
5170	Petroleum & Petroleum Products, 5170	13,177	153,471	161
5180	Beer, Wine, & Distilled Alcoholic Beverages, 5180	5,055	148,567	553
5190	Miscellaneouls Nondurable Goods, 5190	54,335	505,832	208
Retail Trade				
5210	Lumber & Other Building Materials Dealers, 5210	24,266	475,454	401
5230	Paint, Glass, & Wallpaper Stores, 5230	9,777	49,415	315
5250	Hardware Stores, 5250	14,282	124,402	215
5260	Retail Nurseries, Lawn & Garden Supply Stores, 5260	11,258	80,822	254
5270	Mobile Home Dealers, 5270	4,780	36,746	416
5310	Department Stores, 5310	10,824	1,850,213	378
5330	Variety Stores, 5330	10,848	92,765	513
5390	Miscellaneous General Merchandise Stores, 5390	14,797	316,419	139
5410	Grocery Stores, 5410	129,150	2,980,869	254
5420	Meat & Fish Markets, Including Freezer Provisioners, 5420	7,868	45,979	183
5430	Fruit & Vegetable Markets, 5430	3,342	19,178	106
5440	Candy, Nut, & Confectionery Stores, 5440	4,742	27,794	70
5450	Dairy Products Stores, 5450	2,550	14,746	99

Table VIII-1: Estimated Number of Establishments and Employees and Estimated Annual Incidence of All MSD's, by 3-Digit SIC (Continued)

SIC	Industry	Total Number of Establishments	Total Number of Employees in all Establishments	Total MSD Incidence Rate (per 10,000 workers)
5460	Retail Bakeries, 5460	20,156	148,069	120
5490	Miscellaneous Food Stores, 5490	9,904	55,450	89
5510	Motor Vehicle Dealers (New & Used), 5510	24,639	1,014,799	200
5520	Motor Vehicle Dealers (Used Only), 5520	21,951	85,892	13
5530	Auto & Home Supply Stores, 5530	43,806	345,849	212
5540	Gasoline Service Stations 5540	96,236	713,280	110
5550	Boat Dealers, 5550	5,068	33,121	220
5560	Recreational Vehicle Dealers, 5560	2,995	28,499	300
5570	Motorcycle Dealers, 5570	3,785	29,387	27
5590	Automotive Dealers Nec, 5590	1,234	5,654	203
5610	Men'S & Boys' Clothing & Accessory Stores, 5610	13,844	92,334	67
5620	Women'S Clothing Stores, 5620	40,559	327,351	40
5630	Women'S Accessory & Specialty Stores, 5630	8,647	50,147	39
5640	Children'S & Infants' Wear Stores, 5640	5,186	45,078	56
5650	Family Clothing Stores, 5650	19,583	329,123	165
5660	Shoe Stores, 5660	31,737	180,967	67
5690	Miscellaneous Apparel & Accessory Stores, 5690	10,161	53,173	31
5710	Home Furniture & Furnishing Stores,5710	66,004	475,508	260
5720	Household Appliance Stores, 5720	10,045	63,989	239
5730	Radio, Television, Consumer Electronics, & MuStores	39,074	336,182	105
5810	Eating & Drinking Places, 5810	466,386	7,416,595	79
5910	Drug Stores & Proprietary Stores, 5910	43,221	588,160	75
5920	Liquor Stores, 5920	28,812	128,995	32
5930	Used Merchandise Stores, 5930	23,524	117,116	127
5940	Miscellaneous Shopping Goods Stores, 5940	129,136	850,337	107
5960	Nonstore Retailers, 5960	29,947	372,947	257
5980	Fuel Dealers, 5980	11,317	95,385	155
5990	Retail Stores Nec, 5990	95,174	468,433	83
Finance, Insurance, and Real Estate				
6010	Central Reserve Depository Institutions, 6010	102	25,274	191
6020	Commercial Banks, 6020	67,422	1,507,165	40
6030	Savings Institutions, 6030	16,131	262,936	34
6060	Credit Unions, 6060	14,921	163,027	65
6080	Foreign Banking & Agencies Of Foreign Banks, 6080	656	33,830	1
6090	Functions Related To Depository Banking, 6090	5,820	68,711	85
6110	Federal & Federally-Sponsored Credit Agencies, 6110	1,333	22,884	67
6140	Personal Credit Institutions, 6140	18,996	183,249	6
6150	Business Credit Institutions, 6150	5,358	104,991	42
6160	Mortgage Bankers & Brokers, 6160	21,897	226,475	34
6210	Security Brokers, Dealers, & Flotation Companies, 6210	25,523	411,411	19
6220	Commodity Contracts Brokers & Dealers, 6220	1,623	13,185	19
6230	Security & Commodity Exchanges, 6230	117	7,650	62
6280	Services For The Exchange Of Securities Or Commodities	18,123	135,349	12
6310	Life Insurance, 6310	11,754	547,789	32
6320	Accident & Health Insurance & Medical Service Plans	3,337	306,420	114
6330	Fire, Marine, & Casulaty Insurance, 6330	20,361	594,733	83
6350	Surety Insurance, 6350	579	10,255	131
6360	Title Insurance, 6360	2,546	39,886	68
6370	Pensions, Health, & Welfare Funds, 6370	2,747	33,107	35
6390	Insurance Carriers Nec, 6390	292	4,018	72
6410	Insurance Agents, Brokers, & Service, 6410	127,278	695,139	28
6510	Real Estate Operators & Lessors, 6510	100,612	499,293	174
6530	Real Estate Agents & Managers, 6530	124,530	756,905	73
6540	Title Abstract Offices, 6540	5,195	35,417	32
6550	Land Subdividers & Developers, 6550	18,561	115,746	201
6710	Holding Offices, 6710	9,575	161,371	38
6720	Investment Offices, 6720	920	24,933	32

Table VIII-1: Estimated Number of Establishments and Employees and Estimated Annual Incidence of All MSD's, by 3-Digit SIC (Continued)

SIC	Industry	Total Number of Establishments	Total Number of Employees in all Establishments	Total MSD Incidence Rate (per 10,000 workers)
	6730 Trusts, 6730	8,841	57,282	56
	6790 Miscellaneous Investing, 6790	8,419	56,460	82
Services, Excluding 88				
	7010 Hotels & Motels, 7010	45,252	1,539,037	241
	7020 Rooming & Boarding Houses, 7020	1,624	9,302	285
	7030 Camps & Recreational Vehicle Parks, 7030	7,435	35,478	15
	7040 Organization Hotels & Lodging Houses, Memberships	2,410	12,891	40
	7210 Laundry, Cleaning, & Garment Services, 7210	56,704	443,179	200
	7220 Photographic Studios, Portrait, 7220	13,168	70,481	74
	7230 Beauty Shops, 7230	81,872	390,177	31
	7240 Barber Shops, 7240	4,499	14,506	190
	7250 Shoe Repair Shops & Shoeshine Parlors, 7250	2,216	5,807	134
	7260 Funeral Service & Crematories, 7260	15,784	99,027	65
	7290 Miscellaneous Personal Services, 7290	30,697	254,674	9
	7310 Advertising, 7310	19,664	242,468	49
	7320 Cons. Credit Reporting, Mercantile Rpt., & Collection	6,914	109,523	52
	7330 Mailing, Reproduction, Com. Art, Photography, Stenog.	35,058	285,511	118
	7340 Services To Dwellings & Other Buildings, 7342	65,559	916,370	165
	7350 Miscellaneous Equipment Rental & Leasing, 7350	24,814	229,196	142
	7360 Personnel Supply Services, 7360	37,374	2,778,419	48
	7370 Computer Program., Dataprocessing, & Other Services	88,911	1,266,890	33
	7380 Miscellaneous Business Services, 7380	85,634	1,366,526	70
	7510 Automotive Rental & Leasing, Without Drivers, 7510	10,643	149,154	93
	7520 Automobile Parking, 7520	8,892	65,390	57
	7530 Automotive Repair Shops, 7530	139,184	608,702	108
	7540 Automotive Services Except Repair, 7540	26,948	211,838	211
	7620 Electrical Repair Shops, 7620	19,328	144,758	53
	7630 Watch, Clock, & Jewelry Repair, 7630	1,805	5,705	1,346
	7640 Reupholstery & Furniture Repair, 7640	6,842	22,674	244
	7690 Miscellaneous Repair Shops & Related Services, 7690	39,008	262,495	160
	7810 Motion Picture Production & Allied Services, 7810	14,680	240,953	216
	7820 Motion Picture Distribution & Allied Services, 7820	1,456	21,899	498
	7830 Motion Picture Theaters, 7830	6,572	118,921	280
	7840 Video Tape Rental, 7840	20,816	129,258	270
	7910 Dance Studios, Schools, & Halls, 7910	5,719	27,063	18
	7920 Theatrical Producers, Bands, Orchestras, & Entertainers	16,839	161,158	94
	7930 Bowling Centers, 7930	5,735	90,614	50
	7940 Commercial Sports, 7940	4,763	101,728	218
	7990 Miscellaneous Amusement & Recreation Services, 7990	61,841	991,444	181
	8010 Offices & Clinics Of Doctors Of Medicine, 8010	186,994	1,688,823	78
	8020 Offices & Clinics Of Dentists, 8020	113,054	634,709	27
	8030 Offices & Clinics Of Doctors Of Osteopathy, 8030	9,105	53,700	182
	8040 Offices & Clinics Of Other Health Praactioners, 8040	84,667	353,204	166
	8050 Nursing & Personal Care Facilities, 8050	24,009	1,806,086	706
	8060 Hospitals, 806	7,282	5,067,349	327
	8070 Medical & Dental Laboratories, 8070	15,243	190,629	84
	8080 Home Health Care Services, 8080	16,106	779,365	285
	8090 Miscellaneous Health & Allied Services Nec, 8090	20,849	387,020	121
	8110 Legal Services, 8110	168,276	959,809	39
	8210 Elementaary & Secondary Schools, 8210	18,017	609,190	45
	8220 Colleges, Universities, Prof. Schools, & Junior Colleges	3,663	1,258,979	46
	8230 Libraries, 8230	2,252	22,343	73
	8240 Vocational Schools, 8240	6,816	79,561	22
	8290 Schools & Educational Services Nec, 8290	15,395	124,076	13
	8320 Individual & Family Social Services, 8320	43,047	596,191	190
	8330 Job Training & Vocational Rehabilitation Services, 8330	9,114	325,655	107
	8350 Child Day Care Services, 8350	53,592	553,897	80

Table VIII-1: Estimated Number of Establishments and Employees and Estimated Annual Incidence of All MSD's, by 3-Digit SIC (Continued)

SIC	Industry	Total Number of Establishments	Total Number of Employees in all Establishments	Total MSD Incidence Rate (per 10,000 workers)
8360	Residential Care, 8360	28,762	550,745	353
8390	Social Services Nec, 8390	15,702	216,649	87
8410	Museums & Art Galleries, 8410	4,520	63,818	129
8420	Arboreta & Botanical Or Zoological Gardens, 8420	585	16,044	172
8610	Business Associations, 8610	15,767	111,371	30
8620	Professional Membership Organizations, 8620	7,033	63,638	24
8630	Labor Unions & Similar Labor Organizations, 8630	19,536	169,366	16
8640	Civic, Social, & Fraternal Associations, 8640	36,944	369,808	70
8650	Political Organizations, 8650	2,579	10,719	95
8660	Religious Organizations, 8660	158,299	1,380,975	8
8690	Membership Organizations Nec, 8690	9,072	106,606	81
8710	Engineering, Architectural, & Surveying Services, 8710	78,815	910,439	38
8720	Accounting, Auditing, & Bookkeeping Services, 8720	84,175	639,896	59
8730	Research, Development, & Testing Services, 8730	19,471	458,980	113
8740	Management & Public Relations Services, 8740	95,033	985,335	69
8990	Services Nec, 8990	17,221	105,803	249
	Total	**5,904,039**	**92,725,578**	

Sources: Office of Regulatory Analysis, OSHA
Number of establishments is taken from "County Business Patterns", U.S. Bureau of Census (1996)
MSD rates are calculated by multiplying, for each industry, the number of lost workday MSDs reported by employers to the BLS by the ratio of all lost workday injuries and illnesses for that industry to all non-lost workday injuries and illnesses for that industry. OSHA used this approach because the BLS only reports the number of lost workday MSDs by industry.

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Table VIII–2 shows that about 2 million of the establishments in general industry (or about one-third of all establishments) will be covered by the standard (either by a basic or a full program) in the first year after the standard goes into effect (Table VIII–2). This table breaks these establishments out by those within the scope of the proposed standard because they have employees engaged in manufacturing operations, because they have employees engaged in manual handling, or have employees engaged in other activities that have caused a covered MSD. About 373,000 establishments are estimated to need a basic program as a result of having employees engaged in manufacturing operations, and a total of about 976,000 establishments will need a basic program because they have employees engaged in manual handling. In the first year of the standard's implementation, about 600,000 establishments whose employees engage in other general industry jobs (*i.e.,* have jobs that do not involve either manual handling or manufacturing operations) will need to fix jobs because they have an employee who has incurred a covered MSD. In the first year, approximately 7.7 million jobs will be fixed as a result of the ergonomics program standard. At the end of ten years, approximately 30 million problem jobs will have been fixed (see Chapter IV of the Preliminary Economic Analysis).

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Table VIII-2

NUMBER OF ESTABLISHMENTS ESTIMATED TO FALL WITHIN THE SCOPE OF THE STANDARD IN YEAR 1, BY 3-DIGIT SIC

SIC	Industry	Total Number of Establishments in SIC	Total Number of Establishments with Manufacturing Jobs	Total Number of Establishments With Manual Handling Jobs [a]	Total Number of Establishments Not Engaged in Manual Handling or Manufacturing, but incurring a Covered MSD	Total Number of Establishments in First Year in the Scope of the Standard
071	Soil prep. services	641	0	239	74	313
072	Crop services	4,133	0	1,538	986	2,524
074	Veterinary services	22,807	0	8,488	1,183	9,672
075	Animal serv., excpt vet.	10,369	0	3,859	189	4,048
078	Lndscape & hort. services	68,157	0	31,355	4,732	36,087
081	Timber tracts	862	0	321	83	404
083	Forest products	137	0	51	26	77
085	Forestry services	1,568	0	584	99	683
091	Commerical fishing	1,947	0	725	90	815
092	Fish hatcheries	95	0	35	14	49
097	Hunting & trapping	339	0	126	17	143
131	Crude petrol. & nat. gas	7,758	0	1,553	480	2,032
132	Natural gas liquids	560	0	112	100	212
138	Oil & gas field services	8,764	0	1,754	1,707	3,461
201	Meat products	3,080	3,080	0	0	3,080
202	Dairy products	1,881	1,881	0	0	1,881
203	Presrvd fruits & vegetables	2,016	2,016	0	0	2,016
204	Grain mill products	2,603	2,603	0	0	2,603
205	Bakery products	3,523	3,523	0	0	3,523
206	Sugar and confect. prods	1,098	1,098	0	0	1,098
207	Fats and oils	507	507	0	0	507
208	Beverages	2,286	2,286	0	0	2,286
209	Misc. food products	4,007	4,007	0	0	4,007
211	Cigarettes	15	15	0	0	15
212	Cigars	47	47	0	0	47
213	Chewing & smoking tobacco	26	26	0	0	26
214	Tobacco stemm. & redrying	32	32	0	0	32
221	Brdwven fab. mills, cotton	412	412	0	0	412
222	Broadwoven fabric mills	458	458	0	0	458
223	Brdwvn fab. mills, wool	99	99	0	0	99
224	Narrow fabric mills	277	277	0	0	277
225	Knitting mills	1,945	1,945	0	0	1,945
226	Tex. finishing, excpt wool	852	852	0	0	852
227	Carpets and rugs	484	484	0	0	484
228	Yarn and thread mills	588	588	0	0	588
229	Misc. textile goods	1,010	1,010	0	0	1,010
231	Men's & boys' suits & coats	293	293	0	0	293
232	Men's & boys' furnishings	2,112	2,112	0	0	2,112
233	Wm's & misses' outerwear	8,954	8,954	0	0	8,954
234	Wm's & chldrn's undergarmnts	372	372	0	0	372
235	Hats, caps, & millinery	381	381	0	0	381
236	Girls' & chldrn's outerwear	585	585	0	0	585
237	Fur goods	133	133	0	0	133
238	Misc. apparel & accessories	933	933	0	0	933
239	Misc. fab. textile prods	8,797	8,797	0	0	8,797
241	Logging	14,273	14,273	0	0	14,273
242	Sawmills & planing mills	6,103	6,103	0	0	6,103
243	Millwork & plywood	9,548	9,548	0	0	9,548
244	Wood containers	2,830	2,830	0	0	2,830
245	Wood bldings & mobile homes	1,044	1,044	0	0	1,044
249	Misc. wood products	3,536	3,536	0	0	3,536
251	Household furniture	5,500	5,500	0	0	5,500
252	Office furniture	1,033	1,033	0	0	1,033
253	Pub blding & related furn.	449	449	0	0	449
254	Partitions and fixtures	2,996	2,996	0	0	2,996
259	Misc furniture and fixtures	1,412	1,412	0	0	1,412
261	Pulp mills	62	62	0	0	62
262	Paper mills	344	344	0	0	344
263	Paperboard mills	228	228	0	0	228
265	Paperbrd containers & boxes	2,809	2,809	0	0	2,809
267	Misc. cnvrtd paper products	3,033	3,033	0	0	3,033
271	Newspapers	8,878	8,878	0	0	8,878
272	Periodicals	5,781	5,781	0	0	5,781
273	Books	3,559	3,559	0	0	3,559
274	Miscellaneous publishing	3,259	3,259	0	0	3,259

Table VIII-2

NUMBER OF ESTABLISHMENTS ESTIMATED TO FALL WITHIN THE SCOPE OF THE STANDARD IN YEAR 1, BY 3-DIGIT SIC

SIC	Industry	Total Number of Establishments in SIC	Total Number of Establishments with Manufacturing Jobs	Total Number of Establishments With Manual Handling Jobs [a]	Total Number of Establishments Not Engaged in Manual Handling or Manufacturing, but incurring a Covered MSD	Total Number of Establishments in First Year in the Scope of the Standard
275	Commercial printing	34,435	34,435	0	0	34,435
276	Manifold business forms	911	911	0	0	911
277	Greeting cards	143	143	0	0	143
278	Blankbooks & bookbinding	1,583	1,583	0	0	1,583
279	Printing trade services	3,436	3,436	0	0	3,436
281	Indust. inorganic chemicals	1,390	1,390	0	0	1,390
282	Plastics mat. & synthetics	876	876	0	0	876
283	Drugs	1,637	1,637	0	0	1,637
284	Soap, clnrs, & toilet goods	2,434	2,434	0	0	2,434
285	Paints & allied products	1,479	1,479	0	0	1,479
286	Indust. organic chemicals	946	946	0	0	946
287	Agricultural chemicals	938	938	0	0	938
289	Misc. chemical products	2,566	2,566	0	0	2,566
291	Petroleum refining	275	275	0	0	275
295	Asphlt pavng & roofng mat.	1,368	1,368	0	0	1,368
299	Misc. pet. & coal prods	466	466	0	0	466
301	Tires and inner tubes	171	171	0	0	171
302	Rubber & plastics footwear	61	61	0	0	61
305	Hose, bltng, and gaskets	826	826	0	0	826
306	Fab. rubber prod., n.e.c.	1,767	1,767	0	0	1,767
308	Misc plastics, n.e.c.	13,648	13,648	0	0	13,648
311	Leather tan. & finishing	343	343	0	0	343
313	Footwear cut stock	70	70	0	0	70
314	Footwear, except rubber	378	378	0	0	378
315	Leather gloves & mittens	69	69	0	0	69
316	Luggage	261	261	0	0	261
317	Hndbags & prsnal leathr gds.	343	343	0	0	343
319	Leather goods, n.e.c.	418	418	0	0	418
321	Flat glass	81	81	0	0	81
322	Glass, pressed or blown	589	589	0	0	589
323	Prod. of purchased glass	1,640	1,640	0	0	1,640
324	Cement, hydraulic	231	231	0	0	231
325	Structural clay products	593	593	0	0	593
326	Pottery & related prods	1,200	1,200	0	0	1,200
327	Concrete & plast. prdcts	9,498	9,498	0	0	9,498
328	Cut stone & stone prods	1,071	1,071	0	0	1,071
329	Misc. nonmet. mineral prods.	1,599	1,599	0	0	1,599
331	Basic steel products	1,284	1,284	0	0	1,284
332	Iron and steel foundries	1,160	1,160	0	0	1,160
333	Primary nonfer. metals	201	201	0	0	201
334	Secondary nonfer. metals	299	299	0	0	299
335	Nonfer. rolling & drawing	1,105	1,105	0	0	1,105
336	Nonfer. foundries (cstngs)	1,662	1,662	0	0	1,662
339	Misc. primary metal prdcts	947	947	0	0	947
341	Met. cans & ship. containers	435	435	0	0	435
342	Cutlery, hndtls, & hardware	2,446	2,446	0	0	2,446
343	Plumbing & heating fixtures	688	688	0	0	688
344	Fab. struct. metal prdcts	13,334	13,334	0	0	13,334
345	Screw machine products	2,602	2,602	0	0	2,602
346	Met. forgings & stampings	3,694	3,694	0	0	3,694
347	Metal services, n.e.c.	5,529	5,529	0	0	5,529
348	Ordnance and access., n.e.c.	438	438	0	0	438
349	Misc. fab. metal products	7,266	7,266	0	0	7,266
351	Engines and turbines	371	371	0	0	371
352	Farm & garden machinery	1,761	1,761	0	0	1,761
353	Construct. & related mach.	3,324	3,324	0	0	3,324
354	Metalworking machinery	11,811	11,811	0	0	11,811
355	Special industry mach.	4,790	4,790	0	0	4,790
356	General indust. mach.	4,378	4,378	0	0	4,378
357	Computer & office equip.	2,112	2,112	0	0	2,112
358	Refrig. & serv. indust mach.	2,246	2,246	0	0	2,246
359	Industrial mach., n.e.c.	25,875	25,875	0	0	25,875
361	Elect. dist. equipment	875	875	0	0	875
362	Elect. indust. apparatus	2,260	2,260	0	0	2,260
363	Household appliances	474	474	0	0	474

Table VIII-2

NUMBER OF ESTABLISHMENTS ESTIMATED TO FALL WITHIN THE SCOPE OF THE STANDARD IN YEAR 1, BY 3-DIGIT SIC

SIC	Industry	Total Number of Establishments in SIC	Total Number of Establishments with Manufacturing Jobs	Total Number of Establishments With Manual Handling Jobs [a]	Total Number of Establishments Not Engaged in Manual Handling or Manufacturing, but incurring a Covered MSD	Total Number of Establishments in First Year in the Scope of the Standard
364	Elct. lghtng & wire equip.	2,117	2,117	0	0	2,117
365	Household audio & vid. equip.	815	815	0	0	815
366	Communications equipment	2,110	2,110	0	0	2,110
367	Electrnic compnnts & access.	6,570	6,570	0	0	6,570
369	Misc. elect. equipment	1,788	1,788	0	0	1,788
371	Motor vehicles & equipt.	5,049	5,049	0	0	5,049
372	Aircraft and parts	1,693	1,693	0	0	1,693
373	Ship, boat blding and repair	2,676	2,676	0	0	2,676
374	Railroad equipment	213	213	0	0	213
375	Motorcycles & bicycles	370	370	0	0	370
376	Guided missiles	105	105	0	0	105
379	Misc. transportatión equip.	1,135	1,135	0	0	1,135
381	Srch & navigation equipment	696	696	0	0	696
382	Meas. & contrlling devices	4,755	4,755	0	0	4,755
384	Medical instrmnts & supplies	4,471	4,471	0	0	4,471
385	Ophthalmic goods	587	587	0	0	587
386	Photo. equip. & supplies	721	721	0	0	721
387	Watches, clocks, & parts	141	141	0	0	141
391	Jwlry, slvrwre, and plate	2,813	2,813	0	0	2,813
393	Musical instruments	550	550	0	0	550
394	Toys and sporting goods	3,515	3,515	0	0	3,515
395	Office and art supplies	1,038	1,038	0	0	1,038
396	Costume jewelry & notions	1,092	1,092	0	0	1,092
399	Misc. manufactures	8,803	8,803	0	0	8,803
411	Local & suburban trans.	9,536	0	0	5,555	5,555
412	Taxicabs	3,304	0	0	183	183
413	Intercty & rural bus trans.	481	0	0	346	346
414	Bus charter service	1,432	0	0	258	258
415	School buses	4,248	0	0	1,019	1,019
417	Bus terminals	57	0	0	20	20
421	Trking & Courier Service	116,861	0	0	37,262	37,262
422	Pub. warehousing & storage	11,856	0	0	4,384	4,384
423	Trucking terminal fac.	80	0	0	31	31
451	Air trans., scheduled	6,608	0	0	6,608	6,608
452	Air trans., nonsched.	1,831	0	0	445	445
458	Airports and services	4,014	0	0	2,303	2,303
461	Pipelines, excpt natural gas	963	0	193	393	586
472	Pass. trans. arrangements	33,106	0	9,025	438	9,463
473	Freight trans. arrangements	14,771	0	4,027	1,391	5,418
474	Rental of railroad cars	116	0	32	17	49
478	Misc. trans. services	2,681	0	731	680	1,411
481	Telephone communication	27,277	0	7,201	5,844	13,045
482	Telegrph & other comm.	466	0	123	30	153
483	Radio & TV broadcasting	8,833	0	2,332	604	2,936
484	Cable & othr pay TV services	4,786	0	1,263	1,623	2,886
489	Communication serv., n.e.c.	1,488	0	393	71	464
491	Electric services	6,278	0	1,657	3,156	4,814
492	Gas product. & distribution	3,941	0	1,040	1,548	2,589
493	Comb. utility services	1,871	0	494	1,016	1,510
494	Water supply	3,701	0	977	406	1,383
495	Sanitary services	6,491	0	1,714	3,182	4,896
496	Steam & air-cond. supplies	69	0	18	19	37
497	Irrigation systems	366	0	97	28	125
501	Motor vehicles	45,779	0	18,296	6,090	24,387
502	Furn. & homefurnishings	16,693	0	6,672	2,263	8,935
503	Lumber & construct. mat.	23,678	0	9,463	5,328	14,791
504	Prof. & commercial equip.	51,941	0	20,759	5,535	26,294
505	Met. & minerals, excpt pet.	11,416	0	4,563	2,294	6,856
506	Electrical goods	41,707	0	16,669	4,362	21,031
507	Hardware supplies	26,119	0	10,439	4,271	14,710
508	Mach., equipt, & supplies	76,249	0	30,474	9,232	39,706
509	Misc. durable goods	40,029	0	15,998	3,753	19,751
511	Paper and paper products	18,712	0	7,479	2,052	9,531
512	Drugs, propriet., & sundries	7,316	0	2,924	1,303	4,227
513	Apparel and notions	21,766	0	8,699	1,712	10,411

Table VIII-2

NUMBER OF ESTABLISHMENTS ESTIMATED TO FALL WITHIN THE SCOPE OF THE STANDARD IN YEAR 1, BY 3-DIGIT SIC

SIC	Industry	Total Number of Establishments in SIC	Total Number of Establishments with Manufacturing Jobs	Total Number of Establishments With Manual Handling Jobs [a]	Total Number of Establishments Not Engaged in Manual Handling or Manufacturing, but incurring a Covered MSD	Total Number of Establishments in First Year in the Scope of the Standard
514	Groceries & related products	43,314	0	17,311	13,980	31,291
515	Farm-prod. raw materials	10,680	0	4,268	467	4,736
516	Chemicals & allied prods	15,171	0	6,063	1,387	7,450
517	Petrol. & petrol. prods	13,177	0	5,266	1,365	6,632
518	Beer, wine, & dist. bev.	5,055	0	2,020	2,465	4,485
519	Misc. nondurable goods	54,335	0	21,716	5,793	27,509
521	Lumber & other blding mat.	24,266	0	5,835	10,168	16,003
523	Paint, glass, wallpaper strs	9,777	0	2,351	1,108	3,459
525	Hardware stores	14,282	0	3,434	1,871	5,305
526	Retail nurseries and gardens	11,258	0	2,707	1,441	4,148
527	Mobile home dealers	4,780	0	1,149	916	2,066
531	Department stores	10,824	0	2,603	8,210	10,813
533	Variety stores	10,848	0	2,609	2,987	5,596
539	Misc. gen. merchandise strs.	14,797	0	3,558	2,910	6,468
541	Grocery stores	129,150	0	30,304	44,308	74,612
542	Meat and fish markets	7,868	0	1,846	617	2,463
543	Fruit & vegetable markets	3,342	0	784	151	936
544	Candy, nut, & confctnry strs	4,742	0	1,113	190	1,302
545	Dairy products stores	2,550	0	598	76	674
546	Retail bakeries	20,156	0	4,729	1,309	6,038
549	Misc. food stores	9,904	0	2,324	368	2,692
551	New and used car dealers	24,639	0	5,925	10,556	16,482
552	Used car dealers	21,951	0	5,279	185	5,464
553	Auto & home supply stores	43,806	0	10,534	5,171	15,705
554	Gas service stations	96,236	0	23,143	5,732	28,875
555	Boat dealers	5,068	0	1,219	521	1,739
556	Rec. vehicle dealers	2,995	0	720	573	1,293
557	Motorcycle dealers	3,785	0	910	44	954
559	Auto dealers, n.e.c.	1,234	0	297	12	309
561	Men's & boys' clothing strs	13,844	0	3,329	461	3,790
562	Women's clothing stores	40,559	0	9,754	981	10,735
563	Wm's access.& specialty strs	8,647	0	2,079	154	2,234
564	Chldrn's & infants' wear strs	5,186	0	1,247	179	1,426
565	Family clothing stores	19,583	0	4,709	3,633	8,342
566	Shoe stores	31,737	0	7,632	909	8,541
569	Misc. apparel stores	10,161	0	2,443	125	2,568
571	Furnitre & homefurnishng strs	66,004	0	15,872	8,674	24,547
572	Household appliance strs	10,045	0	2,416	1,088	3,503
573	Radio, TV, & comptr strs	39,074	0	9,396	2,569	11,966
581	Eating & drinking places	466,386	0	112,155	41,754	153,909
591	Drug stores	43,221	0	10,394	3,207	13,600
592	Liquor stores	28,812	0	6,929	308	7,237
593	Used merchandise stores	23,524	0	5,657	1,097	6,754
594	Misc. shopping goods strs.	129,136	0	31,054	6,697	37,751
596	Nonstore retailers	29,947	0	7,202	6,307	13,508
598	Fuel dealers	11,317	0	2,721	1,060	3,782
599	Retail stores, n.e.c.	95,174	0	22,887	2,916	25,803
601	Central res. depository	102	0	9	92	101
602	Commercial banks	67,422	0	6,220	5,238	11,458
603	Savings institutions	16,131	0	1,488	799	2,287
606	Credit unions	14,921	0	1,377	932	2,309
608	Foreign banking	656	0	61	128	189
609	Banking-related functions	5,820	0	537	505	1,042
611	Federal credit agencies	1,333	0	123	30	153
614	Personal cred. institutions	18,996	0	1,753	177	1,929
615	Business cred. institutions	5,358	0	494	384	878
616	Mortgage bankers & brokers	21,897	0	2,020	693	2,713
621	Security brokers & dealers	25,523	0	2,355	682	3,037
622	Commodity contracts brokers	1,623	0	150	22	172
623	Security & commod. exchanges	117	0	11	36	46
628	Security & commod. services	18,123	0	1,672	152	1,824
631	Life insurance	11,754	0	1,084	1,501	2,586
632	Medical & health insur.	3,337	0	308	1,972	2,280
633	Fire, marine, & caslty ins.	20,361	0	1,878	3,976	5,855
635	Surety insurance	579	0	53	43	97

Table VIII-2

NUMBER OF ESTABLISHMENTS ESTIMATED TO FALL WITHIN THE SCOPE OF THE STANDARD IN YEAR 1, BY 3-DIGIT SIC

SIC	Industry	Total Number of Establishments in SIC	Total Number of Establishments with Manufacturing Jobs	Total Number of Establishments With Manual Handling Jobs [a]	Total Number of Establishments Not Engaged in Manual Handling or Manufacturing, but incurring a Covered MSD	Total Number of Establishments in First Year in the Scope of the Standard
636	Title insurance	2,546	0	235	328	563
637	Pension and health funds	2,747	0	253	123	376
639	Ins. carriers, n.e.c.	292	0	27	25	52
641	Insurance agents	127,278	0	11,743	1,785	13,527
651	Real estate operators	100,612	0	9,282	7,638	16,920
653	RE agents and managers	124,530	0	11,489	4,936	16,425
654	Title abstract offices	5,195	0	479	319	798
655	Subdividers & developrs	18,561	0	1,712	2,005	3,718
671	Holding offices	9,575	0	883	796	1,679
672	Investment offices	920	0	85	70	155
673	Trusts	8,841	0	816	288	1,103
679	Miscellaneous investing	8,419	0	777	216	992
701	Hotels and motels	45,252	0	2,242	24,234	26,477
702	Rooming & boarding houses	1,624	0	80	236	316
703	Camps and rec. vehicle parks	7,435	0	368	72	440
704	Membership-basis org. hotels	2,410	0	119	26	146
721	Laundry & garment srvices	56,704	0	9,420	6,906	16,325
722	Photo studios, portrait	13,168	0	653	485	1,137
723	Beauty shops	81,872	0	4,057	1,129	5,187
724	Barber shops	4,499	0	223	182	405
725	Shoe repair	2,216	0	110	73	183
726	Fun. service and crematories	15,784	0	782	599	1,381
729	Misc personal services.	30,697	0	1,521	226	1,748
731	Advertising	19,664	0	1,814	2,539	4,353
732	Credit report.& collection	6,914	0	638	494	1,132
733	Mailing, reprod, steno., serv	35,058	0	3,234	2,933	6,167
734	Services to buildings	65,559	0	6,048	12,373	18,422
735	Misc. equipt. rental	24,814	0	2,289	2,784	5,073
736	Pers. supply services	37,374	0	3,448	10,210	13,658
737	Comptr & data proc. services	88,911	0	8,203	3,680	11,883
738	Misc. business services	85,634	0	7,901	8,251	16,151
751	Auto rentals, no drivers	10,643	0	527	1,241	1,768
752	Automobile parking	8,892	0	441	347	788
753	Automotive repair shops	139,184	0	6,897	6,143	13,040
754	Automotive serv., exc repair	26,948	0	1,335	2,932	4,267
762	Electrical repair shops	19,328	0	958	1,754	2,711
763	Watch and jewelry repair	1,805	0	89	71	161
764	Reupholstery & furn. repair	6,842	0	1,137	179	1,316
769	Misc. repair shops	39,008	0	1,933	3,811	5,744
781	Motion picture production	14,680	0	727	4,736	5,464
782	Motion picture dist.	1,456	0	72	816	888
783	Motion picture theaters	6,572	0	326	2,802	3,127
784	Video tape rental	20,816	0	1,032	3,530	4,562
791	Dance studios & schools	5,719	0	283	503	787
792	Prducrs, orch., entertainers	16,839	0	834	1,389	2,223
793	Bowling centers	5,735	0	284	418	702
794	Commercial sports	4,763	0	236	1,702	1,938
799	Misc. recreation services	61,841	0	3,064	14,941	18,005
801	Offices of medical doctors	186,994	0	22,836	11,247	34,083
802	Dentists offices and clinics	113,054	0	13,806	2,775	16,582
803	Osteopathic physicians	9,105	0	1,112	133	1,245
804	Other health practitioners	84,667	0	10,340	5,001	15,340
805	Nursing & personal care fac.	24,009	0	10,629	13,326	23,955
806	Hospitals	7,282	0	3,224	4,058	7,282
807	Med. & dental labs	15,243	0	1,861	1,339	3,201
808	Home hlth care services	16,106	0	1,967	10,642	12,608
809	Hlth & allied serv., n.e.c.	20,849	0	2,546	3,693	6,240
811	Legal services	168,276	0	20,550	3,266	23,817
821	Elem. & secondary schools	18,017	0	2,200	2,243	4,443
822	Colleges & universities	3,663	0	447	2,566	3,013
823	Libraries	2,252	0	275	42	317
824	Vocational schools	6,816	0	832	158	991
829	Schools, n.e.c.	15,395	0	1,880	235	2,115
832	Individual & fam. services	43,047	0	5,257	8,814	14,071
833	Job train. & related serv.	9,114	0	1,113	2,556	3,669

Table VIII-2

NUMBER OF ESTABLISHMENTS ESTIMATED TO FALL WITHIN THE SCOPE OF THE STANDARD IN YEAR 1, BY 3-DIGIT SIC

SIC	Industry	Total Number of Establishments in SIC	Total Number of Establishments with Manufacturing Jobs	Total Number of Establishments With Manual Handling Jobs [a]	Total Number of Establishments Not Engaged in Manual Handling or Manufacturing, but incurring a Covered MSD	Total Number of Establishments in First Year in the Scope of the Standard
835	Child day care services	53,592	0	6,545	3,726	10,271
836	Residential care	28,762	0	3,512	12,565	16,077
839	Social services, n.e.c.	15,702	0	1,918	1,569	3,487
841	Museums & art galleries	4,520	0	552	663	1,215
842	Bot. & zoolog. gardens	585	0	71	194	265
861	Business associations	15,767	0	1,925	291	2,217
862	Prof. organizations	7,033	0	859	132	991
863	Labor organizations	19,536	0	2,386	238	2,623
864	Civic & social assoc.	36,944	0	4,512	2,192	6,704
865	Political organizations	2,579	0	315	88	403
866	Religious organizations	158,299	0	19,332	976	20,308
869	Membership orgs., n.e.c.	9,072	0	1,108	728	1,835
871	Eng. and arch. services	78,815	0	9,625	2,952	12,577
872	Accntng, auditng, & bkeeping	84,175	0	10,280	3,276	13,555
873	Research & testing services	19,471	0	2,378	4,032	6,410
874	Management & pub. relations	95,033	0	11,606	5,746	17,351
899	Services, n.e.c.	17,221	0	2,103	2,174	4,277
Total		**5,904,039**	**373,413**	**975,595**	**618,104**	**1,967,112**

[a] Establishments in SICs 20-39 are not counted in the column because they have already been determined to be in the scope of the rule.

Source: Office of Regulatory Analysis, OSHA, U.S. DOL, from data presented in Tables II-1 and II-4.

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C. Technological Feasibility (Chapter III)

Only a few of the proposed rule's provisions are related to technological feasibility; these are the job hazard analysis and control provisions in sections 1910.917 through 1910.922. These provisions require employers to analyze those jobs that have been linked to a covered MSD, as well as other jobs in the workplace that involve the same work activities and conditions as the job in which the covered MSD was reported. Once the job has been analyzed, employers must evaluate the risk factors identified by the job hazard analysis and implement controls to eliminate or materially reduce the MSD hazards in the job.

Employers are permitted by the proposed standard to use any combination of engineering, administrative, or work practice controls to achieve the required level of control. Engineering controls are always the control method of choice, because they eliminate the hazard at its source. However, the standard permits employers to use work practice and administrative controls to address MSD hazards as well. Personal protective equipment (PPE) may be used to supplement engineering, work practice, and/or administrative controls, but it may not be used as the only method of control unless other controls are not feasible. In addition, the proposed standard notes that back belts and wrist braces are not considered PPE under this standard because these devices do not provide an effective barrier between the MSD hazard and the employee. The standard also permits employers to implement an incremental abatement process, *i.e.,* to try a control that is reasonably anticipated to materially reduce the MSD hazard adequately and to try another such control if the first control fails.

The proposed rule also clearly states that the controls that must be applied to the problem job are limited to those that are feasible. The Technological Feasibility chapter of the analysis provides an extensive list exemplifying the control measures that employers have found effective in addressing the risk factors of concern: forceful exertion, repetitive motions, awkward postures, vibration, contact stress, static postures, and cold temperatures. These are discussed in connection with manual handling, manufacturing production, and other general industry jobs.

Chapter III includes lists of controls to address each of the relevant risk factors associated with these jobs. Numerous intervention studies have also shown that controls of these kinds work to reduce risk factors and MSDs among workers in the jobs targeted by this standard. In addition, thousands of employers have implemented successful ergonomics programs and have identified many feasible engineering, administrative, and work practice controls to reduce the number and severity of the MSDs occurring in their workplaces. In addition, OSHA's 1993 ergonomics survey showed that 50% of general industry employees worked in establishments that have ergonomics programs, and OSHA expects that this percentage has grown since that time. Based on this evidence, OSHA preliminarily concludes that the proposed standard is technologically feasible for general industry employers with problem jobs. Ergonomic controls, including engineering, work practice, and administrative controls, as demonstrated by the many published case studies (such as those captured by the scenarios in Appendix III–A to Chapter III), are widely available, well understood, and demonstrably effective in reducing MSD hazards in the workplace.

D. Benefits Analysis (Chapter IV)

In its analysis of both the benefits and costs of the proposed standard, OSHA has estimated MSD rates based on BLS data. As discussed in the Preliminary Risk Assessment section of the Preamble, there is extensive evidence that MSDs are underreported to the BLS, perhaps by as much as 50 percent. To the extent that those provisions of the standard that are designed to encourage reporting increase the number of MSDs reported, both the costs and benefits of the proposed standard would be affected. (See the Initial Regulatory Flexibility Analysis, Section VIII. H., for a discussion of possible impacts of increased reporting on both the benefits and costs of the proposed standard.) However, the proposed standard also creates incentives for employers to discourage employee reporting of MSDs, because the reporting of a covered MSD is the event under the standard that triggers the need to implement job controls and/or a full program. In this Preliminary Economic Analysis, OSHA has chosen to assume that these two effects will leave the current MSD reporting rate unaffected. However, OSHA welcomes data and comments on the extent of MSD underreporting, possible increases in the reporting of MSDs that may occur after employers implement an ergonomics program, and on the incentive effects of the proposed standard on employee reporting of MSDs.

Most of the benefits of the proposed standard will be generated when employers fix their problem jobs and thus reduce the number of covered MSDs these jobs cause. Hazard information, MSD management and work restriction protection will also generate benefits because they will ensure that MSDs are identified and treated early in their development, thus preventing progression of the MSD to a serious long-term disability. However, OSHA has not yet found ways to separately calculate the benefits of fixing problem jobs and the benefits of early detection, although the Agency is aware that early reporting and medical management have substantial benefits that are similar to those associated with preventive medicine in general. For example, Oxenburgh *et al.* (1985) compared two groups of VDU operators (Ex. 26–1041). In Group A, which did not report early or receive medical management early, 22% of cases were at the second or third stage by the time they sought medical attention, compared with 8% at these stages in Group B, which had been made aware of the need to report early and the value of prompt medical management. The mean period of absence for Group A workers was 33.9 days; only 25% of this group continued to work (*i.e.,* at alternate duty) throughout the period of recuperation. In Group B, however, the mean period of absence from work was only 3.4 days, and fully 80% of this group remained in alternate duty throughout. The mean number of alternate duty days was 91 days for Group A workers and 31.5 days for those in Group B. The total amount of time the average worker in Group A lost, either to days away or alternate duty, was 124.9 days; in Group B, this figure decreased by 72%, to 34.9 days. Thus the elements of the basic program plus medical management can have substantial benefits even in the absence of a full program. Most employers who have implemented ergonomics programs agree, and have included both hazard identification, early reporting, and medical management elements in their programs.

Most of the preventive, as against remedial, benefits of the proposed ergonomics program standard will stem, however, from the implementation of the full program, because the standard's most important preventive elements are job hazard analysis and control. The proposed standard (and therefore this economic analysis) is structured in such a way that the number of jobs fixed in any given year depends on the number of covered MSDs projected to occur and the number of workers OSHA estimates hold jobs that involve the same physical work activities as the job giving rise to

the covered MSD. The number of workers holding the same job, as defined by the standard, varies by industry and job.

A review of 88 studies of ergonomics program interventions showed that they reduced MSDs by an average of 67 percent (the median effectiveness rate for these studies was 64 percent). (These case studies are largely pre- and post-intervention studies of control effectiveness, expressed in terms of reductions in the MSD rate.) Those studies from this group that provide information on reductions in lost workday case rates and reductions in the value of workers' compensation claims demonstrate that these programs are even more effective in reducing more serious MSDs than they are in reducing all types of MSDs. These intervention studies are, in turn, supported by the results of a large group of epidemiological studies of the work-related risk factors leading to MSDs (see the Preliminary Risk Assessment section of this preamble). That section describes the results of a large number of risk ratio studies reviewed by NIOSH (NIOSH 1997), which found that reducing the risk factors present in the jobs of the exposed populations (those who had experienced MSDs) to the risk factor levels found in the jobs of the control (non-exposed) populations in these studies would result in a 69% reduction in the number of MSDs of the neck or shoulder in the exposed population, a 57% to 86% reduction in the number of upper extremity disorders in this population, and a 56% reduction in the number of MSDs of the back. OSHA assumes, for the purpose of this benefits analysis, that the levels of risk factors present in the jobs of the workers in the control populations (*i.e.,* the exposures of the control group workers to forceful exertions, awkward or static posture, repetitive motions, etc.) are equivalent to the levels of these risk factors that would be present in jobs that have been controlled or ''fixed,'' as would be required by the proposed standard. Based on the data from these two sources (the intervention studies and the risk ratio studies), which report effectiveness rates that are strikingly consistent, OSHA estimates that the ergonomics program required by the proposed standard will prevent 50 percent of the covered MSDs that would otherwise have occurred in problem jobs. OSHA believes that this estimate of the effectiveness of the proposed standard is conservative, because many programs achieve substantially higher reductions and some eliminate MSD hazards entirely.

Determining the number of employees whose jobs will be fixed by the full ergonomics program required by the standard is unusually complicated because of the structure of the proposed standard itself. For example, the full program is applicable only to employees in a job in which a covered MSD has occurred and to other employees in the establishment in the same job, as defined by the standard.

Any analysis of the number of employees affected by the program envisioned by the proposed rule must consider: (1) That some MSDs initially reported to employers will turn out, on closer examination, not to be covered MSDs, and (2) that some MSDs will continue to occur in jobs that have already been fixed. To OSHA's knowledge, there are no data on either of these points.

Lacking such data, OSHA assumes, for analytical purposes, that all OSHA-recordable MSDs, rather than a portion of all OSHA-recordable MSDs, that occur in jobs that have not been fixed will require employers to implement a full program, and that all MSDs, rather than some MSDs, subsequently occurring in jobs that have already been fixed will not be covered MSDs and will thus not require employers to implement a full program. In other words, in terms of this analysis, OSHA treats these two factors as offsets of each other, *i.e.,* that the number of MSDs screened out will be equal to the number of MSDs subsequently occurring in controlled jobs. In actuality, some problem jobs that have been fixed will need further hazard control, and some covered MSDs will continue to occur in jobs that have not been fixed but will nevertheless not trigger implementation of the full program. The result of these simplifying assumptions is to overestimate the frequency with which a full program will be needed in the first years after the standard is implemented and to underestimate the frequency with which a full program will be needed in the out-years. Because this analysis only covers the first 10 years following the proposed standard's effective date, OSHA believes that these simplifying assumptions are likely to lead to an overestimate of both the benefits and costs. (In its cost analysis, OSHA assumes that employers will incur costs to investigate all MSDs that occur; thus, the simplifying assumptions used here are not carried forward into the cost analysis, which instead assumes that employers will assess the OSHA recordability and then the covered status of all MSDs occurring among their employees.)

OSHA estimates that employers will be required to fix approximately 7.7 million jobs in the first year the standard is in place, and a diminishing number every year thereafter. Over ten years, approximately 30 million jobs will be fixed. OSHA estimates that fixing these jobs will reduce the number of covered MSDs caused by these jobs by 50 percent per year (based on the effectiveness rate derived above) for the next ten years (the time horizon of this analysis). In the first 10 years, the proposed standard is therefore projected to avert approximately 3 million MSDs. By the tenth year the proposed standard is in place, it will have reduced the number of general industry MSDs by 26 percent, compared with the number of MSDs reported by the BLS for general industry in 1996.

OSHA estimates that the direct cost savings associated with each MSD, including the savings in lost productivity, lost tax payments, and administrative costs for workers' compensation claims, are $22,500 per MSD (1996 dollars). These direct cost savings do not attribute a value or assign a monetary cost to the pain and suffering of injured or ill workers, losses to their families, or losses of the worker's ability to contribute at home, and are thus conservative estimates of these savings. Based on this estimate of the direct cost savings associated with each covered MSD avoided, the annualized benefits (using a discount rate of 7%) accruing in the first ten years the standard is in effect are estimated to be $9.1 billion per year.

E. Costs of Compliance (Chapter V)

This chapter presents OSHA's estimates of the costs employers would incur to comply with the proposed ergonomics program rule. The costs reported are annualized costs measured in 1996 real dollars for the first 10 years the rule is in effect. To calculate annualized costs, non-recurring costs have been annualized using a discount rate of 7 percent for an estimated life of 10 years. The cost analysis does not account for any changes in the economy over time, or for possible adjustments in the demand and supply of goods, changes in production methods, investment effects, or macroeconomic effects of the standard. Taking account of all of these effects could increase or decrease the cost or benefit estimates presented here, although the macroeconomic effects of any rule whose costs are less than 0.05 percent of GNP are likely to be minimal. OSHA believes that its approach, *i.e.,* of determining the benefits and costs of the standard for industry as it is today, is the least

speculative and least controversial way of presenting the benefits and costs of the proposed standard.

OSHA relied on responses to a 1993 ergonomics survey (see Appendix II–A to Chapter II of the Preliminary Economic Analysis) of thousands of general industry employers to estimate the extent to which establishments within the scope of the standard already have implemented ergonomics programs involving the control of jobs. This current industry baseline was taken into account in calculating industry-by-industry and size-of-establishment cost estimates, *i.e.*, any costs employers have already incurred, and any benefits they have already accrued, to voluntarily implement such programs have not been attributed to the proposed rule.

Costs were calculated separately at the three-digit SIC code level for all industries. These industry-by-industry cost estimates account for differences among industries in terms of wage rates, turnover, baseline rates of compliance, and the MSD rate for the industry. To facilitate analysis of the impacts of the proposed rule on small businesses, costs were calculated separately for each of three size classes of establishments. The Initial Regulatory Flexibility Analysis (Section VIII. H. of this Preamble) provides a detailed summary of OSHA's unit cost estimates for each element of the standard.

Table VIII–3 presents the annualized costs of the proposed ergonomics program standard. As this table shows, the total annualized costs to society are $3.4 billion, and the costs to employers are $4.2 billion. (The difference in these cost estimates is accounted for by the fact that an annualized cost of $875 million represents a shift in the costs employees are currently paying in the form of lost wages to costs that employers would be required to incur in the form of work restriction protection costs, *i.e.*, a shift in costs from employees to employers.) The job control provisions of the standard account for $2.3 billion, or 54 percent of the standard's total costs, and the work restriction protection provision accounts for $875 million, or 21 percent of this total.

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TABLE VIII-3

Total Cost of Compliance, by Provision of the Proposed Rule and 3-Digit SIC

SIC	Industry	Familiarization and MSD Coverage Costs	Basic Program	Full Program	Job Fixes	SUBTOTAL (cost to society)	Work Restriction Protection	TOTAL (cost to employers)
710	Soil preparation services	$4,987	$6,476	$35,359	$103,643	$150,466	$91,498	$241,964
720	Crop services	$57,711	$89,037	$715,647	$3,286,507	$4,148,901	$1,048,170	$5,197,071
740	Veterinary services	$111,426	$188,129	$1,502,747	$3,183,834	$4,986,135	$1,281,099	$6,267,235
750	Animal serv., excpt vet.	$33,281	$24,234	$242,781	$662,335	$962,631	$203,076	$1,165,707
780	Lndscape & hort. services	$446,243	$626,152	$5,231,530	$19,503,388	$25,807,313	$4,574,059	$30,381,372
810	Timber tracts	$9,390	$12,725	$92,334	$391,031	$505,480	$83,579	$589,058
830	Forest products	$2,388	$3,203	$24,391	$143,886	$173,867	$27,082	$200,949
850	Forestry services	$14,054	$20,593	$144,287	$377,313	$556,247	$103,784	$660,032
910	Commerical fishing	$14,682	$13,140	$103,663	$443,819	$575,304	$86,987	$662,291
920	Fish hatcheries	$1,380	$2,298	$15,665	$77,790	$97,133	$14,251	$111,384
970	Hunting & trapping	$2,701	$3,093	$22,698	$65,615	$94,107	$5,217	$99,324
1310	Crude petrol. & nat. gas	$99,996	$102,963	$721,594	$1,559,647	$2,484,199	$117,997	$2,602,196
1320	Natural gas liquids	$9,477	$22,565	$120,806	$181,518	$334,366	$64,327	$398,693
1380	Oil & gas field services	$141,424	$194,504	$1,444,641	$6,607,716	$8,388,285	$1,025,762	$9,414,047
2010	Meat products	$1,292,571	$232,815	$5,124,746	$13,849,717	$20,499,849	$14,352,079	$34,851,928
2020	Dairy products	$290,536	$123,080	$1,551,056	$3,414,123	$5,378,795	$2,829,232	$8,208,027
2030	Presrvd fruits & vegetables	$336,169	$132,309	$1,699,103	$4,655,532	$6,823,112	$3,202,193	$10,025,305
2040	Grain mill products	$268,330	$139,496	$1,477,950	$2,513,364	$4,399,140	$2,435,618	$6,834,758
2050	Bakery products	$431,082	$187,666	$2,300,855	$5,604,584	$8,524,186	$3,963,402	$12,487,588
2060	Sugar and confect. prods	$169,220	$73,894	$873,773	$2,094,901	$3,211,788	$1,337,722	$4,549,510
2070	Fats and oils	$42,723	$32,268	$271,343	$506,720	$853,054	$367,900	$1,220,954
2080	Beverages	$476,309	$145,324	$2,231,090	$4,033,755	$6,886,479	$2,166,275	$9,052,754
2090	Misc. food products	$352,217	$166,901	$1,814,634	$4,149,049	$6,482,800	$1,661,026	$8,143,826
2110	Cigarettes	$36,621	$15,330	$351,977	$273,762	$677,690	$138,508	$816,198
2120	Cigars	$2,016	$1,973	$16,353	$41,198	$61,540	$7,674	$69,214
2130	Chewing & smoking tobacco	$3,871	$2,366	$25,837	$19,294	$51,368	$15,987	$67,355
2140	Tobacco stemm. & redrying	$8,889	$4,812	$56,852	$115,984	$186,538	$37,215	$223,753
2210	Brdwven fab. mills, cotton	$153,345	$38,532	$727,340	$1,511,011	$2,430,229	$837,360	$3,267,589
2220	Broadwoven fabric mills	$84,935	$56,779	$680,047	$1,770,076	$2,591,837	$439,326	$3,031,163
2230	Brdwvn fab. mills, wool	$12,264	$10,808	$106,391	$240,228	$369,691	$66,897	$436,588
2240	Narrow fabric mills	$38,341	$22,978	$239,283	$404,408	$705,011	$275,322	$980,333
2250	Knitting mills	$227,250	$161,420	$1,697,598	$4,460,433	$6,546,701	$1,803,827	$8,350,528
2260	Tex. finishing, excpt wool	$74,571	$49,105	$560,822	$1,323,802	$2,008,301	$569,439	$2,577,740
2270	Carpets and rugs	$49,156	$36,546	$418,296	$1,297,526	$1,801,523	$377,969	$2,179,492
2280	Yarn and thread mills	$90,869	$68,818	$744,477	$1,990,103	$2,894,267	$766,120	$3,660,386
2290	Misc. textile goods	$76,312	$73,124	$644,138	$1,366,090	$2,159,665	$531,245	$2,690,910
2310	Men's & boys' suits & coats	$33,934	$17,453	$222,330	$373,337	$647,054	$302,359	$949,413
2320	Men's & boys' furnishings	$352,945	$146,504	$1,883,609	$3,050,871	$5,433,930	$2,804,240	$8,238,170
2330	Wm's & misses' outerwear	$222,143	$222,773	$1,787,931	$2,328,675	$4,561,521	$1,631,513	$6,193,035
2340	Wm's & chldrn's undergarmnts	$40,659	$21,666	$265,909	$645,985	$974,219	$509,425	$1,483,644
2350	Hats, caps, & millinery	$20,727	$15,636	$142,928	$173,942	$353,233	$208,095	$561,328
2360	Girls' & chldrn's outerwear	$22,136	$20,520	$209,489	$436,384	$688,529	$299,964	$988,493
2370	Fur goods	$1,228	$1,022	$7,788	$703	$10,741	$5,621	$16,361
2380	Misc. apparel & accessories	$39,652	$30,119	$274,268	$491,478	$835,516	$341,331	$1,176,847
2390	Misc. fab. textile prods	$295,417	$218,575	$2,042,306	$4,008,768	$6,565,067	$2,378,172	$8,943,239
2410	Logging	$93,363	$58,983	$462,751	$402,670	$1,017,767	$224,823	$1,242,590
2420	Sawmills & planing mills	$287,000	$261,566	$2,529,980	$3,763,949	$6,842,496	$2,360,422	$9,202,918
2430	Millwork & plywood	$583,281	$404,204	$4,528,356	$7,012,486	$12,528,327	$4,814,627	$17,342,953
2440	Wood containers	$56,634	$62,609	$672,815	$832,834	$1,624,892	$700,480	$2,325,372
2450	Wood bldings & mobile homes	$226,958	$84,492	$1,380,386	$3,153,345	$4,845,181	$1,838,941	$6,684,122
2490	Misc. wood products	$146,568	$130,027	$1,323,917	$1,831,541	$3,432,054	$1,776,602	$5,208,656
2510	Household furniture	$459,522	$213,129	$3,133,991	$6,229,989	$10,036,630	$6,212,126	$16,248,756
2520	Office furniture	$174,209	$69,795	$979,383	$1,966,554	$3,189,942	$1,818,118	$5,008,060
2530	Pub blding & related furn.	$189,745	$34,318	$758,473	$1,216,464	$2,199,001	$2,400,525	$4,599,526
2540	Partitions and fixtures	$161,634	$103,211	$1,242,244	$1,825,077	$3,332,165	$2,132,627	$5,464,792
2590	Misc furniture and fixtures	$72,016	$50,833	$527,579	$848,365	$1,498,794	$774,678	$2,273,471
2610	Pulp mills	$11,424	$13,148	$107,993	$280,466	$413,031	$111,883	$524,915
2620	Paper mills	$247,924	$131,832	$1,765,412	$3,765,953	$5,911,121	$2,140,699	$8,051,820
2630	Paperboard mills	$52,638	$75,395	$492,099	$1,034,327	$1,654,459	$444,921	$2,099,380
2650	Paperbrd containers & boxes	$341,820	$321,545	$2,823,669	$4,842,285	$8,329,319	$3,480,788	$11,810,106
2670	Misc. cnvrtd paper products	$401,244	$340,300	$3,008,784	$5,519,766	$9,270,094	$3,520,132	$12,790,226
2710	Newspapers	$438,601	$509,171	$4,174,010	$8,718,626	$13,840,408	$4,002,609	$17,843,017

TABLE VIII-3

Total Cost of Compliance, by Provision of the Proposed Rule and 3-Digit SIC

SIC	Industry	Familiarization and MSD Coverage Costs	Basic Program	Full Program	Job Fixes	SUBTOTAL (cost to society)	Work Restriction Protection	TOTAL (cost to employers)
2720	Periodicals	$86,785	$111,521	$916,865	$956,982	$2,072,152	$753,383	$2,825,535
2730	Books	$146,049	$140,449	$1,402,595	$2,307,355	$3,996,448	$1,448,385	$5,444,833
2740	Miscellaneous publishing	$58,441	$74,584	$543,443	$601,677	$1,278,144	$299,529	$1,577,673
2750	Commercial printing	$789,771	$1,023,042	$8,174,710	$7,189,782	$17,177,305	$5,137,479	$22,314,783
2760	Manifold business forms	$76,103	$84,852	$761,960	$751,585	$1,674,499	$603,556	$2,278,055
2770	Greeting cards	$39,944	$19,323	$265,013	$907,814	$1,232,094	$291,705	$1,523,799
2780	Blankbooks & bookbinding	$89,296	$100,845	$869,426	$1,511,860	$2,571,427	$748,404	$3,319,832
2790	Printing trade services	$59,889	$91,017	$582,268	$211,823	$944,996	$258,745	$1,203,741
2810	Indust. inorganic chemicals	$96,797	$64,914	$582,743	$1,294,714	$2,039,168	$535,798	$2,574,966
2820	Plastics mat. & synthetics	$122,740	$82,151	$746,510	$1,417,255	$2,368,656	$739,988	$3,108,644
2830	Drugs	$260,684	$130,084	$1,426,144	$3,175,181	$4,992,093	$2,457,923	$7,450,017
2840	Soap, clnrs, & toilet goods	$173,485	$88,316	$895,079	$2,111,037	$3,267,917	$1,773,632	$5,041,549
2850	Paints & allied products	$72,281	$46,848	$432,646	$682,993	$1,234,768	$867,025	$2,101,792
2860	Indust. organic chemicals	$125,520	$105,823	$751,671	$1,303,483	$2,286,496	$574,433	$2,860,929
2870	Agricultural chemicals	$40,787	$31,766	$256,873	$452,629	$782,056	$241,451	$1,023,507
2890	Misc. chemical products	$138,254	$97,315	$801,899	$1,128,929	$2,166,396	$880,254	$3,046,650
2910	Petroleum refining	$59,716	$112,893	$594,464	$1,805,294	$2,572,368	$269,676	$2,842,044
2950	Asphlt pavng & roofng mat.	$40,114	$56,241	$375,983	$968,332	$1,440,671	$254,541	$1,695,212
2990	Misc. pet. & coal prods	$9,003	$22,223	$112,739	$289,620	$433,585	$32,399	$465,984
3010	Tires and inner tubes	$219,488	$44,629	$1,163,243	$1,424,982	$2,852,341	$955,426	$3,807,767
3020	Rubber & plastics footwear	$24,725	$4,774	$98,357	$223,485	$351,341	$137,126	$488,467
3050	Hose, bltng, and gaskets	$143,626	$52,078	$679,979	$1,450,210	$2,325,894	$741,890	$3,067,784
3060	Fab. rubber prod., n.e.c.	$266,659	$101,107	$1,271,163	$2,672,038	$4,310,967	$1,383,253	$5,694,221
3080	Misc plastics, n.e.c.	$1,347,716	$699,349	$7,471,653	$15,672,256	$25,190,974	$6,999,315	$32,190,288
3110	Leather tan. & finishing	$33,820	$21,464	$221,025	$589,913	$866,222	$168,574	$1,034,796
3130	Footwear cut stock	$3,110	$3,303	$25,830	$58,823	$91,066	$36,998	$128,064
3140	Footwear, except rubber	$65,979	$31,564	$418,497	$1,624,062	$2,140,102	$884,439	$3,024,541
3150	Leather gloves & mittens	$6,700	$4,470	$43,163	$42,981	$97,313	$84,666	$181,979
3160	Luggage	$8,752	$10,570	$86,370	$187,250	$292,942	$121,747	$414,688
3170	Hndbags & prsnal leathr gds.	$9,358	$7,710	$92,339	$304,038	$413,446	$179,967	$593,413
3190	Leather goods, n.e.c.	$14,962	$12,730	$121,977	$260,087	$409,755	$237,434	$647,189
3210	Flat glass	$47,351	$13,129	$250,688	$493,156	$804,324	$462,291	$1,266,615
3220	Glass, pressed or blown	$211,449	$59,113	$940,301	$2,051,162	$3,262,024	$1,633,864	$4,895,889
3230	Prod. of purchased glass	$148,964	$80,706	$789,277	$2,146,211	$3,165,157	$1,497,315	$4,662,472
3240	Cement, hydraulic	$28,128	$21,979	$212,609	$442,401	$705,117	$163,609	$868,727
3250	Structural clay products	$72,612	$43,294	$425,866	$918,782	$1,460,555	$478,468	$1,939,023
3260	Pottery & related prods	$105,087	$49,343	$531,420	$1,344,773	$2,030,623	$736,348	$2,766,970
3270	Concrete & plast. prdcts	$349,702	$385,906	$2,892,656	$5,057,981	$8,686,245	$2,255,193	$10,941,438
3280	Cut stone & stone prods	$29,602	$31,314	$235,326	$338,425	$634,667	$180,071	$814,738
3290	Misc. nonmet. mineral prods.	$131,038	$98,700	$860,158	$2,155,367	$3,245,263	$886,282	$4,131,545
3310	Basic steel products	$539,361	$189,531	$3,525,180	$6,436,770	$10,690,842	$2,995,612	$13,686,455
3320	Iron and steel foundries	$436,536	$112,336	$2,068,240	$3,432,151	$6,049,263	$3,302,185	$9,351,449
3330	Primary nonfer. metals	$73,026	$24,048	$416,124	$879,707	$1,392,905	$482,769	$1,875,674
3340	Secondary nonfer. metals	$36,839	$18,922	$201,335	$417,990	$675,086	$261,597	$936,683
3350	Nonfer. rolling & drawing	$389,851	$135,054	$1,889,475	$3,935,671	$6,350,051	$2,425,542	$8,775,592
3360	Nonfer. foundries (cstngs)	$235,885	$96,561	$1,101,117	$2,164,493	$3,598,057	$1,773,747	$5,371,804
3390	Misc. primary metal prdcts	$38,664	$43,266	$295,634	$557,634	$935,198	$249,554	$1,184,752
3410	Met. cans & ship. containers	$78,724	$49,208	$586,664	$919,556	$1,634,152	$501,141	$2,135,293
3420	Cutlery, hndtls, & hardware	$297,616	$173,932	$2,011,168	$3,877,717	$6,360,433	$2,061,445	$8,421,878
3430	Plumbing & heating fixtures	$167,692	$53,896	$855,720	$1,660,249	$2,737,557	$1,311,106	$4,048,663
3440	Fab. struct. metal prdcts	$849,767	$693,151	$6,855,786	$11,168,871	$19,567,575	$6,439,798	$26,007,372
3450	Screw machine products	$219,273	$170,580	$1,715,235	$2,116,672	$4,221,759	$1,618,903	$5,840,663
3460	Met. forgings & stampings	$824,129	$376,377	$4,746,165	$8,679,062	$14,625,734	$5,659,519	$20,285,253
3470	Metal services, n.e.c.	$218,656	$222,471	$1,942,865	$2,174,274	$4,558,266	$1,638,394	$6,196,660
3480	Ordnance and access., n.e.c.	$73,076	$36,879	$478,676	$1,033,571	$1,622,202	$436,551	$2,058,754
3490	Misc. fab. metal products	$589,495	$415,675	$4,465,584	$7,479,527	$12,950,281	$4,425,629	$17,375,910
3510	Engines and turbines	$220,541	$69,347	$1,165,957	$1,991,508	$3,447,353	$1,320,904	$4,768,256
3520	Farm & garden machinery	$267,611	$130,767	$1,503,677	$3,108,824	$5,010,879	$1,577,971	$6,588,850
3530	Construct. & related mach.	$454,768	$241,864	$2,880,890	$5,709,236	$9,286,758	$3,209,034	$12,495,792
3540	Metalworking machinery	$582,437	$508,638	$4,655,183	$5,752,420	$11,498,678	$2,612,411	$14,111,089
3550	Special industry mach.	$345,325	$268,298	$2,598,591	$3,898,661	$7,110,875	$1,545,567	$8,656,442
3560	General indust. mach.	$520,063	$326,287	$3,621,951	$6,141,371	$10,609,672	$2,466,064	$13,075,736

TABLE VIII-3

Total Cost of Compliance, by Provision of the Proposed Rule and 3-Digit SIC

SIC	Industry	Familiarization and MSD Coverage Costs	Basic Program	Full Program	Job Fixes	SUBTOTAL (cost to society)	Work Restriction Protection	TOTAL (cost to employers)
3570	Computer & office equip.	$289,582	$179,785	$1,910,387	$4,544,423	$6,924,177	$1,103,833	$8,028,010
3580	Refrig. & serv. indust mach.	$518,937	$201,047	$2,811,471	$6,359,093	$9,890,548	$2,472,817	$12,363,365
3590	Industrial mach., n.e.c.	$674,379	$693,223	$5,692,592	$4,820,735	$11,880,930	$2,779,177	$14,660,107
3610	Elect. dist. equipment	$131,116	$40,529	$594,404	$1,066,571	$1,832,620	$605,637	$2,438,256
3620	Elect. indust. apparatus	$392,662	$101,438	$1,589,553	$2,503,770	$4,587,423	$1,695,903	$6,283,325
3630	Household appliances	$358,851	$41,165	$1,235,281	$2,306,060	$3,941,356	$994,665	$4,936,022
3640	Elct. lghtng & wire equip.	$361,387	$95,196	$1,550,582	$2,567,937	$4,575,103	$1,036,538	$5,611,641
3650	Household audio & vid. equip.	$104,773	$26,313	$436,041	$774,993	$1,342,120	$295,878	$1,637,998
3660	Communications equipment	$268,372	$114,798	$1,354,173	$2,971,302	$4,708,645	$632,236	$5,340,881
3670	Electrnic compnnts & access.	$636,637	$297,328	$3,325,890	$6,451,029	$10,710,884	$1,707,180	$12,418,064
3690	Misc. elect. equipment	$377,907	$91,648	$1,595,343	$2,597,975	$4,662,873	$1,073,328	$5,736,202
3710	Motor vehicles & equipt.	$6,110,272	$106,665	$19,067,888	$9,225,657	$34,510,482	$13,808,384	$48,318,866
3720	Aircraft and parts	$1,059,333	$126,318	$4,943,403	$3,879,273	$10,008,327	$3,949,190	$13,957,517
3730	Ship, boat blding and repair	$190,463	$34,962	$566,210	$586,265	$1,377,901	$928,782	$2,306,682
3740	Railroad equipment	$113,000	$12,212	$400,980	$448,930	$975,122	$613,205	$1,588,327
3750	Motorcycles & bicycles	$62,338	$8,460	$198,199	$183,295	$452,292	$279,135	$731,427
3760	Guided missiles	$71,402	$21,997	$434,354	$517,715	$1,045,467	$309,889	$1,355,357
3790	Misc. transportation equip.	$147,968	$23,286	$464,301	$661,711	$1,297,267	$852,981	$2,150,247
3810	Srch & navigation equipment	$144,859	$96,191	$982,575	$2,171,092	$3,394,716	$619,321	$4,014,037
3820	Meas. & contrlling devices	$388,984	$218,685	$2,165,034	$3,934,262	$6,706,966	$1,845,100	$8,552,066
3840	Medical instrmnts & supplies	$339,754	$182,368	$1,903,998	$4,394,382	$6,820,501	$1,612,150	$8,432,651
3850	Ophthalmic goods	$40,265	$18,210	$207,936	$421,516	$687,927	$221,269	$909,196
3860	Photo. equip. & supplies	$114,816	$36,190	$776,989	$1,282,619	$2,210,613	$600,797	$2,811,411
3870	Watches, clocks, & parts	$4,192	$2,796	$27,259	$77,368	$111,616	$23,271	$134,887
3910	Jwlry, slvrwre, and plate	$58,762	$48,592	$424,219	$878,379	$1,409,952	$607,505	$2,017,457
3930	Musical instruments	$30,303	$15,592	$161,092	$429,830	$636,816	$383,710	$1,020,526
3940	Toys and sporting goods	$253,054	$127,950	$1,322,435	$3,039,197	$4,742,635	$2,971,917	$7,714,553
3950	Office and art supplies	$39,717	$32,649	$276,576	$547,987	$896,930	$373,807	$1,270,737
3960	Costume jewelry & notions	$21,488	$18,643	$166,935	$364,354	$571,419	$248,010	$819,428
3990	Misc. manufactures	$259,336	$210,687	$1,920,586	$3,892,492	$6,283,101	$3,200,145	$9,483,246
4110	Local & suburban trans.	$270,438	$477,130	$3,177,413	$16,349,789	$20,274,770	$3,743,337	$24,018,108
4120	Taxicabs	$14,951	$18,710	$155,751	$927,276	$1,116,687	$106,769	$1,223,456
4130	Intercty & rural bus trans.	$23,248	$40,727	$247,503	$2,189,167	$2,500,645	$286,125	$2,786,770
4140	Bus charter service	$14,224	$38,954	$229,616	$1,010,765	$1,293,558	$161,236	$1,454,794
4150	School buses	$43,496	$158,402	$827,641	$5,623,426	$6,652,965	$653,889	$7,306,855
4170	Bus terminals	$1,151	$2,084	$12,486	$18,547	$34,268	$11,598	$45,866
4210	Trking & Courier Service	$1,991,571	$3,193,985	$20,696,026	$157,727,668	$183,609,250	$19,927,167	$203,536,417
4220	Pub. warehousing & storage	$252,812	$429,735	$2,707,392	$7,580,477	$10,970,415	$2,911,025	$13,881,441
4230	Trucking terminal fac.	$1,879	$2,786	$19,845	$60,210	$84,719	$20,769	$105,488
4510	Air trans., scheduled	$3,141,829	$1,654,817	na	$45,899,440	$50,696,087	$34,383,061	$85,079,148
4520	Air trans., nonsched.	$28,911	$50,403	na	$834,207	$913,521	$306,469	$1,219,990
4580	Airports and services	$151,961	$228,651	na	$5,711,186	$6,091,798	$1,857,214	$7,949,012
4610	Pipelines, excpt natural gas	$43,291	$71,575	$430,575	$779,380	$1,324,821	$371,508	$1,696,329
4720	Pass. trans. arrangements	$130,767	$80,858	$675,387	$1,180,784	$2,067,796	$433,400	$2,501,195
4730	Freight trans. arrangements	$148,131	$273,075	$1,912,863	$4,538,363	$6,872,431	$1,346,468	$8,218,900
4740	Rental of railroad cars	$1,637	$2,506	$19,417	$47,391	$70,951	$16,151	$87,102
4780	Misc. trans. services	$58,293	$116,336	$761,558	$2,239,613	$3,175,800	$687,512	$3,863,312
4810	Telephone communication	$736,341	$687,065	$5,141,577	$15,471,865	$22,036,849	$6,357,405	$28,394,255
4820	Telegrph & other comm.	$4,403	$3,520	$26,693	$54,733	$89,349	$30,420	$119,769
4830	Radio & TV broadcasting	$89,118	$114,740	$598,802	$713,401	$1,516,060	$612,917	$2,128,977
4840	Cable & othr pay TV services	$150,488	$140,247	$1,085,772	$3,365,180	$4,741,687	$1,944,488	$6,686,176
4890	Communication serv., n.e.c.	$8,823	$7,231	$57,693	$130,585	$204,333	$71,041	$275,374
4910	Electric services	$484,291	$402,785	$3,164,075	$7,285,459	$11,336,610	$4,684,979	$16,021,589
4920	Gas product. & distribution	$209,739	$161,388	$1,260,935	$2,777,015	$4,409,076	$1,957,335	$6,366,411
4930	Comb. utility services	$157,931	$174,209	$1,289,606	$3,645,897	$5,267,643	$1,647,225	$6,914,868
4940	Water supply	$47,828	$31,445	$279,398	$365,967	$724,638	$398,715	$1,123,354
4950	Sanitary services	$369,617	$192,723	$1,681,523	$3,905,228	$6,149,092	$4,356,458	$10,505,550
4960	Steam & air-cond. supplies	$1,981	$1,889	$13,831	$18,099	$35,800	$21,137	$56,936
4970	Irrigation systems	$3,846	$2,313	$20,862	$23,444	$50,465	$27,529	$77,993
5010	Motor vehicles	$670,124	$1,119,295	$7,372,540	$17,544,541	$26,706,500	$7,340,983	$34,047,483
5020	Furn. & homefurnishings	$270,260	$420,597	$2,778,495	$5,450,047	$8,919,399	$2,891,441	$11,810,839
5030	Lumber & construct. mat.	$529,424	$868,999	$5,701,892	$12,053,857	$19,154,171	$7,166,477	$26,320,648

TABLE VIII-3

Total Cost of Compliance, by Provision of the Proposed Rule and 3-Digit SIC

SIC	Industry	Familiarization and MSD Coverage Costs	Basic Program	Full Program	Job Fixes	SUBTOTAL (cost to society)	Work Restriction Protection	TOTAL (cost to employers)
5040	Prof. & commercial equip.	$767,460	$1,199,428	$8,149,284	$19,071,169	$29,187,341	$7,035,788	$36,223,129
5050	Met. & minerals, excpt pet.	$250,863	$415,216	$2,702,977	$6,224,460	$9,593,516	$3,061,582	$12,655,098
5060	Electrical goods	$478,477	$801,277	$5,716,175	$12,036,297	$19,032,226	$5,580,786	$24,613,012
5070	Hardware supplies	$470,424	$801,425	$5,195,989	$9,143,776	$15,611,615	$5,546,127	$21,157,742
5080	Mach., equipt, & supplies	$1,169,252	$1,952,553	$12,787,599	$22,207,577	$38,116,981	$11,848,377	$49,965,358
5090	Misc. durable goods	$465,035	$651,528	$4,491,872	$10,424,284	$16,032,719	$4,680,988	$20,713,707
5110	Paper and paper products	$240,016	$372,882	$2,427,331	$8,007,675	$11,047,904	$1,832,530	$12,880,434
5120	Drugs, propriet., & sundries	$195,812	$263,578	$1,750,403	$5,626,906	$7,836,699	$1,208,244	$9,044,943
5130	Apparel and notions	$268,799	$326,789	$2,208,296	$4,405,641	$7,209,526	$1,503,877	$8,713,403
5140	Groceries & related products	$1,527,746	$1,801,204	$12,216,331	$42,961,160	$58,506,441	$14,326,055	$72,832,496
5150	Farm-prod. raw materials	$66,736	$82,303	$596,285	$1,078,621	$1,823,945	$424,401	$2,248,346
5160	Chemicals & allied prods	$208,707	$302,167	$1,991,680	$3,603,976	$6,106,530	$1,250,754	$7,357,284
5170	Petrol. & petrol. prods	$166,173	$263,520	$1,716,782	$3,996,954	$6,143,429	$1,239,897	$7,383,326
5180	Beer, wine, & dist. bev.	$367,763	$389,064	$2,616,453	$8,440,158	$11,813,438	$4,961,044	$16,774,482
5190	Misc. nondurable goods	$693,384	$912,518	$6,127,581	$15,953,876	$23,687,359	$7,234,035	$30,921,394
5210	Lumber & other blding mat.	$699,520	$1,437,405	$8,503,116	$32,098,003	$42,738,044	$11,288,080	$54,026,123
5230	Paint, glass, wallpaper strs	$66,022	$133,922	$1,051,264	$1,847,081	$3,098,289	$1,048,571	$4,146,859
5250	Hardware stores	$116,198	$263,783	$1,748,911	$3,515,909	$5,644,801	$1,797,909	$7,442,710
5260	Retail nurseries and gardens	$98,921	$211,193	$1,384,171	$4,074,662	$5,768,946	$1,366,958	$7,135,904
5270	Mobile home dealers	$75,960	$183,892	$962,173	$2,286,762	$3,508,786	$864,884	$4,373,670
5310	Department stores	$1,456,112	$2,579,222	$18,543,511	$86,647,527	$109,226,373	$39,736,507	$148,962,880
5330	Variety stores	$148,025	$363,875	$1,991,237	$2,637,282	$5,140,419	$2,864,574	$8,004,993
5390	Misc. gen. merchandise strs.	$202,970	$468,617	$2,836,343	$8,674,125	$12,182,055	$2,975,324	$15,157,380
5410	Grocery stores	$2,935,417	$4,233,564	$26,283,328	$113,882,170	$147,334,478	$47,341,032	$194,675,511
5420	Meat and fish markets	$69,086	$90,323	$561,701	$1,239,539	$1,960,649	$585,028	$2,545,677
5430	Fruit & vegetable markets	$23,636	$22,499	$156,467	$266,400	$469,001	$147,343	$616,344
5440	Candy, nut, & confctnry strs	$32,298	$31,179	$216,748	$264,010	$544,235	$187,128	$731,363
5450	Dairy products stores	$15,944	$12,657	$90,534	$122,416	$241,552	$75,394	$316,946
5460	Retail bakeries	$162,972	$207,986	$1,345,909	$1,811,860	$3,528,727	$1,287,555	$4,816,282
5490	Misc. food stores	$65,862	$58,657	$414,300	$521,922	$1,060,742	$362,575	$1,423,316
5510	New and used car dealers	$895,819	$3,214,783	$13,666,384	$61,678,633	$79,455,619	$8,931,247	$88,386,866
5520	Used car dealers	$112,022	$39,914	$323,147	$464,113	$939,196	$187,272	$1,126,468
5530	Auto & home supply stores	$382,532	$846,125	$5,571,912	$15,653,650	$22,454,218	$5,007,197	$27,461,415
5540	Gas service stations	$550,926	$915,746	$6,601,353	$12,641,485	$20,709,510	$5,664,091	$26,373,601
5550	Boat dealers	$53,560	$107,649	$672,657	$1,384,860	$2,218,725	$497,866	$2,716,592
5560	Rec. vehicle dealers	$47,080	$111,721	$616,395	$1,644,332	$2,419,529	$547,481	$2,967,010
5570	Motorcycle dealers	$20,053	$11,011	$77,519	$156,348	$264,931	$44,384	$309,316
5590	Auto dealers, n.e.c.	$6,423	$2,738	$21,672	$41,515	$72,348	$12,298	$84,647
5610	Men's & boys' clothing strs	$57,123	$69,153	$561,816	$763,952	$1,452,045	$249,329	$1,701,374
5620	Women's clothing stores	$232,823	$213,332	$1,480,170	$1,757,782	$3,684,107	$536,675	$4,220,782
5630	Wm's access.& specialty strs	$48,236	$33,257	$242,898	$231,625	$556,017	$84,389	$640,405
5640	Chldrn's & infants' wear strs	$33,654	$40,250	$267,092	$542,086	$883,082	$96,966	$980,049
5650	Family clothing stores	$268,162	$658,432	$3,646,772	$8,852,053	$13,425,419	$1,946,312	$15,371,732
5660	Shoe stores	$228,146	$221,430	$1,508,850	$1,444,254	$3,402,680	$492,592	$3,895,272
5690	Misc. apparel stores	$49,834	$24,788	$190,112	$194,717	$459,451	$68,416	$527,866
5710	Furnitre & homefurnishng strs	$699,700	$1,473,531	$9,311,645	$22,284,325	$33,769,201	$4,439,257	$38,208,458
5720	Household appliance strs	$126,596	$237,972	$1,369,086	$3,324,919	$5,058,573	$545,741	$5,604,314
5730	Radio, TV, & comptr strs	$322,158	$528,607	$3,541,892	$7,962,991	$12,355,649	$1,355,193	$13,710,842
5810	Eating & drinking places	$4,248,762	$7,266,370	$42,553,440	$70,883,331	$124,951,904	$22,914,838	$147,866,742
5910	Drug stores	$372,398	$796,948	$4,612,042	$10,215,051	$15,996,439	$1,743,740	$17,740,179
5920	Liquor stores	$91,255	$42,835	$392,767	$301,406	$828,263	$168,944	$997,207
5930	Used merchandise stores	$162,168	$204,697	$1,409,967	$2,404,560	$4,181,392	$577,048	$4,758,441
5940	Misc. shopping goods strs.	$887,324	$1,250,591	$8,597,085	$14,732,139	$25,467,139	$3,547,251	$29,014,390
5960	Nonstore retailers	$503,122	$825,565	$4,963,604	$24,029,191	$30,321,482	$3,109,435	$33,430,917
5980	Fuel dealers	$87,883	$181,195	$1,268,193	$4,122,069	$5,659,339	$560,282	$6,219,621
5990	Retail stores, n.e.c.	$535,805	$538,601	$4,091,752	$6,973,613	$12,139,771	$1,567,049	$13,706,820
6010	Central res. depository	$19,144	$24,128	$165,488	$372,874	$581,634	$158,978	$740,611
6020	Commercial banks	$620,662	$835,361	$4,935,074	$8,888,205	$15,279,302	$2,394,004	$17,673,306
6030	Savings institutions	$128,150	$141,972	$843,489	$1,035,567	$2,149,177	$366,166	$2,515,343
6060	Credit unions	$100,628	$120,393	$810,520	$885,011	$1,916,553	$422,449	$2,339,002
6080	Foreign banking	$15,270	$34,485	$145,489	$229,772	$425,016	$61,800	$486,815
6090	Banking-related functions	$56,144	$49,863	$375,814	$645,549	$1,127,371	$217,934	$1,345,305

TABLE VIII-3

Total Cost of Compliance, by Provision of the Proposed Rule and 3-Digit SIC

SIC	Industry	Familiarization and MSD Coverage Costs	Basic Program	Full Program	Job Fixes	SUBTOTAL (cost to society)	Work Restriction Protection	TOTAL (cost to employers)
6110	Federal credit agencies	$8,492	$5,013	$34,195	$49,581	$97,282	$13,935	$111,216
6140	Personal cred. institutions	$112,035	$27,803	$207,198	$263,851	$610,888	$81,123	$692,011
6150	Business cred. institutions	$57,056	$59,231	$396,646	$724,486	$1,237,419	$171,496	$1,408,915
6160	Mortgage bankers & brokers	$157,167	$110,887	$777,704	$879,280	$1,925,038	$313,295	$2,238,332
6210	Security brokers & dealers	$159,455	$131,439	$860,678	$1,452,879	$2,604,451	$311,818	$2,916,269
6220	Commodity contracts brokers	$7,261	$3,252	$26,627	$44,464	$81,605	$13,277	$94,882
6230	Security & commod. exchanges	$3,025	$5,276	$36,921	$69,316	$114,538	$24,167	$138,705
6280	Security & commod. services	$123,175	$28,186	$224,831	$355,502	$731,694	$91,630	$823,324
6310	Life insurance	$187,677	$235,235	$1,407,818	$3,429,444	$5,260,175	$931,857	$6,192,032
6320	Medical & health insur.	$191,754	$195,434	$1,653,638	$4,601,419	$6,642,246	$2,281,161	$8,923,407
6330	Fire, marine, & caslty ins.	$414,568	$332,119	$3,059,917	$4,652,261	$8,458,865	$2,435,612	$10,894,478
6350	Surety insurance	$6,499	$5,635	$38,479	$72,517	$123,129	$25,498	$148,627
6360	Title insurance	$29,427	$34,115	$231,572	$301,887	$597,001	$199,132	$796,133
6370	Pension and health funds	$22,958	$15,827	$111,956	$129,160	$279,902	$73,601	$353,503
6390	Ins. carriers, n.e.c.	$2,789	$2,925	$19,629	$24,678	$50,022	$15,114	$65,136
6410	Insurance agents	$757,305	$322,150	$2,557,541	$2,192,452	$5,829,448	$1,074,351	$6,903,799
6510	Real estate operators	$745,191	$872,979	$7,055,751	$12,868,326	$21,542,247	$3,265,756	$24,808,003
6530	RE agents and managers	$815,824	$690,631	$5,574,350	$11,897,961	$18,978,767	$2,169,868	$21,148,635
6540	Title abstract offices	$37,586	$48,876	$364,140	$235,700	$686,302	$143,450	$829,752
6550	Subdividers & developrs	$164,809	$211,960	$1,651,162	$4,537,840	$6,565,771	$844,484	$7,410,254
6710	Holding offices	$109,973	$116,620	$813,320	$2,127,896	$3,167,810	$353,154	$3,520,964
6720	Investment offices	$8,167	$5,938	$69,362	$383,912	$467,380	$31,101	$498,481
6730	Trusts	$59,082	$38,007	$303,743	$482,252	$883,084	$128,345	$1,011,429
6790	Miscellaneous investing	$53,744	$29,185	$237,240	$515,830	$835,999	$96,823	$932,823
7010	Hotels and motels	$1,252,550	$1,765,915	$12,608,058	$42,680,891	$58,307,415	$16,348,430	$74,655,845
7020	Rooming & boarding houses	$17,330	$25,809	$154,750	$172,712	$370,601	$126,581	$497,181
7030	Camps and rec. vehicle parks	$16,921	$5,171	$54,269	$129,092	$205,454	$41,783	$247,237
7040	Membership-basis org. hotels	$12,231	$3,629	$28,094	$27,747	$71,701	$15,167	$86,868
7210	Laundry & garment srvices	$468,255	$789,972	$6,846,313	$10,450,279	$18,554,820	$4,352,819	$22,907,639
7220	Photo studios, portrait	$50,880	$42,265	$378,061	$944,847	$1,416,052	$361,206	$1,777,258
7230	Beauty shops	$224,867	$107,624	$1,030,277	$1,373,722	$2,736,490	$654,226	$3,390,716
7240	Barber shops	$28,636	$26,634	$196,420	$163,675	$415,365	$102,219	$517,584
7250	Shoe repair	$13,392	$10,468	$80,069	$106,671	$210,599	$41,254	$251,854
7260	Fun. service and crematories	$88,972	$87,960	$640,687	$1,060,634	$1,878,252	$341,909	$2,220,161
7290	Misc personal services.	$137,183	$35,970	$266,366	$920,342	$1,359,861	$131,568	$1,491,429
7310	Advertising	$235,413	$239,994	$1,886,567	$4,375,182	$6,737,157	$1,472,713	$8,209,870
7320	Credit report.& collection	$69,094	$74,800	$456,050	$591,161	$1,191,105	$297,398	$1,488,503
7330	Mailing, reprod, steno., serv	$281,025	$257,467	$1,933,844	$4,658,495	$7,130,831	$1,697,626	$8,828,457
7340	Services to buildings	$628,043	$634,021	$5,033,478	$5,364,864	$11,660,407	$7,187,708	$18,848,115
7350	Misc. equipt. rental	$215,210	$259,345	$1,847,785	$5,712,640	$8,034,980	$1,649,167	$9,684,148
7360	Pers. supply services	$640,818	$1,623,943	$7,848,843	$59,345,512	$69,459,117	$6,215,022	$75,674,139
7370	Comptr & data proc. services	$718,770	$559,503	$4,167,141	$9,421,916	$14,867,330	$2,016,630	$16,883,961
7380	Misc. business services	$590,380	$587,373	$4,843,727	$17,179,287	$23,200,768	$4,444,159	$27,644,927
7510	Auto rentals, no drivers	$124,728	$205,961	$1,300,782	$4,846,224	$6,477,696	$641,664	$7,119,360
7520	Automobile parking	$41,040	$42,374	$326,895	$1,339,248	$1,749,556	$106,678	$1,856,234
7530	Automotive repair shops	$886,925	$978,950	$7,413,679	$15,186,779	$24,466,334	$1,863,043	$26,329,376
7540	Automotive serv., exc repair	$183,481	$335,697	$2,372,396	$6,070,140	$8,961,714	$1,495,848	$10,457,562
7620	Electrical repair shops	$158,028	$243,078	$1,761,339	$5,467,305	$7,629,750	$892,065	$8,521,815
7630	Watch and jewelry repair	$11,782	$11,285	$88,236	$126,849	$238,152	$36,642	$274,794
7640	Reupholstery & furn. repair	$41,646	$32,828	na	$326,022	$400,496	$107,400	$507,897
7690	Misc. repair shops	$317,624	$511,068	$3,682,545	$10,337,609	$14,848,846	$1,916,580	$16,765,426
7810	Motion picture production	$336,437	$295,610	$4,360,858	$10,643,414	$15,636,318	$2,155,898	$17,792,216
7820	Motion picture dist.	$50,910	$70,707	$441,887	$776,095	$1,339,599	$467,747	$1,807,346
7830	Motion picture theaters	$127,253	$314,744	$1,984,981	$2,170,895	$4,597,873	$1,616,051	$6,213,923
7840	Video tape rental	$204,854	$418,048	$2,346,539	$713,797	$3,683,238	$1,745,730	$5,428,968
7910	Dance studios & schools	$48,181	$71,072	$460,552	$451,053	$1,030,858	$252,972	$1,283,830
7920	Prducrs, orch., entertainers	$115,309	$136,276	$1,071,893	$3,415,871	$4,739,349	$709,114	$5,448,464
7930	Bowling centers	$44,678	$76,822	$445,225	$704,821	$1,271,546	$224,639	$1,496,184
7940	Commercial sports	$117,673	$143,715	$1,056,575	$3,759,981	$5,077,943	$909,627	$5,987,571
7990	Misc. recreation services	$762,471	$1,283,504	$8,739,338	$34,654,985	$45,440,298	$7,594,554	$53,034,852
8010	Offices of medical doctors	$1,393,281	$1,355,048	$10,068,080	$26,817,760	$39,634,170	$6,350,341	$45,984,511
8020	Dentists offices and clinics	$847,573	$488,588	$3,512,703	$2,970,314	$7,819,178	$1,606,642	$9,425,820

TABLE VIII-3

Total Cost of Compliance, by Provision of the Proposed Rule and 3-Digit SIC

SIC	Industry	Familiarization and MSD Coverage Costs	Basic Program	Full Program	Job Fixes	SUBTOTAL (cost to society)	Work Restriction Protection	TOTAL (cost to employers)
8030	Osteopathic physicians	$35,075	$15,032	$128,267	$179,195	$357,570	$77,167	$434,736
8040	Other health practitioners	$536,674	$481,334	$3,987,147	$5,847,699	$10,852,854	$2,800,602	$13,653,456
8050	Nursing & personal care fac.	$3,759,898	$2,114,261	$24,074,294	$77,752,250	$107,700,702	$51,294,314	$158,995,016
8060	Hospitals	$7,239,105	$4,890,903	$55,115,077	$209,521,909	$276,766,994	$68,404,131	$345,171,125
8070	Med. & dental labs	$152,323	$155,108	$1,123,088	$4,132,142	$5,562,660	$748,539	$6,311,199
8080	Home hlth care services	$815,588	$990,964	$6,851,537	$33,742,269	$42,400,358	$9,114,120	$51,514,478
8090	Hlth & allied serv., n.e.c.	$290,769	$448,678	$2,834,519	$9,416,424	$12,990,390	$2,145,692	$15,136,082
8110	Legal services	$1,078,509	$636,931	$4,975,954	$6,296,553	$12,987,947	$1,839,321	$14,827,269
8210	Elem. & secondary schools	$252,669	$536,448	$2,408,558	$7,409,246	$10,606,920	$1,315,740	$11,922,661
8220	Colleges & universities	$297,420	$845,008	$5,562,216	$27,745,022	$34,449,666	$2,500,587	$36,950,253
8230	Libraries	$12,931	$6,340	$47,050	$57,024	$123,346	$24,182	$147,528
8240	Vocational schools	$39,821	$24,899	$173,999	$329,784	$568,502	$90,754	$659,256
8290	Schools, n.e.c.	$83,539	$33,915	$262,448	$372,197	$752,100	$249,057	$1,001,157
8320	Individual & fam. services	$501,092	$942,073	$5,686,199	$24,515,841	$31,645,206	$8,689,296	$40,334,501
8330	Job train. & related serv.	$127,353	$321,339	$1,760,324	$13,721,380	$15,930,395	$2,714,343	$18,644,738
8350	Child day care services	$294,739	$474,979	$3,338,656	$5,616,982	$9,725,355	$3,936,218	$13,661,574
8360	Residential care	$603,128	$1,135,315	$6,226,790	$29,787,259	$37,752,492	$13,687,890	$51,440,382
8390	Social services, n.e.c.	$119,886	$201,304	$1,338,684	$5,819,126	$7,479,000	$1,566,723	$9,045,724
8410	Museums & art galleries	$47,270	$66,558	$440,174	$1,239,604	$1,793,606	$632,280	$2,425,886
8420	Bot. & zoolog. gardens	$11,271	$17,193	$115,067	$821,371	$964,903	$199,648	$1,164,551
8610	Business associations	$101,194	$59,901	$453,625	$593,807	$1,208,527	$303,599	$1,512,126
8620	Prof. organizations	$42,146	$28,169	$203,430	$346,495	$620,240	$138,569	$758,809
8630	Labor organizations	$70,138	$41,336	$320,476	$539,511	$971,460	$252,578	$1,224,039
8640	Civic & social assoc.	$213,175	$314,542	$2,421,858	$5,697,880	$8,647,454	$2,230,603	$10,878,058
8650	Political organizations	$16,951	$13,249	$108,296	$114,082	$252,577	$87,849	$340,427
8660	Religious organizations	$718,771	$209,759	$1,548,569	$2,986,046	$5,463,144	$1,043,032	$6,506,177
8690	Membership orgs., n.e.c.	$62,510	$99,111	$750,596	$3,132,955	$4,045,172	$717,630	$4,762,801
8710	Eng. and arch. services	$640,764	$610,807	$4,228,773	$10,162,590	$15,642,934	$3,020,533	$18,663,467
8720	Accntng, auditng, & bkeeping	$680,660	$487,522	$3,690,408	$9,984,888	$14,843,479	$3,180,317	$18,023,796
8730	Research & testing services	$347,366	$558,510	$3,817,933	$15,079,435	$19,803,244	$3,906,451	$23,709,695
8740	Management & pub. relations	$753,839	$712,697	$5,792,697	$25,689,167	$32,948,400	$5,564,929	$38,513,329
8990	Services, n.e.c.	$206,385	$286,962	$2,199,863	$2,763,293	$5,456,503	$2,157,591	$7,614,094
	TOTAL	$108,632,674	$106,997,692	$823,597,643	$2,317,443,741	$3,356,671,750	$875,526,111	$4,232,197,861

Source: Office of Regulatory Analysis, OSHA, U.S. DOL

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Estimates of the costs of job control are presented as net costs, because OSHA has taken the benefits employers often accrue from productivity improvements associated with job controls as offsets to the costs of job control. OSHA estimates that the labor savings (productivity improvements) provided by the job controls the standard will require will amount to approximately $1.3 billion per year in annualized savings.[6] OSHA believes that many ergonomic interventions improve productivity, either because they reduce employee fatigue and relieve muscle pain (which means that the employee will do more work in less time), or because they involve automating portions of jobs in ways that can be expected to improve productivity. In addition to such direct effects on productivity, ergonomic interventions frequently offset the employers' cost for controls by:

- Reducing absenteeism because a worker is less likely to take time off to recover from muscle soreness, fatigue, etc.;
- Reducing turnover, particularly since new hires are more likely to find an ergonomically designed job within their physical capacity;
- Improving product quality because fewer errors are made when processes are more automated and demand less physical effort.

These positive productivity impacts are attested to by the experience of many employers (see the productivity tables in Chapter V of the Preliminary Economic Analysis). OSHA's 1993 ergonomics survey of general industry employers found that 30 percent of those employers who had implemented ergonomics controls reported that their ergonomics programs had had measurable positive impacts on productivity. On average, these employers (including the few employers who reported that their controls had negative impacts on productivity) reported a weighted average productivity improvement of 7 percent per intervention. A review of the case studies of ergonomics programs discussed in Chapter IV found that one program in four reported having produced an increase in productivity.

F. Economic Feasibility (Chapter VI)

The OSH Act requires the Agency to set standards for toxic materials and harmful physical agents (such as musculoskeletal risk factors) that are feasible, both technologically and economically. To demonstrate that a standard is feasible, the courts have held that OSHA must ''construct a reasonable estimate of compliance costs and demonstrate a reasonable likelihood that these costs will not threaten the existence or competitive structure of an industry, even if it does portend disaster for some marginal firms'' [*United Steelworkers of America, AFL–CIO–CLC* v. *Marshall* (the ''Lead'' decision)].

OSHA's analysis of economic feasibility is conducted on an establishment basis. For each affected industry, estimates of per-establishment annualized compliance costs are compared with per-establishment estimates of revenues and per-establishment estimates of profits, using two worst-case assumptions about the ability of employers to pass the costs of compliance through to their customers: the no cost passthrough assumption and the full cost passthrough assumption. Based on the results of these comparisons, which bound the universe of potential impacts of the proposed standard, OSHA then assesses the proposed standard's economic feasibility for establishments in all covered industries.

OSHA assumed that the establishments falling within the scope of the proposed standard had the same average sales and profits as other establishments in their industries. This assumption is reasonable because there is no evidence suggesting that the financial characteristics of those firms whose employees experience covered MSDs are different from firms that do not have covered MSDs among their workforce. Absent such evidence, OSHA relied on the best available financial data (those from the Bureau of the Census (Ex. 28–6) and Robert Morris Associates), used commonly accepted methodology to calculate industry averages, and based its analysis of the significance of the projected economic impacts and the feasibility of compliance on these data.

The analysis of the potential impacts of the proposed standard on before-tax profits and sales shown in Table VIII–4 is a screening analysis because it simply measures costs as a percentage of pre-tax profits and sales under the worst-case assumptions discussed above, but does not predict impacts on these before-tax profits or sales. The screening analysis is used to determine whether the compliance costs potentially associated with the proposed standard could lead to significant impacts on affected establishments. The actual impact of the proposed standard on the profit and sales of establishments in a given industry will depend on the price elasticity of demand for the products or services of establishments in that industry.

Table VIII–4 shows that the potential impacts of the proposed standard on average industry profits are small, even under the worst-case scenario of no cost passthrough. For all industries as a whole, annualized compliance costs are 0.6 percent of profits. Compliance costs potentially exceed 5 percent of profits only for 10 industry groups, and they exceed 10 percent of profits only in one industry (SIC 561, Men's and boy's clothing stores). This potential impact is accounted for in this industry by the fact that, as reported by Robert Morris Associates (RMA), this industry's profits are extremely small—0.1 percent of sales (compared with an average profit of 4.89 percent for all industries).

Based on the data for establishments in all industries shown in Table VIII–4, OSHA preliminarily concludes that the proposed ergonomics program standard is economically feasible for the industries covered by the standard. OSHA reaches this conclusion based on the fact that, even under the worst case scenarios of full cost passthrough and no cost passthrough, respectively, impacts on average industry revenues are only 0.03 percent, and impacts on average profits are only 0.6 percent. In only one industry, SIC 561, do worst-case profit impacts exceed 10 percent and, as discussed above, this industry's profits are abnormally low (only 0.1 percent of sales). The average annual profit per establishment for the establishments in SIC 561 is $721, by far the lowest profit for any of the approximately 300 industries shown in Table VIII–4.

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[6] OSHA estimated productivity impacts by determining the average percentage reduction from gross costs caused by productivity in a set of examples of ergonomic interventions. Please see the Preliminary Economic Analysis, particularly Tables V–17 through V–19, for details.

Table VIII-4 Estimated Economic Impact of the Proposed Ergonomics Standard on All Industries and all Affected Establishments

						For All Establishments			For Affected Establishments (Those with MSDs)			
SIC	Industry	Annualized Compliance Costs for all Establishments	Revenues for all Establishments ($1,000s)	Profits as a Percentage of Revenues	Profits ($1,000s)	Annualized Compliance Costs as a Percentage of Revenues	Annualized Compliance Costs as a Percentage of Profits	Compliance Cost per Establishment	Total Number of Affected Establishments over 10 years	Annualized Costs as a Percent of Revenues	Annualized Costs as a Percent of Profits	Annualized Cost per Affected Establishment
710	Soil prep. services	$241,964	$932,972	6.0%	$55,698	0.03	0.0	$377	268	0.06	1.04	$902
720	Crop services	$5,197,071	$5,966,617	7.9%	$471,363	0.09	1.1	$1,257	1,848	0.19	2.47	$2,812
740	Veterinary services	$6,267,235	$7,693,839	8.7%	$669,364	0.08	0.9	$275	8,982	0.21	2.38	$698
750	Animal serv., excpt vet.	$1,165,707	$1,821,371	6.0%	$108,736	0.06	1.1	$112	1,704	0.39	6.52	$684
780	Lndscape & hort. services	$30,381,372	$19,389,342	4.4%	$853,131	0.16	3.6	$446	22,430	0.48	10.82	$1,355
810	Timber tracts	$589,058	$851,843	3.1%	$26,322	0.07	2.2	$683	260	0.23	7.42	$2,266
830	Forest products	$200,949	$247,111	3.1%	$7,636	0.08	2.6	$1,467	45	0.25	8.04	$4,484
850	Forestry services	$660,032	$1,069,094	3.1%	$33,035	0.06	2.0	$421	469	0.21	6.68	$1,407
910	Commerical fishing	$662,291	$1,343,245	5.0%	$67,162	0.05	1.0	$340	347	0.28	5.54	$1,910
920	Fish hatcheries	$111,384	$62,473	5.0%	$3,124	0.18	3.6	$1,172	31	0.54	10.80	$3,552
970	Hunting & trapping	$99,324	$167,605	5.0%	$8,380	0.06	1.2	$293	67	0.30	5.97	$1,475
1310	Crude petrol. & nat. gas	$2,602,196	$59,652,592	5.7%	$3,406,163	0.00	0.1	$335	1,369	0.02	0.43	$1,901
1320	Natural gas liquids	$398,693	$41,021,720	4.8%	$1,977,247	0.00	0.0	$712	239	0.00	0.05	$1,667
1380	Oil & gas field services	$9,414,047	$9,630,581	2.0%	$188,759	0.10	5.0	$1,074	1,917	0.45	22.80	$4,911
2010	Meat products	$34,851,928	$117,204,932	2.3%	$2,695,713	0.03	1.3	$11,316	824	0.11	4.84	$42,320
2020	Dairy products	$8,208,027	$59,676,113	2.2%	$1,312,874	0.01	0.6	$4,364	518	0.05	2.27	$15,860
2030	Presrvd fruits & vegetables	$10,025,305	$47,486,808	4.2%	$1,994,446	0.02	0.5	$4,973	523	0.08	1.94	$19,174
2040	Grain mill products	$6,834,758	$55,960,493	2.7%	$1,510,933	0.01	0.5	$2,626	726	0.04	1.62	$9,412
2050	Bakery products	$12,487,588	$31,963,430	2.2%	$703,195	0.04	1.8	$3,545	874	0.16	7.16	$14,291
2060	Sugar and confect. prods	$4,549,510	$22,593,884	4.6%	$1,039,319	0.02	0.4	$4,143	278	0.08	1.73	$16,367
2070	Fats and oils	$1,220,954	$21,732,140	2.9%	$630,232	0.01	0.2	$2,408	146	0.02	0.67	$8,388
2080	Beverages	$9,052,754	$64,480,420	4.5%	$2,901,619	0.01	0.3	$3,960	596	0.05	1.20	$15,192
2090	Misc. food products	$8,143,826	$37,957,910	2.9%	$1,100,779	0.02	0.7	$2,032	1,001	0.09	2.96	$8,138
2110	Cigarettes	$816,198	$25,695,548	3.9%	$1,002,126	0.00	0.1	$54,413	4	0.01	0.31	$204,270
2120	Cigars	$69,214	$315,743	3.9%	$12,314	0.02	0.6	$1,473	8	0.13	3.42	$8,964
2130	Chewing & smoking tobacco	$67,355	$1,544,972	3.9%	$60,254	0.00	0.1	$2,591	6	0.02	0.46	$10,572
2140	Tobacco stemm. & redrying	$223,753	$3,104,375	3.9%	$121,071	0.01	0.2	$6,992	9	0.02	0.64	$24,180
2210	Brdwven fab. mills, cotton	$3,267,589	$6,018,357	3.6%	$216,661	0.05	1.5	$7,931	154	0.15	4.04	$21,270
2220	Broadwoven fabric mills	$3,031,163	$9,703,013	2.4%	$232,872	0.03	1.3	$6,618	170	0.08	3.51	$17,823
2230	Brdwvn fab. mills, wool	$436,588	$1,720,695	2.4%	$41,297	0.03	1.1	$4,410	38	0.07	2.78	$11,606
2240	Narrow fabric mills	$980,333	$1,485,068	1.3%	$19,306	0.07	5.1	$3,539	117	0.16	12.05	$8,401
2250	Knitting mills	$8,350,528	$17,214,105	2.7%	$464,781	0.05	1.8	$4,293	767	0.12	4.56	$10,891
2260	Tex. finishing, excpt wool	$2,577,740	$7,498,188	1.2%	$89,978	0.03	2.9	$3,026	285	0.10	8.57	$9,045
2270	Carpets and rugs	$2,179,492	$12,446,310	1.7%	$211,587	0.02	1.0	$4,503	168	0.05	6.97	$12,956
2280	Yarn and thread mills	$3,660,386	$12,173,797	4.0%	$486,952	0.03	0.8	$6,225	252	0.07	4.04	$14,548
2290	Misc. textile goods	$2,690,910	$8,817,910	2.4%	$211,630	0.03	1.3	$2,664	380	0.08	3.38	$7,074
2310	Men's & boys' suits & coats	$949,413	$1,906,167	4.0%	$76,247	0.05	1.2	$3,240	87	0.17	1.52	$10,959
2320	Men's & boys' furnishings	$8,238,170	$15,125,809	3.2%	$484,026	0.05	1.7	$3,901	665	0.17	5.40	$12,386
2330	Wm's & misses' outerwear	$6,193,035	$19,500,842	2.0%	$390,017	0.03	1.6	$692	2,390	0.12	5.95	$2,591
2340	Wm's & chldrn's undergarmnts	$1,483,644	$2,918,268	2.2%	$64,202	0.05	2.3	$3,988	116	0.16	7.43	$12,821
2350	Hats, caps, & millinery	$561,328	$1,098,786	4.3%	$47,248	0.05	1.2	$1,473	106	0.18	4.27	$5,293
2360	Girls' & chldrn's outerwear	$988,493	$2,258,886	1.4%	$31,624	0.04	3.1	$1,690	174	0.15	10.51	$5,682
2370	Fur goods	$16,361	$142,828	2.4%	$3,428	0.01	0.5	$123	28	0.06	2.30	$594
2380	Misc. apparel & accessories	$1,176,847	$2,244,834	2.4%	$53,876	0.05	2.2	$1,261	262	0.19	7.77	$4,489
2390	Misc. fab. textile prods	$8,943,239	$22,070,600	2.4%	$529,694	0.04	1.7	$1,017	2,469	0.14	6.02	$3,623
2410	Logging	$1,242,590	$15,538,413	3.9%	$605,998	0.01	0.2	$87	2,002	0.06	1.46	$621
2420	Sawmills & planing mills	$9,202,918	$25,776,399	3.8%	$979,503	0.04	0.9	$1,508	2,260	0.10	2.54	$4,072
2430	Millwork & plywood	$17,342,953	$31,414,582	3.7%	$1,162,340	0.06	1.5	$1,816	3,534	0.15	4.03	$4,908
2440	Wood containers	$2,325,372	$4,006,433	3.6%	$144,232	0.06	1.6	$822	1,076	0.15	4.24	$2,160
2450	Wood bldings & mobile homes	$6,684,122	$12,663,722	3.7%	$468,558	0.05	1.4	$6,402	388	0.14	3.84	$17,215

Table VIII-4 Estimated Economic Impact of the Proposed Ergonomics Standard on All Industries and all Affected Establishments

						For All Establishments			For Affected Establishments (Those with MSDs)			
SIC	Industry	Annualized Compliance Costs for all Establishments	Revenues for all Establishments ($1,000s)	Profits as a Percentage of Revenues	Profits ($1,000s)	Annualized Compliance Costs as a Percentage of Revenues	Annualized Compliance Costs as a Percentage of Profits	Compliance Cost per Establishment	Total Number of Affected Establishments over 10 years	Annualized Costs as a Percent of Revenues	Annualized Costs as a Percent of Profits	Annualized Cost per Affected Establishment
2490	Misc. wood products	$5,208,656	$13,133,205	2.8%	$367,730	0.04	1.4	$1,473	1,153	0.12	4.35	$4,519
2510	Household furniture	$16,248,756	$24,242,412	2.9%	$703,030	0.07	2.3	$2,954	1,585	0.23	8.02	$10,249
2520	Office furniture	$5,008,060	$9,836,788	3.9%	$383,635	0.05	1.3	$4,848	316	0.17	4.27	$15,843
2530	Pub blding & related furn.	$4,599,526	$6,139,247	3.0%	$184,177	0.07	2.5	$10,244	151	0.22	7.44	$30,520
2540	Partitions and fixtures	$5,464,792	$8,109,037	3.0%	$243,271	0.07	2.2	$1,824	931	0.22	7.23	$5,871
2590	Misc furniture and fixtures	$2,273,471	$4,857,016	3.0%	$145,710	0.05	1.6	$1,610	436	0.15	5.05	$5,216
2610	Pulp mills	$524,915	$5,810,924	3.8%	$220,815	0.01	0.2	$8,466	23	0.02	0.64	$22,716
2620	Paper mills	$8,051,820	$35,582,333	4.7%	$1,672,370	0.02	0.5	$23,406	142	0.05	1.17	$56,681
2630	Paperboard mills	$2,099,380	$19,899,897	4.7%	$935,295	0.01	0.2	$9,208	98	0.02	0.52	$21,519
2650	Paperbrd containers & boxes	$11,810,106	$40,019,006	4.0%	$1,600,760	0.03	0.7	$4,204	1,196	0.07	1.73	$9,878
2670	Misc. cnvrtd paper products	$12,790,226	$49,954,537	2.7%	$1,348,772	0.03	0.9	$4,217	1,247	0.06	2.31	$10,258
2710	Newspapers	$17,843,017	$37,006,756	6.0%	$2,220,405	0.05	0.8	$2,010	3,294	0.13	2.17	$5,418
2720	Periodicals	$2,825,535	$26,525,283	3.7%	$981,435	0.01	0.3	$489	1,501	0.04	1.11	$1,882
2730	Books	$5,444,833	$26,774,751	4.0%	$1,070,990	0.02	0.5	$1,530	1,105	0.07	1.64	$4,925
2740	Miscellaneous publishing	$1,577,673	$10,624,468	5.1%	$541,848	0.01	0.3	$484	866	0.06	1.10	$1,821
2750	Commercial printing	$22,314,783	$66,006,851	3.3%	$2,178,226	0.03	1.0	$648	12,615	0.09	2.80	$1,769
2760	Manifold business forms	$2,278,055	$7,941,418	2.7%	$214,418	0.03	1.1	$2,501	432	0.06	2.24	$5,268
2770	Greeting cards	$1,523,799	$4,434,535	3.8%	$168,512	0.03	0.9	$10,656	55	0.09	2.33	$27,512
2780	Blankbooks & bookbinding	$3,319,832	$5,222,155	3.8%	$198,442	0.06	1.7	$2,097	706	0.14	3.75	$4,703
2790	Printing trade services	$1,203,741	$4,984,730	3.0%	$149,542	0.02	0.8	$350	803	0.10	3.44	$1,499
2810	Indust. inorganic chemicals	$2,574,966	$30,002,480	4.1%	$1,230,102	0.01	0.2	$1,852	245	0.05	1.19	$10,511
2820	Plastics mat. & synthetics	$3,108,644	$57,333,971	5.0%	$2,866,699	0.01	0.1	$3,549	177	0.03	0.54	$17,558
2830	Drugs	$7,450,017	$98,347,315	5.5%	$5,409,102	0.01	0.1	$4,551	310	0.04	0.73	$24,025
2840	Soap, clnrs, & toilet goods	$5,041,549	$48,294,820	2.9%	$1,400,550	0.01	0.4	$2,071	447	0.06	1.96	$11,277
2850	Paints & allied products	$2,101,792	$17,587,225	2.8%	$492,442	0.01	0.4	$1,421	299	0.06	2.11	$7,018
2860	Indust. organic chemicals	$2,860,929	$79,254,515	3.3%	$2,615,399	0.00	0.1	$3,024	193	0.02	0.54	$14,814
2870	Agricultural chemicals	$1,023,507	$22,569,700	3.4%	$767,370	0.00	0.1	$1,091	173	0.02	0.72	$5,905
2890	Misc. chemical products	$3,046,650	$27,864,576	3.8%	$1,058,854	0.01	0.3	$1,187	764	0.04	0.97	$3,989
2910	Petroleum refining	$2,842,044	$145,808,878	3.1%	$4,520,075	0.00	0.1	$10,335	121	0.00	0.14	$23,466
2950	Asphlt pavng & roofng mat.	$1,695,212	$9,765,070	3.3%	$322,247	0.02	0.5	$1,239	535	0.04	1.35	$3,170
2990	Misc. pet. & coal prods	$465,984	$6,900,468	3.7%	$255,317	0.01	0.2	$1,000	160	0.02	0.53	$2,908
3010	Tires and inner tubes	$3,807,767	$12,649,425	3.9%	$493,328	0.03	0.8	$22,268	47	0.11	2.82	$81,275
3020	Rubber & plastics footwear	$488,467	$688,879	4.2%	$28,933	0.07	1.7	$8,008	16	0.26	6.27	$29,753
3050	Hose, bltng, and gaskets	$3,067,784	$8,004,186	4.4%	$352,184	0.04	0.9	$3,714	228	0.14	3.16	$13,480
3060	Fab. rubber prod., n.e.c.	$5,694,221	$13,765,033	3.9%	$536,836	0.04	1.1	$3,223	483	0.15	3.88	$11,792
3080	Misc plastics, n.e.c.	$32,190,288	$106,907,067	3.4%	$3,634,840	0.03	0.9	$2,359	4,168	0.10	2.90	$7,723
3110	Leather tan. & finishing	$1,034,796	$2,738,038	1.7%	$46,547	0.04	2.2	$3,017	129	0.10	5.90	$8,004
3130	Footwear cut stock	$128,064	$213,944	1.8%	$3,851	0.06	3.3	$1,829	27	0.15	8.52	$4,687
3140	Footwear, except rubber	$3,024,541	$3,634,490	1.9%	$69,055	0.08	4.4	$8,001	148	0.21	11.22	$20,489
3150	Leather gloves & mittens	$181,979	$149,789	1.8%	$2,696	0.12	6.7	$2,637	29	0.29	16.19	$6,325
3160	Luggage	$414,688	$1,007,874	1.8%	$18,142	0.04	2.3	$1,589	93	0.12	6.39	$4,445
3170	Hndbags & prsnal leathr gds.	$593,413	$848,276	1.8%	$15,269	0.07	3.9	$1,730	114	0.21	11.70	$5,206
3190	Leather goods, n.e.c.	$647,189	$651,426	1.8%	$11,726	0.10	5.5	$1,548	148	0.28	15.63	$4,386
3210	Flat glass	$1,266,615	$2,709,081	4.5%	$121,909	0.05	1.0	$15,637	27	0.14	3.10	$46,637
3220	Glass, pressed or blown	$4,895,889	$9,244,687	6.8%	$628,639	0.05	0.8	$8,312	168	0.19	2.74	$29,227
3230	Prod. of purchased glass	$4,662,472	$9,109,494	4.4%	$400,818	0.05	1.2	$2,843	479	0.18	3.99	$9,741
3240	Cement, hydraulic	$868,727	$4,720,190	4.5%	$212,409	0.02	0.4	$3,761	80	0.05	1.18	$10,878
3250	Structural clay products	$1,939,023	$3,232,723	6.0%	$193,963	0.06	1.0	$3,270	208	0.17	2.85	$9,317
3260	Pottery & related prods	$2,766,970	$3,370,197	4.5%	$151,659	0.08	1.8	$2,306	339	0.29	6.45	$8,151
3270	Concrete & plast. prdcts	$10,941,438	$29,948,845	4.3%	$1,287,800	0.04	0.8	$1,152	3,309	0.10	2.44	$3,307

Table VIII-4 Estimated Economic Impact of the Proposed Ergonomics Standard on All Industries and all Affected Establishments

						For All Establishments			For Affected Establishments (Those with MSDs)			
SIC	Industry	Annualized Compliance Costs for all Establishments	Revenues for all Establishments ($1,000s)	Profits as a Percentage of Revenues	Profits ($1,000s)	Annualized Compliance Costs as a Percentage of Revenues	Annualized Compliance Costs as a Percentage of Profits	Compliance Cost per Establishment	Total Number of Affected Establishments over 10 years	Annualized Costs as a Percent of Revenues	Annualized Costs as a Percent of Profits	Annualized Cost per Affected Establishment
3280	Cut stone & stone prods	$814,738	$1,218,989	4.2%	$51,198	0.07	1.6	$761	348	0.21	4.90	$2,341
3290	Misc. nonmet. mineral prods.	$4,131,545	$12,831,147	5.7%	$731,375	0.03	0.6	$2,584	507	0.10	1.78	$8,144
3310	Basic steel products	$13,686,455	$69,010,676	4.7%	$3,243,502	0.02	0.4	$10,659	337	0.08	1.61	$40,584
3320	Iron and steel foundries	$9,351,449	$15,484,686	4.7%	$727,780	0.06	1.3	$8,062	347	0.20	4.30	$26,976
3330	Primary nonfer. metals	$1,875,674	$17,465,720	4.5%	$785,957	0.01	0.2	$9,332	52	0.04	0.93	$36,275
3340	Secondary nonfer. metals	$936,683	$7,521,366	3.6%	$270,769	0.01	0.3	$3,133	87	0.04	1.19	$10,761
3350	Nonfer. rolling & drawing	$8,775,592	$45,476,554	5.6%	$2,546,687	0.02	0.3	$7,942	320	0.07	1.19	$27,412
3360	Nonfer. foundries (cstngs)	$5,371,804	$9,611,068	3.7%	$355,610	0.06	1.5	$3,232	476	0.20	5.27	$11,278
3390	Misc. primary metal prdcts	$1,184,752	$4,169,927	0.5%	$21,267	0.03	5.6	$1,251	283	0.09	18.62	$4,181
3410	Met. cans & ship. containers	$2,135,293	$13,004,892	2.8%	$364,137	0.02	0.6	$4,909	166	0.04	1.54	$12,850
3420	Cutlery, hndtls, & hardware	$8,421,878	$17,122,208	4.7%	$804,744	0.05	1.0	$3,443	876	0.14	2.92	$9,611
3430	Plumbing & heating fixtures	$4,048,663	$7,375,857	3.8%	$280,283	0.05	1.4	$5,885	257	0.15	3.87	$15,746
3440	Fab. struct. metal prdcts	$26,007,372	$56,840,749	4.0%	$2,273,630	0.05	1.1	$1,950	4,927	0.12	3.10	$5,279
3450	Screw machine products	$5,840,663	$11,596,795	3.9%	$452,275	0.05	1.3	$2,245	1,012	0.13	3.32	$5,772
3460	Met. forgings & stampings	$20,285,253	$40,752,728	4.5%	$1,833,873	0.05	1.1	$5,491	1,417	0.13	2.88	$14,315
3470	Metal services, n.e.c.	$6,196,660	$12,900,758	5.7%	$735,343	0.05	0.8	$1,121	2,013	0.13	2.31	$3,079
3480	Ordnance and access., n.e.c.	$2,058,754	$4,686,212	4.4%	$206,193	0.04	1.0	$4,700	132	0.15	3.31	$15,584
3490	Misc. fab. metal products	$17,375,910	$38,754,246	4.8%	$1,860,204	0.04	0.9	$2,391	2,571	0.13	2.64	$6,758
3510	Engines and turbines	$4,768,256	$16,985,636	4.4%	$747,368	0.03	0.6	$12,852	125	0.08	1.90	$38,286
3520	Farm & garden machinery	$6,588,850	$17,677,144	4.1%	$724,763	0.04	0.9	$3,742	570	0.12	2.81	$11,555
3530	Construct. & related mach.	$12,495,792	$33,857,157	5.0%	$1,692,858	0.04	0.7	$3,759	1,127	0.11	2.18	$11,092
3540	Metalworking machinery	$14,111,089	$34,863,234	4.6%	$1,603,709	0.04	0.9	$1,195	3,901	0.12	2.66	$3,617
3550	Special industry mach.	$8,656,442	$29,950,693	4.5%	$1,347,781	0.03	0.6	$1,807	1,544	0.09	1.99	$5,607
3560	General indust. mach.	$13,075,736	$38,890,135	4.5%	$1,750,056	0.03	0.7	$2,987	1,492	0.10	2.19	$8,761
3570	Computer & office equip.	$8,028,010	$72,679,343	3.3%	$2,398,418	0.01	0.3	$3,801	554	0.04	1.28	$14,499
3580	Refrig. & serv. indust mach.	$12,363,365	$36,688,548	2.0%	$733,771	0.03	1.7	$5,505	746	0.10	5.07	$16,564
3590	Industrial mach., n.e.c.	$14,660,107	$35,100,649	5.5%	$1,930,536	0.04	0.8	$567	5,982	0.18	3.28	$2,451
3610	Elect. dist. equipment	$2,438,256	$11,273,986	4.0%	$450,959	0.02	0.5	$2,787	164	0.12	2.88	$14,831
3620	Elect. indust. apparatus	$6,283,325	$21,854,697	4.0%	$874,188	0.03	0.7	$2,780	416	0.16	3.90	$15,101
3630	Household appliances	$4,936,022	$21,300,973	3.4%	$724,233	0.02	0.7	$10,414	87	0.13	3.70	$56,599
3640	Elct. lghtng & wire equip.	$5,611,641	$23,289,566	4.6%	$1,071,320	0.02	0.5	$2,651	400	0.13	2.77	$14,014
3650	Household audio & vid. equip.	$1,637,998	$13,716,113	5.9%	$809,251	0.01	0.2	$2,010	136	0.07	1.21	$12,018
3660	Communications equipment	$5,340,881	$57,675,808	5.4%	$3,114,494	0.01	0.2	$2,531	337	0.06	1.07	$15,840
3670	Electrnic compnnts & access.	$12,418,064	$103,870,202	5.4%	$5,608,991	0.01	0.2	$1,890	1,115	0.07	1.30	$11,137
3690	Misc. elect. equipment	$5,736,202	$26,674,704	5.0%	$1,333,735	0.02	0.4	$3,208	296	0.13	2.60	$19,407
3710	Motor vehicles & equipt.	$48,318,866	$339,576,992	3.9%	$13,243,503	0.01	0.4	$9,570	630	0.11	2.92	$76,717
3720	Aircraft and parts	$13,957,517	$93,016,989	4.3%	$3,999,731	0.02	0.3	$8,244	169	0.15	3.50	$82,754
3730	Ship, boat blding and repair	$2,306,682	$6,028,640	3.6%	$217,031	0.04	1.1	$862	406	0.25	7.01	$5,686
3740	Railroad equipment	$1,588,327	$6,654,526	2.8%	$186,327	0.02	0.9	$7,457	25	0.20	7.13	$62,329
3750	Motorcycles & bicycles	$731,427	$3,336,172	3.8%	$126,775	0.02	0.6	$1,977	39	0.21	5.54	$18,976
3760	Guided missiles	$1,355,357	$18,052,173	3.8%	$685,983	0.01	0.2	$12,908	11	0.07	1.82	$118,636
3790	Misc. transportation equip.	$2,150,247	$8,420,402	3.8%	$319,975	0.03	0.7	$1,894	186	0.16	4.09	$11,541
3810	Srch & navigation equipment	$4,014,037	$30,132,161	4.7%	$1,416,212	0.01	0.3	$5,767	134	0.07	1.47	$29,875
3820	Meas. & contrlling devices	$8,552,066	$39,725,944	5.3%	$2,105,475	0.02	0.4	$1,799	1,022	0.10	1.89	$8,364
3840	Medical instrmnts & supplies	$8,432,651	$49,607,297	6.2%	$3,075,652	0.02	0.3	$1,886	892	0.09	1.37	$9,458
3850	Ophthalmic goods	$909,196	$2,850,267	4.2%	$119,711	0.03	0.8	$1,549	120	0.16	3.70	$7,551
3860	Photo. equip. & supplies	$2,811,411	$19,103,716	5.3%	$1,012,497	0.01	0.3	$3,899	129	0.08	1.56	$21,876
3870	Watches, clocks, & parts	$134,887	$768,223	5.6%	$43,020	0.02	0.3	$957	27	0.09	1.66	$5,069
3910	Jwlry, slvrwre, and plate	$2,017,457	$6,261,321	2.8%	$175,317	0.03	1.2	$717	641	0.14	5.05	$3,147
3930	Musical instruments	$1,020,526	$1,313,948	3.3%	$43,360	0.08	2.4	$1,856	138	0.31	9.36	$7,383

Table VIII-4 Estimated Economic Impact of the Proposed Ergonomics Standard on All Industries and all Affected Establishments

						For All Establishments			For Affected Establishments (Those with MSDs)			
SIC	Industry	Annualized Compliance Costs for all Establishments	Revenues for all Establishments ($1,000s)	Profits as a Percentage of Revenues	Profits ($1,000s)	Annualized Compliance Costs as a Percentage of Revenues	Annualized Compliance Costs as a Percentage of Profits	Compliance Cost per Establishment	Total Number of Affected Establishments over 10 years	Annualized Costs as a Percent of Revenues	Annualized Costs as a Percent of Profits	Annualized Cost per Affected Establishment
3940	Toys and sporting goods	$7,714,553	$14,422,948	3.5%	$504,803	0.05	1.5	$2,195	948	0.20	5.66	$8,136
3950	Office and art supplies	$1,270,737	$3,683,197	3.3%	$121,546	0.03	1.0	$1,224	268	0.13	4.05	$4,747
3960	Costume jewelry & notions	$819,428	$2,246,891	3.3%	$74,147	0.04	1.1	$750	244	0.16	4.95	$3,360
3990	Misc. manufactures	$9,483,246	$19,008,990	3.4%	$646,306	0.05	1.5	$1,077	4,174	0.11	3.09	$2,272
4110	Local & suburban trans.	$24,018,108	$8,742,145	6.2%	$542,013	0.27	4.4	$2,519	5,338	0.49	7.92	$4,499
4120	Taxicabs	$1,223,456	$1,286,889	5.9%	$75,926	0.10	1.6	$370	714	0.44	7.45	$1,713
4130	Intercty & rural bus trans.	$2,786,770	$1,610,701	7.0%	$112,749	0.17	2.5	$5,794	246	0.34	4.83	$11,310
4140	Bus charter service	$1,454,794	$1,653,193	3.8%	$62,821	0.09	2.3	$1,016	668	0.19	4.96	$2,178
4150	School buses	$7,306,855	$4,192,484	5.9%	$247,357	0.17	3.0	$1,720	2,090	0.35	6.00	$3,495
4170	Bus terminals	$45,866	$44,464	5.9%	$2,623	0.10	1.7	$805	29	0.20	3.39	$1,560
4210	Trking & Courier Service	$203,536,417	$169,408,687	3.2%	$5,421,078	0.12	3.8	$1,742	38,171	0.37	11.49	$5,332
4220	Pub. warehousing & storage	$13,881,441	$11,696,021	9.4%	$1,099,426	0.12	1.3	$1,171	5,717	0.25	2.62	$2,428
4230	Trucking terminal fac.	$105,488	na	4.2%	na	na	na	$1,319	37	na	na	$2,890
4510	Air trans., scheduled	$85,079,148	$139,896,879	4.0%	$5,595,875	0.06	1.5	$12,875	4,757	0.08	2.11	$17,886
4520	Air trans., nonsched.	$1,219,990	$4,596,451	6.0%	$275,787	0.03	0.4	$666	698	0.07	1.16	$1,747
4580	Airports and services	$7,949,012	$9,429,735	4.6%	$433,768	0.08	1.8	$1,980	1,791	0.19	4.11	$4,439
4610	Pipelines, excpt natural gas	$1,696,329	$8,949,097	4.9%	$438,506	0.02	0.4	$1,762	587	0.03	0.63	$2,890
4720	Pass. trans. arrangements	$2,501,195	$14,855,776	2.7%	$401,106	0.02	0.6	$76	3,772	0.15	5.47	$663
4730	Freight trans. arrangements	$8,218,900	$13,557,555	3.7%	$501,630	0.06	1.6	$556	5,923	0.15	4.09	$1,388
4740	Rental of railroad cars	$87,102	$2,475,148	3.4%	$84,155	0.00	0.1	$751	34	0.01	0.35	$2,572
4780	Misc. trans. services	$3,863,312	$3,112,064	3.4%	$105,810	0.12	3.7	$1,441	952	0.35	10.28	$4,056
4810	Telephone communication	$28,394,255	$208,432,617	7.7%	$16,049,312	0.01	0.2	$1,041	4,532	0.08	1.06	$6,266
4820	Telegrph & other comm.	$119,769	$1,436,935	5.7%	$81,905	0.01	0.1	$257	59	0.07	1.16	$2,037
4830	Radio & TV broadcasting	$2,128,977	$35,250,634	2.4%	$846,015	0.01	0.3	$241	1,336	0.04	1.66	$1,594
4840	Cable & othr pay TV services	$6,686,176	$43,809,951	5.4%	$2,365,737	0.02	0.3	$1,397	1,050	0.07	1.29	$6,368
4890	Communication serv., n.e.c.	$275,374	$5,631,490	5.7%	$320,995	0.00	0.1	$185	141	0.05	0.91	$1,957
4910	Electric services	$16,021,589	$162,448,596	10.8%	$17,544,448	0.01	0.1	$2,552	1,389	0.04	0.41	$11,534
4920	Gas product. & distribution	$6,366,411	$89,523,533	6.7%	$5,998,077	0.01	0.1	$1,615	848	0.03	0.49	$7,508
4930	Comb. utility services	$6,914,868	$71,542,818	8.3%	$5,938,054	0.01	0.1	$3,696	401	0.05	0.54	$17,263
4940	Water supply	$1,123,354	$4,130,669	10.6%	$437,851	0.03	0.3	$304	577	0.17	1.65	$1,946
4950	Sanitary services	$10,505,550	$24,057,028	7.6%	$1,828,334	0.04	0.6	$1,618	1,363	0.21	2.74	$7,710
4960	Steam & air-cond. supplies	$56,936	$434,948	8.3%	$36,101	0.01	0.2	$825	15	0.06	0.73	$3,843
4970	Irrigation systems	$77,993	$167,025	8.3%	$13,863	0.05	0.6	$213	98	0.17	2.10	$795
5010	Motor vehicles	$34,047,483	$510,238,863	2.0%	$10,204,777	0.01	0.3	$744	18,333	0.02	0.83	$1,857
5020	Furn. & homefurnishings	$11,810,839	$68,862,490	2.0%	$1,377,250	0.02	0.9	$708	6,229	0.05	2.30	$1,896
5030	Lumber & construct. mat.	$26,320,648	$117,970,381	1.9%	$2,241,437	0.02	1.2	$1,112	11,317	0.05	2.46	$2,326
5040	Prof. & commercial equip.	$36,223,129	$329,207,483	2.5%	$8,230,187	0.01	0.4	$697	16,158	0.04	1.41	$2,242
5050	Met. & minerals, excpt pet.	$12,655,098	$151,787,907	2.8%	$4,250,061	0.01	0.3	$1,109	4,929	0.02	0.69	$2,567
5060	Electrical goods	$24,613,012	$337,183,776	2.2%	$7,418,043	0.01	0.3	$590	14,621	0.02	0.95	$1,683
5070	Hardware supplies	$21,157,742	$95,859,741	2.2%	$2,108,914	0.02	1.0	$810	11,803	0.05	2.22	$1,793
5080	Mach., equipt, & supplies	$49,965,358	$293,593,950	2.9%	$8,514,225	0.02	0.6	$655	30,491	0.04	1.47	$1,639
5090	Misc. durable goods	$20,713,707	$183,194,901	3.2%	$5,862,237	0.01	0.4	$517	11,575	0.04	1.22	$1,790
5110	Paper and paper products	$12,880,434	$132,104,428	1.6%	$2,113,671	0.01	0.6	$688	5,481	0.03	2.08	$2,350
5120	Drugs, propriet., & sundries	$9,044,943	$194,538,527	2.9%	$5,641,617	0.00	0.2	$1,236	2,055	0.02	0.57	$4,400
5130	Apparel and notions	$8,713,403	$125,178,134	2.1%	$2,628,741	0.01	0.3	$400	5,359	0.03	1.35	$1,626
5140	Groceries & related products	$72,832,496	$587,575,642	1.4%	$8,226,059	0.01	0.9	$1,682	15,954	0.03	2.40	$4,565
5150	Farm-prod. raw materials	$2,248,346	$141,454,588	1.7%	$2,404,728	0.00	0.1	$211	2,702	0.01	0.37	$832
5160	Chemicals & allied prods	$7,357,284	$170,707,220	3.2%	$5,462,631	0.00	0.1	$485	4,682	0.01	0.44	$1,571
5170	Petrol. & petrol. prods	$7,383,326	$315,300,716	1.2%	$3,783,609	0.00	0.2	$560	4,605	0.01	0.56	$1,603
5180	Beer, wine, & dist. bev.	$16,774,482	$70,906,318	2.3%	$1,630,845	0.02	1.0	$3,318	2,313	0.05	2.25	$7,253

Table VIII-4 Estimated Economic Impact of the Proposed Ergonomics Standard on All Industries and all Affected Establishments

SIC	Industry	Annualized Compliance Costs for all Establishments	Revenues for all Establishments ($1,000s)	Profits as a Percentage of Revenues	Profits ($1,000s)	For All Establishments: Annualized Compliance Costs as a Percentage of Revenues	For All Establishments: Annualized Compliance Costs as a Percentage of Profits	For All Establishments: Compliance Cost per Establishment	For Affected Establishments (Those with MSDs): Total Number of Affected Establishments over 10 years	For Affected Establishments (Those with MSDs): Annualized Costs as a Percent of Revenues	For Affected Establishments (Those with MSDs): Annualized Costs as a Percent of Profits	For Affected Establishments (Those with MSDs): Annualized Cost per Affected Establishment
5190	Misc. nondurable goods	$30,921,394	$218,636,094	1.9%	$4,154,086	0.01	0.7	$569	22,236	0.03	1.82	$1,391
5210	Lumber & other blding mat.	$54,026,123	$94,882,400	1.9%	$1,802,766	0.06	3.0	$2,226	16,009	0.09	4.54	$3,375
5230	Paint, glass, wallpaper strs	$4,146,859	$7,137,672	0.9%	$64,239	0.06	6.5	$424	5,611	0.10	11.25	$739
5250	Hardware stores	$7,442,710	$11,768,982	2.3%	$270,687	0.06	2.7	$521	7,771	0.12	5.05	$958
5260	Retail nurseries and gardens	$7,135,904	$8,246,165	2.2%	$181,416	0.09	3.9	$634	5,839	0.17	7.58	$1,222
5270	Mobile home dealers	$4,373,670	$12,128,180	2.9%	$351,717	0.04	1.2	$915	2,953	0.06	2.01	$1,481
5310	Department stores	$148,962,880	$212,202,049	2.6%	$5,517,253	0.07	2.7	$13,762	9,514	0.08	3.07	$15,657
5330	Variety stores	$8,004,993	$7,801,344	2.7%	$210,636	0.10	3.8	$738	7,517	0.15	5.48	$1,065
5390	Misc. gen. merchandise strs.	$15,157,380	$73,078,703	1.6%	$1,169,259	0.02	1.3	$1,024	6,319	0.05	3.04	$2,399
5410	Grocery stores	$194,675,511	$413,038,161	1.2%	$4,956,458	0.05	3.9	$1,507	45,877	0.13	11.06	$4,243
5420	Meat and fish markets	$2,545,677	$5,620,494	1.3%	$73,066	0.05	3.5	$324	2,272	0.16	12.07	$1,121
5430	Fruit & vegetable markets	$616,344	$2,467,380	1.3%	$32,076	0.02	1.9	$184	638	0.13	10.07	$966
5440	Candy, nut, & confctnry strs	$731,363	$1,508,092	1.3%	$19,605	0.05	3.7	$154	1,097	0.21	16.12	$667
5450	Dairy products stores	$316,946	$746,400	1.3%	$9,703	0.04	3.3	$124	488	0.22	17.08	$650
5460	Retail bakeries	$4,816,282	$5,837,642	3.0%	$175,129	0.08	2.8	$239	5,704	0.29	9.72	$844
5490	Misc. food stores	$1,423,316	$4,903,987	1.8%	$88,272	0.03	1.6	$144	2,708	0.11	5.90	$526
5510	New and used car dealers	$88,386,866	$473,713,203	1.1%	$5,210,845	0.02	1.7	$3,587	18,989	0.02	2.20	$4,655
5520	Used car dealers	$1,126,468	$26,046,018	2.5%	$651,150	0.00	0.2	$51	1,964	0.05	1.93	$574
5530	Auto & home supply stores	$27,461,415	$41,415,750	1.9%	$786,899	0.07	3.5	$627	24,438	0.12	6.26	$1,124
5540	Gas service stations	$26,373,601	$154,592,503	1.6%	$2,473,480	0.02	1.1	$274	39,526	0.04	2.60	$667
5550	Boat dealers	$2,716,592	$7,697,095	2.2%	$169,336	0.04	1.6	$536	2,493	0.07	3.26	$1,090
5560	Rec. vehicle dealers	$2,967,010	$9,355,689	1.7%	$159,047	0.03	1.9	$991	1,757	0.05	3.18	$1,689
5570	Motorcycle dealers	$309,316	$6,487,093	3.1%	$201,100	0.00	0.2	$82	468	0.04	1.24	$660
5590	Auto dealers, n.e.c.	$84,647	$1,290,175	2.6%	$33,545	0.01	0.3	$69	126	0.06	2.47	$672
5610	Men's & boys' clothing strs	$1,701,374	$9,985,692	0.1%	$9,986	0.02	17.0	$123	3,814	0.06	61.85	$446
5620	Women's clothing stores	$4,220,782	$29,323,315	4.0%	$1,172,933	0.01	0.4	$104	8,885	0.07	1.64	$475
5630	Wm's access & specialty strs	$640,405	$4,417,649	4.5%	$198,794	0.01	0.3	$74	1,531	0.08	1.82	$418
5640	Chldrn's & infants' wear strs	$980,049	$4,249,583	1.2%	$50,995	0.02	1.9	$189	1,402	0.09	7.11	$699
5650	Family clothing stores	$15,371,732	$40,135,206	1.3%	$521,758	0.04	2.9	$785	10,597	0.07	5.44	$1,451
5660	Shoe stores	$3,895,272	$18,686,566	2.6%	$485,851	0.02	0.8	$123	8,210	0.08	3.10	$474
5690	Misc. apparel stores	$527,866	$4,848,422	1.2%	$58,181	0.01	0.9	$52	1,273	0.09	7.24	$415
5710	Furnitre & homefurnishng strs	$38,208,458	$63,978,206	2.3%	$1,471,499	0.06	2.6	$579	34,538	0.11	4.96	$1,106
5720	Household appliance strs	$5,604,314	$10,491,658	2.3%	$241,308	0.05	2.3	$558	4,546	0.12	5.13	$1,233
5730	Radio, TV, & comptr strs	$13,710,842	$59,843,357	2.3%	$1,376,397	0.02	1.0	$351	11,044	0.08	3.52	$1,241
5810	Eating & drinking places	$147,866,742	$253,760,234	3.0%	$7,612,807	0.06	1.9	$317	166,985	0.16	5.42	$886
5910	Drug stores	$17,740,179	$91,701,331	2.5%	$2,292,533	0.02	0.8	$410	19,584	0.04	1.71	$906
5920	Liquor stores	$997,207	$21,457,553	1.4%	$300,406	0.00	0.3	$35	3,267	0.04	2.93	$305
5930	Used merchandise stores	$4,758,441	$7,863,561	4.6%	$361,724	0.06	1.3	$202	7,083	0.20	4.37	$672
5940	Misc. shopping goods strs.	$29,014,390	$86,940,718	2.2%	$1,912,696	0.03	1.5	$225	41,973	0.10	4.67	$691
5960	Nonstore retailers	$33,430,917	$71,726,499	2.0%	$1,434,530	0.05	2.3	$1,116	11,107	0.13	6.28	$3,010
5980	Fuel dealers	$6,219,621	$17,012,865	0.8%	$136,103	0.04	4.6	$550	5,417	0.08	9.55	$1,148
5990	Retail stores, n.e.c.	$13,706,820	$39,343,051	2.6%	$1,022,919	0.03	1.3	$144	17,648	0.19	7.23	$777
6010	Central res. depository	$740,611	$34,398,950	12.7%	$4,368,667	0.00	0.0	$7,261	51	0.00	0.03	$14,419
6020	Commercial banks	$17,673,306	$362,240,850	12.7%	$46,004,588	0.00	0.0	$262	15,433	0.02	0.17	$1,145
6030	Savings institutions	$2,515,343	$86,099,788	12.7%	$10,934,673	0.00	0.0	$156	3,147	0.01	0.12	$799
6060	Credit unions	$2,339,002	$28,386,945	12.7%	$3,605,142	0.01	0.1	$157	3,281	0.04	0.30	$713
6080	Foreign banking	$486,815	$85,523,610	12.7%	$10,861,498	0.00	0.0	$742	234	0.00	0.01	$2,078
6090	Banking-related functions	$1,345,305	$17,268,075	12.7%	$2,193,046	0.01	0.1	$231	928	0.05	0.38	$1,449
6110	Federal credit agencies	$111,216	$27,976,840	14.6%	$4,084,619	0.00	0.0	$83	97	0.01	0.04	$1,150
6140	Personal cred. institutions	$692,011	$69,321,834	18.1%	$12,547,252	0.00	0.0	$36	839	0.02	0.12	$824

Table VIII-4 Estimated Economic Impact of the Proposed Ergonomics Standard on All Industries and all Affected Establishments

						For All Establishments			For Affected Establishments (Those with MSDs)			
SIC	Industry	Annualized Compliance Costs for all Establishments	Revenues for all Establishments ($1,000s)	Profits as a Percentage of Revenues	Profits ($1,000s)	Annualized Compliance Costs as a Percentage of Revenues	Annualized Compliance Costs as a Percentage of Profits	Compliance Cost per Establishment	Total Number of Affected Establishments over 10 years	Annualized Costs as a Percent of Revenues	Annualized Costs as a Percent of Profits	Annualized Cost per Affected Establishment
6150	Business cred. institutions	$1,408,915	$54,425,294	15.5%	$8,435,921	0.00	0.0	$263	747	0.02	0.12	$1,886
6160	Mortgage bankers & brokers	$2,238,332	$28,664,554	9.6%	$2,751,797	0.01	0.1	$102	2,576	0.07	0.69	$869
6210	Security brokers & dealers	$2,916,269	$136,415,141	10.5%	$14,323,590	0.00	0.0	$114	2,497	0.02	0.21	$1,168
6220	Commodity contracts brokers	$94,882	$2,902,031	11.7%	$339,538	0.00	0.0	$58	103	0.05	0.44	$921
6230	Security & commod. exchanges	$138,705	$1,424,656	11.7%	$166,685	0.01	0.1	$1,186	24	0.05	0.40	$5,715
6280	Security & commod. services	$823,324	$30,330,543	14.1%	$4,276,607	0.00	0.0	$45	572	0.09	0.61	$1,439
6310	Life insurance	$6,192,032	$402,471,102	12.7%	$51,113,830	0.00	0.0	$527	1,775	0.01	0.08	$3,488
6320	Medical & health insur.	$8,923,407	$225,866,321	12.7%	$28,685,023	0.00	0.0	$2,674	705	0.02	0.15	$12,653
6330	Fire, marine, & caslty ins.	$10,894,478	$304,968,860	12.7%	$38,731,045	0.00	0.0	$535	2,315	0.03	0.25	$4,706
6350	Surety insurance	$148,627	$5,184,734	12.7%	$658,461	0.00	0.0	$257	64	0.03	0.21	$2,337
6360	Title insurance	$796,133	$5,360,463	12.7%	$680,779	0.01	0.1	$313	472	0.08	0.63	$1,685
6370	Pension and health funds	$353,503	$1,884,439	12.7%	$239,324	0.02	0.1	$129	275	0.19	1.48	$1,286
6390	Ins. carriers, n.e.c.	$65,136	$810,377	12.7%	$102,918	0.01	0.1	$223	58	0.04	0.32	$1,128
6410	Insurance agents	$6,903,799	$67,001,357	6.8%	$4,556,092	0.01	0.2	$54	10,770	0.12	1.79	$641
6510	Real estate operators	$24,808,003	$89,035,697	15.4%	$13,711,497	0.03	0.2	$247	25,646	0.11	0.71	$967
6530	RE agents and managers	$21,148,635	$72,786,929	12.1%	$8,807,218	0.03	0.2	$170	19,365	0.19	1.54	$1,092
6540	Title abstract offices	$829,752	$2,702,283	12.1%	$326,976	0.03	0.3	$160	1,425	0.11	0.93	$582
6550	Subdividers & developrs	$7,410,254	$17,073,624	9.1%	$1,553,700	0.04	0.5	$399	4,091	0.20	2.16	$1,811
6710	Holding offices	$3,520,964	$49,468,775	17.5%	$8,657,036	0.01	0.0	$368	1,401	0.05	0.28	$2,514
6720	Investment offices	$498,481	$12,829,710	17.5%	$2,245,199	0.00	0.0	$542	73	0.05	0.28	$6,833
6730	Trusts	$1,011,429	$12,102,680	17.5%	$2,117,969	0.01	0.0	$114	987	0.07	0.43	$1,025
6790	Miscellaneous investing	$932,823	$23,366,830	17.5%	$4,089,195	0.00	0.0	$111	869	0.04	0.22	$1,074
7010	Hotels and motels	$74,655,845	$85,827,743	7.0%	$6,007,942	0.09	1.2	$1,650	17,848	0.22	3.15	$4,183
7020	Rooming & boarding houses	$497,181	$427,076	7.0%	$29,895	0.12	1.7	$306	542	0.21	4.99	$918
7030	Camps and rec. vehicle parks	$247,237	$2,820,658	7.0%	$197,446	0.01	0.1	$33	454	0.14	2.05	$545
7040	Membership-basis org. hotels	$86,868	$762,685	7.0%	$53,388	0.01	0.2	$36	182	0.15	2.16	$478
7210	Laundry & garment srvices	$22,907,639	$19,968,307	3.8%	$758,796	0.11	3.0	$404	22,113	0.29	7.74	$1,036
7220	Photo studios, portrait	$1,777,258	$4,360,841	3.9%	$170,073	0.04	1.0	$135	2,301	0.23	5.98	$772
7230	Beauty shops	$3,390,716	$11,597,696	4.6%	$533,494	0.03	0.6	$41	8,870	0.27	5.87	$382
7240	Barber shops	$517,584	$488,787	4.6%	$22,484	0.11	2.3	$115	1,072	0.44	9.66	$483
7250	Shoe repair	$251,854	$280,028	4.6%	$12,881	0.09	2.0	$114	450	0.44	9.63	$560
7260	Fun. service and crematories	$2,220,161	$8,817,707	7.9%	$696,599	0.03	0.3	$141	3,747	0.11	1.34	$593
7290	Misc personal services.	$1,491,429	$6,849,595	4.6%	$315,081	0.02	0.5	$49	1,285	0.52	11.31	$1,161
7310	Advertising	$8,209,870	$28,132,776	3.8%	$1,069,045	0.03	0.8	$418	3,504	0.16	4.31	$2,343
7320	Credit report.& collection	$1,488,503	$8,373,157	7.0%	$586,121	0.02	0.3	$215	1,208	0.10	1.45	$1,233
7330	Mailing, reprod, steno., serv	$8,828,457	$26,231,013	4.6%	$1,206,627	0.03	0.7	$252	5,754	0.21	4.46	$1,534
7340	Services to buildings	$18,848,115	$24,230,046	3.7%	$896,512	0.08	2.1	$287	12,793	0.40	10.77	$1,473
7350	Misc. equipt. rental	$9,684,148	$30,369,885	9.2%	$2,794,029	0.03	0.3	$390	6,024	0.13	1.43	$1,608
7360	Pers. supply services	$75,674,139	$71,832,848	3.0%	$2,154,985	0.11	3.5	$2,025	9,268	0.42	14.16	$8,165
7370	Comptr & data proc. services	$16,883,961	$181,997,360	5.2%	$9,463,863	0.01	0.2	$190	8,304	0.10	1.91	$2,033
7380	Misc. business services	$27,644,927	$71,061,254	3.4%	$2,416,083	0.04	1.1	$323	16,228	0.21	6.04	$1,704
7510	Auto rentals, no drivers	$7,119,360	$28,628,943	5.7%	$1,631,850	0.02	0.4	$669	3,441	0.08	1.35	$2,069
7520	Automobile parking	$1,856,234	$4,810,800	4.8%	$230,918	0.04	0.8	$209	1,854	0.19	3.86	$1,001
7530	Automotive repair shops	$26,329,376	$52,456,660	3.9%	$2,045,810	0.05	1.3	$189	38,478	0.18	4.66	$684
7540	Automotive serv., exc repair	$10,457,562	$9,160,104	6.5%	$595,407	0.11	1.8	$388	10,766	0.29	4.40	$971
7620	Electrical repair shops	$8,521,815	$12,355,727	2.6%	$321,249	0.07	2.7	$441	6,191	0.22	8.28	$1,376
7630	Watch and jewelry repair	$274,794	$374,160	3.4%	$12,721	0.07	2.2	$152	444	0.30	8.77	$618
7640	Reupholstery & furn. repair	$507,897	$1,276,653	3.4%	$43,406	0.04	1.2	$74	1,422	0.19	5.63	$357
7690	Misc. repair shops	$16,765,426	$24,393,605	5.9%	$1,439,223	0.07	1.2	$430	12,871	0.21	3.53	$1,303
7810	Motion picture production	$17,792,216	$28,310,206	5.4%	$1,528,751	0.06	1.2	$1,212	2,546	0.36	6.71	$6,988