

Injuries and Accident Causes in the Manufacture of PAPERBOARD CONTAINERS

**A Detailed Analysis of
Hazards and of Injury Rates
for 1950 by Region, Plant Size,
and Operating Departments**

Bulletin No. 1139

**UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin, *Secretary***

**BUREAU OF LABOR STATISTICS
Ewan Clague, *Commissioner***



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LETTER OF TRANSMITTAL

United States Department of Labor,
Bureau of Labor Statistics,
Washington, D. C., April 1, 1953.

The Secretary of Labor:

I have the honor to transmit herewith a report on the occurrence and causes of work injuries in the manufacture of paperboard containers.

This report, a portion of which appeared in the December 1951 Monthly Labor Review, constitutes a part of the Bureau's regular program of compiling work-injury information for use in accident-prevention work. The statistical analysis and the preparation of the report were performed in the Bureau's Branch of Industrial Hazards by George R. McCormack. The specific accident-prevention suggestions were prepared by Sheldon W. Homan of the Safety Standards Division of the Bureau of Labor Standards.

EWAN CLAGUE, Commissioner.

HON. MARTIN P. DURKIN,
Secretary of Labor.

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ABSTRACT

The injury—frequency rate for plants manufacturing paperboard containers has been consistently unfavorable compared to the all-manufacturing industry average. In 1951, the injury-frequency rate for the paperboard-container industry was 18.1, about 17 percent greater than the all-manufacturing average, 15.5. However, this represents a reduction of more than 22 percent from the peak 1944 rate, 23.3, which was 21 percent higher than the all-manufacturing rate, 18.4.

Approximately 5,000 workmen were disabled as a result of industrial injuries during 1951. The economic loss, including direct and indirect costs, of these injuries is estimated at nearly 10 million dollars.

Plants manufacturing corrugated or fiber boxes generally had the highest injury-frequency rates, averaging 23.0 for 1950. Setup-box plants had the best rates, averaging 12.9. Folded-box plants had an average frequency rate of 16.7 and fiber-can,-tube, and-drum plants had a rate of 16.5.

Plant-size appears to be closely related to the occurrence of injuries in the paperboard-container industry. Generally, the very small plants (with fewer than 50 employees each) and the large plants (with 500 or more employees) had the lowest injury-frequency rates. Plants employing 100 to 249 workers had the highest average injury-frequency rate.

Production operations as a group had a somewhat higher injury-frequency rate than the service-department group, but the injuries experienced by service workers tended to be more severe. Among the production departments, injuries were most frequent in the corrugating, printing, and cutting operations. Storage operations ranked as the most hazardous of the plant-service activities.

About a fourth of all injuries resulted from contact with machines; paper and its products produced 18 percent; vehicles, 11 percent; working surfaces, 9 percent; and skids, 6 percent.

More than 80 percent of all recorded accidents fell into four general categories. These were accidents in which workmen were caught in, on, or between moving objects; were struck by moving objects; struck against or bumped into objects; or strained themselves while handling materials or equipment.

Hazardous working procedures, particularly lifting or moving heavy loads without adequate assistance, was the most common physical cause of accidents. Other hazardous working conditions included: inadequate guarding; defects of agencies, especially slippery and uneven floors; improperly placed objects; and poor housekeeping.

Outstanding among the unsafe acts which resulted in accidents were: Using equipment unsafely or hands instead of equipment; assuming unsafe positions or postures; inattention to surroundings; and unsafe loading, placing, mixing, or combining:

Accident prevention suggestions, prepared by the Division of Safety Standards of the Bureau of Labor Standards, indicate that most accidents in the industry could be prevented through the application of very simple precautions.

INJURIES AND ACCIDENT CAUSES IN THE MANUFACTURE OF PAPERBOARD CONTAINERS

The paperboard-container industry, as defined for this study, includes all plants engaged in the manufacture of paperboard boxes, fiber cans, tubes, drums, and similar paperboard products. Actually, more than nine-tenths of the plants manufacture paperboard boxes.

Paperboard boxes are classified as corrugated, fiber, setup, and folded. Corrugated and fiber boxes, used almost exclusively for packing and shipping, are made from fiber or corrugated stock. Some of this stock is purchased, but generally is fabricated in the box plants from paperboard purchased from paper mills. Folded and setup boxes, on the other hand, are used primarily for packaging and are manufactured directly from paperboard stock.

Only a few of the larger container plants manufacture their own paperboard.¹ Most plants purchase the raw stock and perform only the fabricating and printing operations. In general, each paperboard-box plant performs some or all of the following operations: corrugating, printing, creasing, cutting, stripping, staying, gluing, and wrapping.

THE INDUSTRY RECORD

The injury-frequency rate for paperboard-container manufacturing turned upward in 1950 following a 3-year decline.² The 1951 rate, 18.1, however, was only slightly higher than the 1950 average, 17.9.³ Compared with the all-manufacturing industry average, the record of the paperboard-container industry has been consistently unfavorable.

¹ For a discussion of the hazards in the manufacture of paperboard, see Bureau of Labor Statistics Bulletin No. 1036, Injuries and Accident Causes in the Manufacture of Pulp and Paper.

² For definition, see section on Scope and Method of Survey.

³ Bureau of Labor Statistics Bulletin No. 1137, Work Injuries in the United States During 1951.

In 1938, prior to wartime influences, the injury-frequency rates for the paperboard-container industry and for all manufacturing were practically identical, 15.2 and 15.1 respectively. During the next few years, a variety of circumstances--chiefly shortages of trained workers, new equipment, and repair parts, and pressure for increased production to meet wartime needs--caused a rise in the injury rates for most manufacturing industries. By 1941 the injury rate for the paperboard-container industry had advanced nearly 50 percent to 22.4, and in 1944 it reached a peak of 23.3. It held closely to this level through 1946 and then declined steadily to 16.9 in 1949, from which it turned upward again in 1950.

The average injury rate for all manufacturing followed a similar course during these years, but at its peak in 1943 (20.0), it was only about 32 percent higher than in 1938 in contrast to the 53 percent rise in the paperboard-container rate recorded in 1944. In the postwar recovery period the all-manufacturing rate dropped to 14.5 in 1949, about 4 percent below the 1938 average. At this point the paperboard-container industry rate was 17 percent higher than the all-manufacturing average. In 1950 the all-manufacturing rate also turned upward, but its rise was much less pronounced than the paperboard-container increase. In contrast, however, the increase in the all-manufacturing rate during 1951 (14.7 to 15.5) was much greater than the increase in the rate for the paperboard-container industry.

AN ESTIMATE OF INJURY LOSSES AND COSTS, 1951

Approximately 5,000 workers in the paperboard-container industry experienced disabling injuries during 1951. This represents 1 disabling injury for every 27 employees in the industry.

An estimated 5 of these injured workers died as a result of their injuries and 265 others were permanently disabled in some

degree by the loss, or loss of use, of some body part or function. The other 4,730 workers were more fortunate in that they suffered no permanent ill effects, but each was injured seriously enough to require at least one full day for recovery.

The actual time lost by the industry's injured workers during 1951 is estimated at about 75,000 man-days of work. Based on the average earnings of production workers in the industry during the year, (\$60.65 per week),⁴ the immediate wage loss would approximate \$650,000. Time lost within the year, however, does not measure adequately the real work loss resulting from these injuries. Many of the permanently disabled workers will have their earning ability reduced for the rest of their lives. For the fatally injured workers, the loss is equivalent to their total expected earnings throughout the years in which they would have worked had their careers not been cut short. If allowance were made for future losses resulting from injuries experienced in 1951, the economic time loss would be about 320,000 man-days. The total wage loss attributable to these injuries, based on 1951 wage levels, therefore, would be about \$2,750,000. In part, this loss is covered by workmen's compensation payments financed by the employers. But because these payments are never equivalent to full wages, the injured workers and their dependents must bear a considerable portion of this loss.

In addition to wage losses, payments for medical and hospital care as well as many indirect costs contribute to the total cost of injury-producing accidents. Among the latter are damage to equipment and materials; the cost of training replacement workers; time lost by other workers who stopped to offer assistance at the time of accident; and supervisory time spent caring for the injured, investigating the accident, and reorganizing operations after the accident. Unfortunately, the indirect costs are seldom recorded, and as a result, cannot be determined accurately. However, a study by Mr. H. W. Heinrich, Travelers Insurance Company, indicates that for manufacturing generally the indirect costs arising from injury-producing accidents average about four times the combined amounts of compensation, hospital, and medical

payments.⁵ Assuming this ratio to be approximately correct for the paperboard-container industry, the estimated indirect cost of injury-producing accidents in 1951 amounted to \$6,500,000, and the total cost, including medical expenses, amounted to nearly \$10,000,000.

SCOPE AND METHOD OF SURVEY

The United States Bureau of Labor Statistics has compiled annual injury rates in the paperboard-container industry since 1936. In recent years these surveys have included about 40 percent of the industry's employees.

For the 1950 survey, the scope of the report was enlarged and cooperating employers were asked information on each type of operation carried on in the plant. This data permitted more specific and detailed analysis. Usable reports were received from 851 plants with approximately 73,000 workers, or nearly 60 percent of the employment in the industry. The reporting group included 424 setup-box plants, 189 folded-box plants, 172 corrugated- and fiber-box plants, and 35 fiber-can, -tube, and -drum plants. Reports from the other 31 plants failed to indicate the particular type of container manufactured.

In addition to the summary reports, the original accident records of 185 cooperating plants were made available for detailed inspection and analysis. A representative of the Bureau visited each of these plants and transcribed from their records the following items, where available: (a) place of accident; (b) occupation and age of injured worker; (c) nature of injury and part of body injured; (d) object or substance producing the injury; (e) type of accident; (f) unsafe condition and/or unsafe act leading to the accident.

This group of plants, employing about 34,000 workers, had a combined injury-frequency rate of 22.3. Although this rate was somewhat higher than the industry average, there was no indication that their hazards differed greatly from those of other plants in the industry. Much of the variation is due to the exclusion of plants with zero frequency rates--i.e., plants which had no injuries for analysis--from this part of the study. Individual case records were collected in this part of the survey for 1,505

⁴ Monthly Labor Review, November 1952.

⁵ Industrial Accident Prevention, by H. W. Heinrich, New York, McGraw-Hill Book Co., Third Edition, 1950.

disabling injuries. These included 2 fatalities, 80 permanent-partial disabilities, and 1,423 temporary-total disabilities.

Injury Rates

The injury-rate comparisons presented in this report are based primarily upon the injury-frequency and severity rates compiled under the definitions and procedures specified in the American Standard Method of Compiling Industrial Injury Rates, as approved by the American Standards Association in 1945. These standard rates have been supplemented by an additional measure of injury severity designated as the average time charge per disabling injury.

The definitions⁶ of these several disability classifications as applied in this survey are as follows:

(1) Fatality.--A death resulting from an industrial injury is classified as an industrial fatality regardless of the time intervening between injury and death.

(2) Permanent-Total Disability.--An injury other than death which permanently and totally incapacitates an employee from following any gainful occupation is classified as permanent-total disability. The loss, or complete loss of use, of any of the following in one accident is considered permanent-total disability:

(a) Both eyes; (b) one eye and one hand, or arm, or leg, or foot; (c) any two of the following not on the same limb: hand, arm, foot, or leg.

(3) Permanent-Partial Disability.--The complete loss in one accident of any member or part of a member of the body, or any permanent impairment of functions of the body or part thereof to any degree less than permanent-total disability is classified as permanent-partial disability, regardless of any pre-existing disability of the injured member or impaired body function. The following injuries are not classified as permanent-partial disabilities, but are classified as temporary-total, temporary-partial disabilities, or medical treatment cases, depending upon the degree of disability during the healing period: (a) hernia, if it can be repaired; (b) loss of fingernails or toenails; (c) loss of teeth; (d) disfigurement; (e) strains or sprains not causing

permanent limitation of motion; (f) fractures healing completely without deformities or displacements.

(4) Temporary-Total Disability.--Any injury not resulting in death or permanent impairment is classified as a temporary-total disability if the injured person, because of his injury, is unable to perform a regularly established job, open and available to him, during the entire time interval corresponding to the hours of his regular shift on any one or more days (including Sundays, days off, or plant shutdowns) subsequent to the date of injury.

Injury-Frequency Rate.--The injury-frequency rate represents the average number of disabling work injuries occurring in each million employee-hours worked. It is computed according to the following formula: Frequency rate equals

$$\frac{\text{Number of disabling injuries} \times 1,000,000}{\text{Number of employee-hours worked}}$$

Average Time Charge per Injury.--The relative severity of a temporary injury is measured by the number of calendar days during which the injured person is unable to work at any regularly established job open and available to him, excluding the day of injury and the day on which he returns to work. The relative severity of death and permanent impairment cases is determined by reference to a table of economic time charges included in the American Standard Method of Compiling Industrial Injury Rates. These time charges, based upon an average working-life expectancy of 20 years for the entire working population, represent the average percentage of working ability lost as the result of specified impairments, expressed in unproductive days. The average time charge per disabling injury is computed by adding the days lost for each temporary injury and the days charged according to the standard table for each death and permanent impairment and dividing the total by the number of disabling injuries.

Injury-Severity Rate.--The injury-severity rate weights each disabling injury with its corresponding time loss or time charge and expresses the aggregate in terms of the average number of days lost or charged per 1,000 employee-hours worked. It is computed according to the following formula:

⁶ See American Standard Method of Compiling Industrial Injury Rates, approved by the American Standards Association, October 11, 1945.

Severity rate equals

$$\frac{\text{Total days lost or charged} \times 1,000}{\text{Number of employee-hours worked}}$$

Accident-Cause Analysis

The accident-cause analysis procedure used in this study differs in some respects from the procedures specified in the American Standard Method of Compiling Industrial Accident Causes. The deviations from the Standard include the introduction of an additional analysis factor, termed the "agency of injury" and the modification of the standard definitions of some of the other factors. These changes permit more accurate cross classifications.

Agency of Injury.--The standard classification provides for the selection of but one "agency" in the analysis of each accident. By definition, this agency may be either (a) the object or substance which was unsafe and thereby contributed to the occurrence of the accident, or (b) in the absence of such an object or substance, the object or substance most closely related to the injury. Under this definition, therefore, a tabulation of "agencies" for a group of accidents includes objects or substances which may have been inherently safe and unrelated to the occurrence of the accidents, as well as those which led to the occurrence of accidents because of their condition, location, structure, or method of use. The development of the classification "agency of injury" represents an attempt to separate and classify separately these two agency concepts.

As used in this study, the "agency of injury" is the object, substance, or bodily reaction which actually produced the injury, selected without regard to its safety characteristics or its influence upon the chain of events constituting the accident.

Accident Type.--As used in this study, the accident-type classification assigned to each accident is purely descriptive of the occurrence resulting in an injury and is related specifically to the agency of injury. It indicates how the injured person came into contact with or was affected by the previously selected agency of injury, as for example, fall from one level to another. The definition represents a change from the standard procedure in two respects: First,

the accident-type classification is specifically related to the previously selected agency of injury; second, the sequence of selecting this factor is specified.

Hazardous Working Condition.--Under the standard definition, the hazardous working condition indicated in the analysis is defined as the "unsafe mechanical or physical condition of the selected agency which could have been guarded or corrected." An example of such a hazard is the lack of a guard for a press. This implies the prior selection of the "agency" but does not provide for recognition of any relationship between the hazardous condition and accident type classifications. Nor does the standard provide for any definite relationship between the "agency" and the "accident-type" classifications.

To provide continuity and to establish direct relationships among the various analysis factors to permit cross classification, the standard definition was modified for this study to read: "The hazardous working condition is the hazardous condition which permitted or occasioned the occurrence of the selected accident type." The hazardous-condition classification, therefore, was selected after the determination of the accident type classification. It represents the physical or mechanical reason for the occurrence of that particular accident without regard to the feasibility of guarding or correcting the condition.

Elimination of the condition "which could have been guarded or corrected" is based upon the premise that statistical analysis should indicate the existence of hazards, but should not attempt to specify the feasibility of corrective measures.

Agency of Accident.--For the purpose of this study, the agency of accident was defined as "the object, substance, or premises in or about which the hazardous condition existed," as, for example, the press which was unguarded. Its selection, therefore, is directly associated with the hazardous condition leading to the occurrence of the accident and not with the occurrence of the injury. In many instances the agency of injury and the agency of accident were identical. The double agency classification, however, avoids any possibility of ambiguity in the interpretation of the "agency" tabulations.

Unsafe Act.--The unsafe act definition used in this survey is identical with the standard definition, i. e., "that violation of a commonly accepted safe procedure which resulted in the selected accident type."

THE INDUSTRY AND ITS HAZARDS

Corrugating

In corrugating operations, three layers of heavy paper are glued together to produce an elastic paperboard for corrugated boxes. The middle layer of the paper is fluted or formed into alternate ridges and grooves, and glued to the two outside layers which are called liners.

Heavy rolls of paper, weighing as much as 2,000 pounds, are delivered to the corrugating machine by crane, lift truck, or dolly. A metal shaft is placed through the core of each roll and secured. The roll is then lifted onto the corrugating machine by hoist or other mechanical device. After the wrappings on the roll have been removed, the paper is threaded through the machine.

During the actual machine operation, the inner or corrugated layer first passes over a steam shower. The moisture and heat thus absorbed by the paper assists in "setting" or imparting rigidity to the corrugations as the paper passes through the next step--the corrugating rolls. On these rolls, which have teeth that mesh together in a gear-like operation, the ridges and grooves are formed in the paper. From the corrugating rolls, the sheet passes over a gluing roll and then to pressure rolls where the liners and the corrugated sheet are pressed together. Before entering the pressure rolls the liners have been preheated to assure good adhesion. From the pressure rolls, the board passes over a heated surface which sets the glue, adds rigidity, and dries the board. It is then trimmed by a slitter--a shaft equipped with a slitting head--and cut in the length desired. The cutter is usually a rotary type--a knife set on the outside of a revolving drum. The manufacture of fiberboard is similar to that of corrugated board, the only difference being that the middle layer is not corrugated.

Although corrugating is primarily a machine operation, many of the hazards of the corrugating department are connected with manual handling. There are many possibilities of strains from overexertion or of crushed feet or toes from dropped objects.

Powered equipment is generally used for moving the heavy rolls of paper but frequently the paper is rolled or moved manually. Shafts must be inserted through the cores of the rolls of paper by hand. These shafts are quite heavy, long, and awkward to handle. Moreover, the corrugated board is generally removed from the machine by hand.

Loading paper onto corrugating machines involves a number of hazards. Workmen's fingers may be crushed between the shafts and rolls of paper during the "shafting" operation or between the shafts and the roll stands while guiding the rolls of paper onto machines. Other serious crushing hazards include unguarded gears and unguarded machine rolls.

Sodium silicate, used as an adhesive, is another possible source of injuries. Spilled on the floor, it is a slipping hazard. Dried, it may chip off the corrugated board during machine operations and strike workmen's eyes, or the dried pieces along the edge of the board may be a cutting hazard.

Unguarded slitter and cutter heads may result in severe cuts, lacerations, or even amputations. Minor lacerations also may result from rubbing the edges of paper. Knives generally are used to remove wrappings from the rolls of paper, and extreme caution must be exercised in that work to prevent knife cuts.

Scraps of paperboard frequently collect around the corrugating machine. The danger of slips and falls, therefore, is quite common. Hazards connected with the operation of hoists and vehicles are also important in the corrugating operations.

Printing

Three types of printing presses are used in boxboard printing operations: cylinder, rotary, and platen. The main features of the cylinder press and the rotary press are a moving table and a revolving cylinder. In the cylinder press, the cylinder carries the boxboard into contact with the printing plate which is locked into the movable table. In the rotary press, the printing plate is locked into the cylinder and the boxboard is carried through the operation on the table. In each machine the table moves back and forth under the revolving cylinder. During the actual printing operation, the two are in contact, synchronized so that they are moving in the same direction at the same

speed. The boxboard may be fed into these two machines mechanically or by hand. In the latter case, the operator merely keeps the feeding table supplied with boxboard.

The platen press is especially adaptable for small printing orders where the press must be started and stopped frequently. In this press, the printing plate is locked in a vertical position. The boxboard is placed, one sheet at a time, on a movable platen which is hinged at the bottom. For the impression, the platen swings upward into contact with the plate. When it returns to its original position, the operator removes the printed boxboard and replaces it with another unprinted board.

Material handling is an important source of hazards encountered in the printing department. Boxboard is generally placed on, and removed from, the printing machine by hand. Buckets of ink must be lifted to fill the ink fountains. Heavy printing plates must be lifted and locked into place and empty skids from which boxboard has been removed are usually transferred by hand from the entry end of the machine to the delivery end. In all these operations, the chance of strains is very great.

Handling operations also result in other types of injuries. Hands or fingers may be lacerated in rubbing against the edges of the paperboard or in coming into contact with sharp particles of silicate on corrugated board. Splintered or rough boards on skids may cause punctured fingers or hands during the handling or moving of that equipment. In addition, the skids are frequently placed upright against the printing machine or some other support until needed. Unless great care is exercised in thus placing the skids, they may fall or topple over, and strike workmen. Then, too, workmen may drop the skids on their feet or toes.

There are many possibilities of falls in printing operations. The operator of the press frequently must work from a raised platform. Workmen often stand on the presses or on other elevated surfaces to adjust or lubricate the equipment. In either of these operations the workmen are exposed to the danger of falls to lower levels. Spilled ink, and spots of oil dropped during the lubrication of equipment, may cause slips or falls.

Paperboard and other supplies are usually delivered to the printing machine by hand truck. Vehicular hazards are, therefore, common in printing work. Other hazards,

noteworthy because of the danger of permanent and serious disability, include unguarded gears, belts, rolls, and other moving parts of printing machines.

Cutting and Creasing

In cutting and creasing operations, the boxboard is trimmed or cut to size and marked (creased) to indicate the folds which are necessary in assembling the boxboard into a box. Two types of cutting and creasing operations predominate in the industry. In many cases, the cutting and creasing edges are mounted on shafts of machines. As the boxboard passes under the rotating shafts, the cutting knives cut the boxboard to the desired size and the creasing edges, which are similar to the cutting knives except that their edges are rounded, make impressions indicating where the boxboard is to be folded. This type of operation is common in the manufacture of corrugated boxes.

An alternative procedure, used chiefly in the manufacture of folded and set-up boxes, makes use of machines similar to printing presses. The creasing and cutting edges are metal strips which are placed in dies similar to the printing plates. The action of the machine is similar to that of the cylinder or rotary printing press.

Several other specialized types of cutting are performed in the industry. Usually, the name of the operation indicates the kind of cut made. For example, corner cutting involves cutting corners from scored blanks so that the boxboard may be folded to form the box. The corner-cutting machine is basically a cutting die, shaped into a 90-degree angle. The operation is similar to that of a punch press--the die moves vertically and cuts the boxboard when the board is placed under it. In some instances, the die is activated by a foot pedal. In others, it moves continuously and the operator must time his movements in placing the boxboard to the motion of the die.

In the slitting operation paperboard is cut into narrow strips, and the procedure is similar to the cutting operation described above. Scoring is similar to the creasing operation, except that the surface of the boxboard is actually cut by a knife edge.

Slotting is the process of cutting slots in pieces of boxboard to form partitions. Specially designed slotting machines are generally used for this purpose but occa-

sionally circular saws are used. Thumbholing, as the name implies, is the operation in which thumbholes are cut into the boxboard.

Many of the hazards in the cutting and creasing departments are similar to those in the printing and corrugating departments. Many hazards are involved in the handling of materials and equipment. Boxboard, rolls of paper, shafts, and dies involve much lifting. The danger of strained muscles from overexertion is great. In addition, the handling of those objects may lead to bruised or fractured toes and feet unless considerable care is exercised in grasping and holding objects securely. Cuts or lacerations may result from contact with the edges of the paperboard; from contact with the metal cutting edges which are inserted in the dies; or from contact with the knives which are frequently used to trim the cork or rubber inserts in the dies. Wood used in the framework of dies and in skids may have rough or splintered edges which can puncture hands or fingers.

Unguarded rolls and other moving parts of machines, such as gears, belts, and pulleys may cause serious disabilities. Inadequately guarded circular saw blades are especially hazardous because of the possibility of finger amputations.

Two other hazards which the cutting and creasing departments have in common with the corrugating departments are the silicate particles which may be thrown from corrugated boxboard during machine operations and the scraps of boxboard lying on the floor which may cause slipping.

Stripping

Generally, the die does not cut entirely through the boxboard blank during the cutting operation. As a result the waste remains attached to the boxboard until it is removed in a separate operation called stripping. Manually operated stripping hammers are generally used in this work. However, a powered hand stripper has been developed and is being used in some plants. Essentially, the powered stripper is a notched disc attached to a flexible, powered shaft. In the stripping operation, the flat boxboard blanks are piled on top of each other to a height of several feet. The waste edgings are removed by striking them with a stripping hammer or by directing the disc of a powered stripper against the edges of the boxboards.

For stripping, the boxboard may be left on skids which are used to transport the boxboard from the cutting and creasing department. In most instances, however, the boxboard is transferred to stripping tables. Lifting heavy bundles of boxboard to and from work tables is, therefore, one of the more common hazards in stripping. Another handling operation involving a substantial hazard is that of moving the empty skids. This may result in strained backs due to overexertion, bruised or fractured toes and feet if the skids are dropped, and punctured hands or fingers, if the skids are rough.

Handtool operations in stripping are potential major producers of injury. The stripping hammer may slip from a workman's hand or may be deflected from the pile of stock against the workman's body unless the hammer is securely held. In addition, the repeated motion in the use of these hammers may produce sprained wrists.

Another hazard common to much work in the industry, but especially important in stripping operations, is that due to discarded boxboard scraps. In spite of frequent cleanups in the stripping department, the general practice of permitting scraps of boxboard to fall to the working floor presents a serious tripping and slipping hazard.

Gluing, Staying, Stitching, and Taping

In the gluing, staying, stitching, and taping operations, the box is formed or folded into shape and fastened. Folded boxes are usually glued. The gluing machine folds the boxboard along the creased lines, glues the board where necessary, and delivers the finished folded box to the shippers or packers.

The assembling operation in setup-box plants is called staying. The boxboard is bent as indicated by the creasing operation and placed under a plunger in a staying machine. When the plunger descends, it presses a piece of moistened, gummed, kraft paper over the corner of the box. Some staying machines are designed to fasten one corner of a box for each operation of the plunger whereas others fasten two or four corners in a single operation. In some cases, the boxboard is folded by hand and placed under the plunger which is operated by a foot pedal whereas in others the machines are fully automatic. The automatic quadruple staying machine is most frequently used.

Corrugated boxes are either stitched

(actually stapled) or taped. In the stitching operation, the operator folds the boxboard by hand and places it under the stapling head of the stitching machine, which is controlled by a foot pedal. Most corrugated boxes, however, are taped. In that operation, the operator folds the boxboard and feeds it to the taping machine where moistened, gummed paper is pressed over the seam. Pressure belts convey the box to the delivery end of the taping machine and assure that the tape has been firmly secured to the box.

Unguarded equipment is the outstanding hazard in these operations. In most instances, the boxboard stock is fed to the machines manually. The operator must be extremely careful, therefore, to keep his hands a safe distance from the point of operation. This hazard is especially important on machines which are operated by foot pedals. In such cases, the operator must coordinate the movements of his hands and feet. Unguarded foot pedals also may be depressed accidentally, activating machines without warning. Open rolls, belts, gears, and pulleys are other injury-producing possibilities. Paperboard, conveyed by rolls or belts, frequently becomes jammed in machines. In that case, it is common practice to remove the paperboard without stopping the machine. This extreme hazardous procedure presents many chances for employees to be caught in the unguarded belts or rolls.

Although not so important as in some other operations, a lifting hazard also exists in this work. Stacks of boxboard must be lifted to, and removed from, many of the machines. Skids also must be shifted when the stock has been removed and glue is generally carried to the gluing machine in buckets.

The possibility of a slip or fall is not uncommon in these operations. Drops of glue, spilled while the glue is being poured, present a slipping hazard near the gluing machine. Boxboard which had been jammed in the machines is frequently thrown on the floor after it has been removed. The discarded boxboard, therefore, becomes a slipping and tripping hazard. In addition, some machines are so designed that operators must work from platforms. As these working surfaces are only slightly above floor level, guard rails are generally considered unnecessary. However, falls from any elevation may be quite serious.

Covering and Wrapping

Setup boxes are usually wrapped or covered to improve their appearance. Most boxes are machine wrapped but either machine- or hand-wrapping methods may be employed. In machine wrapping, the paper which has been slit and cut to size passes through a gluing roll, where one surface is coated with adhesive. It is then conveyed, by belt, to the operator who centers a box or lid on the wrapper. Then, by foot pedal, he releases a plunger which pushes the box between brushes which, in turn, press the wrapper on the box.

On deep boxes, the wrapper is usually applied by hand. The employee merely pulls a strip of wrapping paper over a glue roll and then works it onto the box.

Machine hazards predominate in these operations. Unguarded gears, pulleys, belts, and rolls may catch employees or their clothing, pulling them into the moving parts of machines. Because the operator must place the box and wrapping paper under the plunger by hand, the work is exceptionally hazardous. The operator must coordinate his movements so that the plunger does not descend until his fingers and hands are in the clear. Unguarded foot pedals may be pressed unintentionally and thus cause the plunger to descend prematurely.

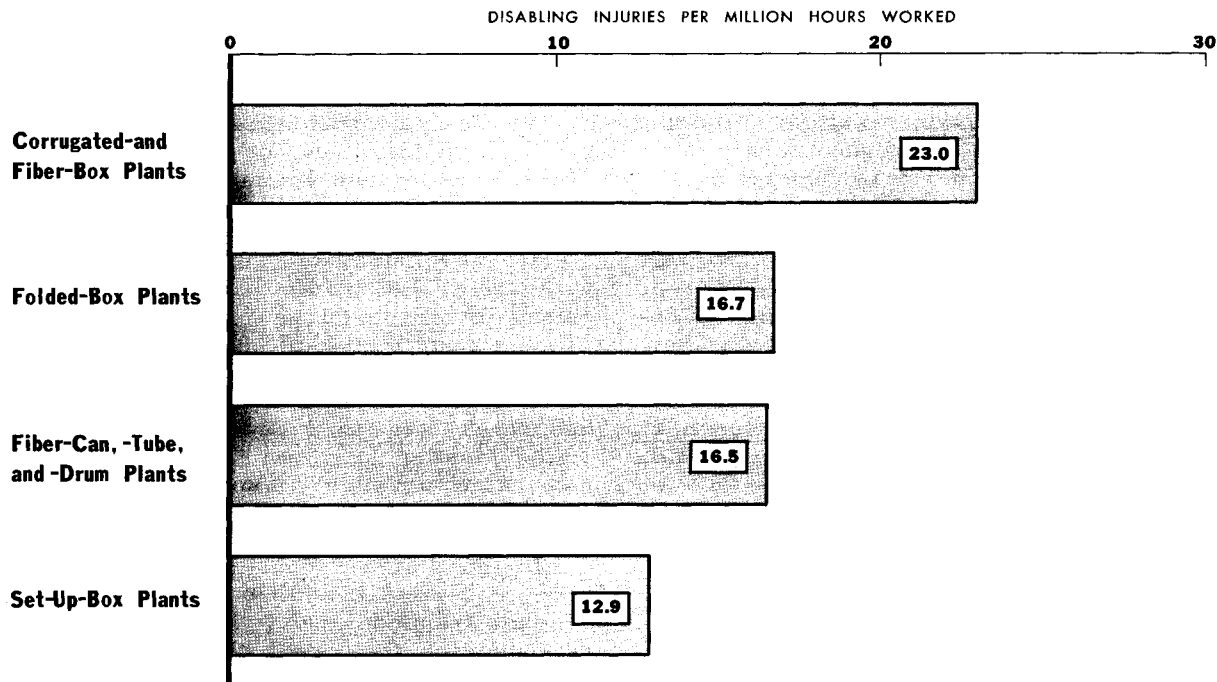
FACTORS IN THE INJURY RECORD

The injury record of any plant or of any group of plants is a composite of a great many factors: the kinds of material processed; the types of processing performed; the safety regulations of the States in which the plants are located, and the extent to which those regulations are enforced; the kind of personnel employed; the size of the plants; and the extent of the safety programs carried on in the plants. In particular instances the influence of these factors may offset each other, but in comparisons based upon large groups of operations their effects frequently can be demonstrated, as in the following breakdowns of the 1950 experience of the paperboard-container industry.

Product Comparisons

Average injury-frequency rates for the four major groups of plants ranged from a high of 23.0 for plants manufacturing cor-

**CHART 1. INJURY-FREQUENCY RATES IN THE PAPERBOARD-CONTAINER INDUSTRY,
By Type of Plant, 1950**



UNITED STATES DEPARTMENT OF LABOR
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rugated or fiber boxes to a low of 12.9 for those manufacturing setup boxes. Between these limits, the folded-box plants had an average frequency rate of 16.7 compared with 16.5 for fiber-can, -tube, and-drum plants. (See appendix, table 1.)

In the corrugated and fiber-box plants, 1 in every 21 full-time workers experienced a disabling injury during 1950. Three deaths were reported by these plants, averaging 1 fatality for each 18 million man-hours worked. The ratio of permanent-impairment cases, however, was relatively low, averaging somewhat less than one in every million man-hours. Temporary-total disabilities occurred in these plants at the rate of 22 per million man-hours, but the average recovery time for these cases (14 days each) was comparatively low. As a reflection of this combination of a low average time loss for temporary-total disabilities and a low incidence of permanent impairments, the average time charge for

all disabling injuries in this group of plants was only 67 days per case. This was lower than the average time charge for any of the other plant groups. The standard severity rate for the corrugated and fiber-box plants, 1.5, was somewhat higher than the rates for the setup and folded-box plants; it was substantially lower than for plants manufacturing fiber cans, tubes, and drums.

The overall frequency rate of 16.7 for plants manufacturing folded boxes represented an average of 1 disabling injury during the year for every 28 workers in that segment of the industry. One fatality occurred in each 21 million man-hours and there was 1 permanent-impairment case for each $1\frac{1}{4}$ million man-hours. Recovery time for the temporary-total disabilities experienced in these plants averaged 14 days per case. The average time charge for all cases was 69 days and the standard severity rate for the group was 1.2.

Plants manufacturing fiber cans, tubes,

and drums, averaged 1 disabling injury for every 29 full-time workers. Their relatively favorable frequency rate, 16.5, however, was offset by a very unfavorable record of injury severity. No fatalities were reported by these plants during 1950, but their record of 5 permanent impairments in each million man-hours worked coupled with an average recovery time of 21 days per case for temporary-total disabilities gave them a severity rate of 4.8 and an average time charge of 289 days per case. The possibility of experiencing a serious injury appeared to be much greater in these plants than in any other part of the industry.

The setup-box plants, with an average frequency rate of 12.9, had the most favorable experience in the industry. Their record showed 1 disabling injury for each 39 full-year workers, only 1 fatality in 40 million man-hours, and only a fraction more than 1 permanent impairment per million man-hours. Their average recovery time for temporary-total disabilities, 17 days, was relatively high. As a result, their average time charge per case was 76 days, but their severity rate of 1.0 was the lowest for any of the 4 groups of plants.

Regional and State Comparisons

Variations in injury rates among the different States and regions may reflect any one or any combination of several factors. State safety regulations and the degree to which they are enforced, the age and maintenance of plants and equipment, and employment factors such as the experience of available workers, all tend to influence the average level of injury rates in any area.

Injury-rate comparisons by region and State may be affected by the type of product predominating in the particular areas.⁷ For example, the highest national average frequency rate was recorded by plants manufacturing corrugated and fiber boxes. Any area in which those particular operations constitute a high proportion of the total production, therefore, would be expected to have a comparatively high overall average regardless of other factors which might influence the rate. Because of these variable internal weighting factors, the significance of comparisons among the States and regions

⁷ State samples were too small to correlate injury-frequency rates by product and size of establishment.

on the basis of industry-wide averages may be questioned. The most realistic area comparisons, therefore, are those based upon specific types of production rather than upon industry totals.

Corrugated and Fiber-Box Plants.--Injury rates for plants manufacturing corrugated and fiber boxes were computed for 15 States. Compared with the national average of 23.0 for this group of plants, 2 States--Massachusetts and Indiana--had very high injury-frequency rates, 41.7 and 41.1 respectively (appendix, table 3). In contrast, 2 States--Florida, with 10.7, and Wisconsin, with 11.4--had rates less than half the national average. Of the remaining 11 States, 1 had a frequency rate of 13.4 (California), 3 others had rates less than 20 (Illinois, 15.4, Texas, 16.7, and Michigan, 18.0), 3 had rates between 20 and 25 (New Jersey, 20.0, Missouri, 21.3, and Ohio, 22.9) and 4 had rates between 25 and 30 (New York, 25.2, Pennsylvania, 27.9, Tennessee, 28.4, and West Virginia, 29.8).

Florida plants had the best State injury-severity record, in addition to having the best average frequency rate. None of the injuries reported for that group of three plants resulted in death or permanent disability. Therefore, the average time lost per disabling injury was only 13 days and the severity rate was extremely low, 0.1. The plants in Michigan also had a record of no death or permanent disability. In the 6 plants reporting from that State, however, temporary-total disabilities were quite severe, requiring an average of 33 days for recuperation. Serious disabilities were infrequent in Massachusetts (1 in 87), Ohio (1 in 129), and Tennessee (1 in 50). As a result, the average time lost per injury in those States was comparatively low--19, 20, and 25 days respectively. Other States with average time charges below the national average were Missouri, 25 days, Texas, 29 days, Wisconsin, 44 days, and California, 55 days.

Unfavorable severity records were reported by Illinois, 151 days lost per injury; West Virginia, 121 days; Indiana, 108 days; and New York, 106 days. These adverse severity records were due chiefly to a high ratio of permanent disabilities. Twelve of the 107 reported injuries in 21 cooperating Illinois plants and 3 of the 31 injuries in 5 West Virginia plants were permanent disabilities. Five Indiana plants reported 1 fatality and 4 permanent disabilities among 116 injuries,

and the 102 injuries in 17 New York plants included 1 fatality and 3 permanent disabilities.

Fiber-Can, -Tube, and -Drum Plants.--Average injury rates for fiber-can,-tube, and-drum plants could be computed for only 3 States. In Ohio, 4 plants achieved a frequency rate of only 8.4--about half the national average, 16.5. In addition, they had favorable injury-severity records. None of the nine reported injuries resulted in serious disability. Consequently, the average time lost per injury was only 15 days and the severity rate was only 0.1.

Favorable averages were also reported by 7 plants in Pennsylvania. For that group of plants the injury-frequency rate was 10.6, the average time lost per injury was 25 days, and the severity rate was 0.3.

In contrast, 6 New Jersey plants reported 26 disabling injuries per million hours worked and many of these were permanent disabilities. The severity record, therefore, was also unfavorable, 724 days charged per injury and 18.8 days charged per thousand hours worked.

Folded-Box Plants.--State averages for plants producing folded boxes were available for 14 States. Compared with the national average of 16.7, the State injury-frequency rates ranged from 9.3 in Illinois to 24.4 in Texas. Six States had averages between 10 and 15 (Wisconsin, 10.3; Missouri, 11.6; Ohio, 12.3; Michigan, 12.6; Indiana 14.1; and California, 14.7); 4 had rates between 15 and 20 (New Jersey, 16.5; Maryland, 18.0; New York, 19.6; and Pennsylvania, 19.8); and 3 had rates between 20 and 25 (Massachusetts, 23.1; Connecticut, 23.9; and Texas 24.4).

The Texas plants balanced their adverse frequency rate by a favorable severity record. None of the reported injuries for the four cooperating plants in that State resulted in death or permanent disability. Coupled with the relatively slight temporary-total disabilities, this held the average time lost to 5 days per disabling injury and 0.1 days per thousand hours worked. Favorable severity averages were also reported by plants in Pennsylvania (14 days lost per injury), Maryland (18 days per injury) and Indiana (24 days per injury).

In contrast, 3 of 20 injuries reported by 7 Missouri plants resulted in permanent disability, giving that State a very high average time loss per injury, 240 days.

Similarly, 14 Connecticut plants reported 2 fatalities and 5 permanent partial disabilities among 91 injuries. As a result, the average time lost per injury was 201 days and the severity rate was 4.8, the highest recorded for any State group of folded-box plants. Two other groups of plants averaged more than 100 days lost time per injury, California, 182 days, and Illinois, 140 days.

Setup-Box Plants.--Averages for setup-box plants were computed for 10 States. State injury-frequency rates ranged from 7.1 in Illinois to 16.9 in California, the average for all setup-box plants being 12.9. In addition to Illinois, one other State had a rate less than 10--Missouri, with 8.5. Five of the 10 States had averages between 10 and 15--New York, 11.7; New Jersey, 11.8; North Carolina, 12.9; Massachusetts, 14.1; and Wisconsin, 14.1. Pennsylvania and Connecticut plants averaged 15.3 disabling injuries per million hours of work.

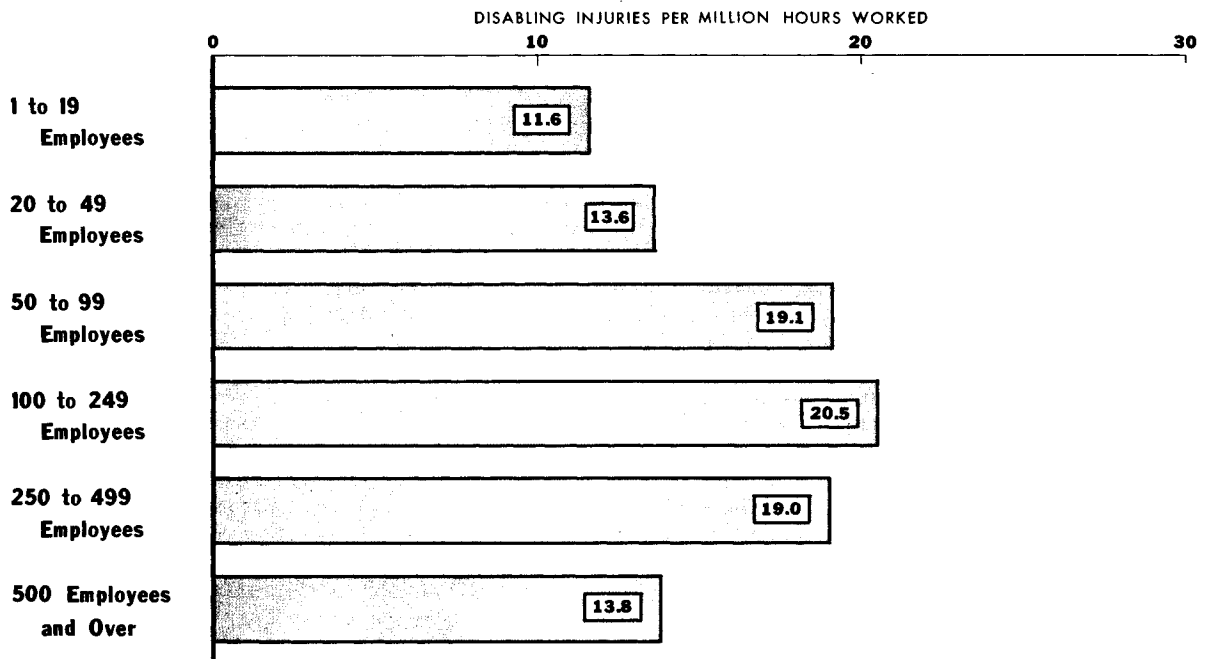
Injury severity, however, followed a somewhat different pattern. The adverse frequency rate in California was offset by a favorable severity record, 33 days lost per injury, the lowest for any State group of setup-box plants. Similarly, the favorable frequency rate of Illinois plants was counterbalanced by an unfavorable severity record, 212 days lost per injury, the highest recorded for any group. However, with the exception of the Illinois plants, all State groups held their averages to less than 75 days lost time per disabling injury.

Plant-Size Comparisons

Plant-size appears to be closely related to the occurrence of injuries in the paper-board-container industry. Generally, the very small plants (with fewer than 50 employees each) and the large plants (with 500 or more employees) had the lowest injury-frequency rates. Plants employing 100 to 249 workers had the highest average injury-frequency rate.

For the group of plants employing fewer than 20 workers apiece, the average frequency rate was 11.6. In each of the next 3 size groups, the average moved progressively higher: 13.6 for plants with 20 to 49 employees; 19.1 for plants with 50 to 99 employees; and 20.5 for those with 100 to 249 employees. The average rate then

**CHART 2. INJURY-FREQUENCY RATES IN THE PAPERBOARD-CONTAINER INDUSTRY,
By Size of Plant, 1950**



UNITED STATES DEPARTMENT OF LABOR
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dropped slightly to 19.0 for plants having 250 to 499 employees apiece. In the final group, made up of plants having 500 or more employees each, the average dropped sharply to 13.8 (appendix, table 1).

This pattern of injury-frequency rate variations in relation to plant size is similar to patterns found in other Bureau industry surveys. The indications are that the owner is frequently the supervisor in small shops. He has personal financial interest in keeping the accident volume at a minimum, and is generally able to keep all operations under close observation. Therefore, he can see unsafe conditions and practices as they develop, and can take immediate action to eliminate hazards before they cause accidents.

The high volume of production in large shops makes it financially possible to give special attention to safety. These plants usually can afford to employ safety engineers to carry on scientific accident-

prevention programs, and can provide all guards and safety equipment known to be available. Large plants also can maintain some form of medical or trained first-aid service on the premises. They have the advantage of professionally engineered plant layout and work processes, and are generally in a position to utilize mechanical equipment more extensively than are the smaller plants. Material-handling operations utilizing mechanical conveyors, hoists, and power trucks can do much to avoid many of the injuries associated with the manual performance of such operations.

The problem of safety in medium-size plants is complicated because the responsible head seldom can devote much time to observing shop operations, and, therefore, must delegate much of the responsibility for safety to others. Unfortunately, these safety responsibilities frequently are assigned to foremen or supervisors with little or no safety training and who frequently

place greater importance on production than on safety.

The group averages, however, tend to conceal the wide differences in the injury-frequency rates of the individual plants within the various size groups. Actually, nearly 44 percent of the plants included in the survey operated throughout the year without a single disabling injury (appendix, tables 2 and 4). Most of these were small plants, but the list included 10 with over 100 workers, 2 of which employed nearly 250 workers apiece. Although no plant with over 250 employees achieved a zero frequency rate, 1 employing 600 workers finished the year with a rate of only 3.7.

At the other extreme, 8 plants with fewer than 100 employees reported rates of more than 100. Another group of 56 plants, all with fewer than 500 employees, reported rates of over 50. Together, these 64 plants employed less than 6 percent of the workers covered in the survey but they accounted for nearly 20 percent of the disabling injuries and 17 percent of the time lost from injuries. No plant with 500 or more employees had a rate exceeding 30.

DEPARTMENTAL INJURY RATES

Nearly all the surveyed plants reported on some of their operations in sufficient detail to permit the inclusion of such data in typical departmental groups. (Many plants were unable to furnish complete breakdowns of their operations according to a standardized pattern because of differences in internal organization.) Thus, separate injury records were compiled for 18 production departments and 5 plant-service departments.

Production Operations

Production operations as a group had a somewhat higher injury-frequency rate, 18.2, than the service-department group, 14.6, but the injuries experienced by service workers tended to be more severe (appendix, table 5).

The greatest concentration of injuries occurred in the corrugating departments. The average frequency rate for these operations was 42.5, representing approximately 1 disabling injury in the course of the year for every 11 full-time workers. A relatively high proportion of these injuries were serious. As a result, the corrugating de-

partments also had the highest average time charge per case (91 days) and the highest severity rate (3.9) among the entire group of production departments.

Only two other production departments had frequency rates above 20--the printing and cutting departments. Each of these operations had a comparatively high proportion of permanent-partial disabilities and ranked relatively high in the injury-severity comparisons.

At the other extreme, two production departments had frequency rates of less than 10--the hand covering, topping, and turning operation, and the labeling operation. The average recovery time for temporary-total disabilities was high in both departments, but the low incidence of permanent impairments gave them relatively low injury-severity rates.

In the middle range 13 production departments had frequency rates ranging from 12.9 for gluing operations to 19.3 for stitching operations. The tying and bundling department, with a frequency rate of 14.1, had the best severity record among all the production departments. In this operation no fatality or permanent impairment occurred, and the recovery time for temporary-total disabilities averaged only 10 days. Among the operations with less favorable records were corner cutting and integrated cutting and creasing.

Service Operations

Storage operations, with 1 disabling injury for every 13 full-time workers, ranked as the most hazardous of the plant-service activities. Along with a high injury-frequency rate of 35.8, these operations had a high injury-severity rate (4.6) and a high average time charge per injury (128 days).

The shipping departments also had a high frequency rate of 30.8. Injuries in these departments, however, tended to be less serious than those occurring in storage operations, giving them a better than average severity ranking.

Maintenance operations ranked third among the service departments in injury frequency and second in respect to injury severity. The frequency rate of 24.8, however, was higher than that of any production department except corrugating.

The administrative and clerical departments had a particularly good record. Their

injury-frequency rate of 1.7 compared favorably with the rates for similar activities in other industries recently surveyed by the Bureau of Labor Statistics. In the clay-construction products industry, for example, the frequency rate for clerical and administrative work in 1948 was 3.0, and in the fertilizer industry the rate for similar work was 2.8 in 1946. In the pulp and paper industry, surveyed in 1948, the clerical and administrative rate was somewhat lower, 1.4.

KINDS OF INJURIES EXPERIENCED

Fatalities

Individual case records of 1,505 injuries were collected for detailed analysis by Bureau representatives. Only 2 of these injuries resulted in death. In one case, a cleaner crawled under a cutting and creasing press to clean the floor. While he was engaged in this work, the operator, not knowing the cleaner was under the machine, started the press. The traveling bed of the press crushed the cleaner, killing him.

In the second fatal accident, a baler operator was killed when the top platen of the baler fell on him.

Permanent-Partial Disabilities

The 80 permanent-partial disabilities included 51 amputations and 29 cuts, fractures, bruises, and strains which resulted in the permanent loss of use of a body part or function. All but one of the amputations involved fingers or thumbs. In that case, a workman lost two minor toes when his foot was caught between an elevator cage and a floor.

Eight workmen lost two or more fingers. In two cases the accidents occurred as workmen were adjusting moving machines. One involved a slitter operator who had four fingers amputated when his hand was caught between a belt and a pulley. The other, a laminating machine operator, lost two fingers. Full details of his accident are not available but the injury resulted when his wrench slipped from a nut. Five workers each lost two fingers while operating machines. Two corner-cutting machines, a band saw, a circular saw with a dado blade, and a partition slotter were involved in those accidents. Maintenance work also accounted for a two-finger case.

In that accident, a machinist was injured when his fingers were caught in the sprocket of a corrugator.

All of the 42 single-thumb and finger amputations involved moving equipment. Seventeen different kinds of machines were included, the most common being printing presses, 8 accidents; cutters and creasers, 5 accidents; staying machines, 5 accidents; corner cutters, 3 accidents; powered saws, 3 accidents; and punch presses, 3 accidents. In 25 of these accidents, the workman had his finger or thumb amputated at the point-of-operation of the machine; in 6 cases, belts or pulleys were responsible; and in 6 cases automatic feeding devices were involved.

The 29 loss-of-use disablements included 17 finger, 4 hand, 2 arm, 2 leg, 2 foot, and 2 back injuries. Fourteen finger injuries, 3 hand injuries, and an arm injury resulted from machine operations. Printing machines accounted for 6 of the 18 injuries. In four cases (two fingers, a hand, and an arm injury) the workmen were caught in the rolls of machines; in the fifth (a finger injury) the employee was caught between a belt and a pulley; and in the sixth case a projecting set screw on the motor shaft caught a ring on a workman's finger. Circular saws lacerated the fingers of three workmen and the cutting dies or knives of a slitter, a corner cutter, and a die press accounted for two more finger injuries and a hand injury. Belts on a box-covering machine, a folding and gluing machine, and a corrugator were responsible for a hand and two finger injuries. Two more finger injuries were ascribed to the wooden plunger of a quad machine and the block of a wrapping machine. The other finger injury in this group occurred when a workman was caught between the stripper arm and the frame of a machine.

Handling operations were responsible for a back, a leg, and two finger injuries. One workman suffered a herniated disc when he attempted to lift a coil of wire. The second accident occurred as a maintenance crew was removing a gear from a die-cutting machine. When the workmen dropped the gear, it struck a slitter operator, fracturing his leg. Another maintenance accident occurred during the moving of a press. In this case, a maintenance man was hurt when an 8-inch by 8-inch plank dropped on his finger. In the other accident of this group, a tin-press operator lacerated his finger on a sheet of tin plate as he was

placing it in the machine. Infection developed and the permanent disability resulted.

Two permanent foot injuries, a hand, an arm, and a back injury resulted from falls. Two of these (an arm and a foot injury) were falls on steps. In one instance, the steps led to the working platform of a printing machine. The second foot injury was due to a fall from a ladder and the back injury resulted from a fall off a scaffold. The hand injury occurred when a workman who was replacing a tag on a roll of paper, fell from the second tier of 50-inch rolls of paper.

Falling objects were responsible for the remaining two loss-of-use injuries. In one case, a roll of paper fell on a moistening-machine operator, inflicting a permanent finger injury. The second injury affected a leg. In that accident, a printing-press operator was injured when a second workman pushed a cylinder head from the printer.

Temporary-Total Disabilities

Nearly 32 percent of the temporary-total disabilities were bruises or contusions. Another 29 percent were strains or sprains and 21 percent were cuts or lacerations. Fractures ranked next in frequency, accounting for 11 percent of the total, and hernias and foreign bodies in eyes each amounted to 2 percent of the total.

In general, hernias and fractures were the most severe temporary-total disabilities, averaging, respectively, 50 and 25 days of lost time per case. Only 7 cases of occupational disease were reported among the 1,423 temporary-total disabilities, but the average time loss for these cases, 22 days, was comparatively high. Strains and sprains averaged 15 days per injury and burns and scalds 14 days. Miscellaneous foreign bodies (eye injuries) were the least severe of all temporary-total disabilities, averaging 3 days per injury.

Nearly three-fourths of the bruises and contusions affected the limbs of the body. Feet, legs, and fingers were most frequently injured. Handling operations were responsible for most of these injuries which occurred when objects were dropped.

Strains and sprains were mostly trunk injuries; back injuries predominated. Ankle and wrist injuries were frequent, however. Reflecting the amount of manual handling work in the industry, the number of back

strains indicates that there is a great need for more training in the safe methods of handling and lifting objects and materials. Many of the sprained wrists were also due to lifting operations, whereas sprained ankles were principally the result of missteps by workers.

More than half the cuts and lacerations were finger or thumb injuries and another fifth involved hands. More extensive use of gloves might have prevented many of these injuries, but their use is necessarily limited by the fact that much of the work is on moving machinery where gloves would create an additional hazard.

Most of the fractures also occurred during manual handling activities. Over half of these injuries involved feet or toes; most of the latter could have been prevented by the use of steel-toed safety shoes. About a fourth of the fractures were finger or thumb injuries.

ACCIDENT ANALYSIS

Accident reports frequently do not show the specific reason for the occurrence of the particular events culminating in an injury. In most instances, the only available information comes from the injured person himself, or from witnesses present at the time who may lack either the skill or the opportunity to investigate the event fully to determine the actual accident cause. In the analysis of a large number of accident reports, therefore, it is common to find a large proportion deficient in the one item most important to the safety engineer. Despite these limitations, however, the analyst can draw much useful information from even the most sketchy accident description.

The description of an accident invariably tends to follow the normal line of thinking on the part of an interested person who hears that a friend or acquaintance has been injured. The first thought is of the injury itself. Was it a burn, a cut, a bruise, a strain, or something else? Then, what produced the injury and how did it happen? These are all descriptive facts which usually are readily apparent to the witnesses. Therefore, they loom large in the accounts of the events. The more analytical question, "Why did it happen?" normally arises only after the desire for descriptive information has been satisfied. It frequently goes unanswered, either because of preoccupation

with the descriptive factors, or because the answer may not be readily apparent.

The direct approach in accident analysis, therefore, is to draw from the records the various elements of information in the order in which they are usually recorded. Standing alone, these elements may have limited value, but when related to each other they can do much to indicate the accident-prevention activities which may be needed. The determination of the objects or substances most commonly producing injuries, coupled with information on how they produced the injuries, constitutes the first step toward an understanding of the accident problem.

Agencies of Injury

Machines, the most frequent agency of injury, inflicted nearly a fourth of all injuries in paperboard-container plants (appendix, tables 9, 10, and 11). Many different kinds of machines were involved in these accidents, the most common being printing presses; creasers and cutters; saws; and gluing, staying, stitching, wrapping, and taping machines. Two types of accidents accounted for nearly all these injuries. The most common was that of workmen being caught in the moving parts of equipment. Although gears, pulleys, and belts were involved in many of these accidents, most of them resulted from workmen being caught in the points-of-operation. The second most common type of accident involving machines was that of workmen bumping into or striking against equipment as they were working or moving about the working area. Nearly three-fourths of the resulting injuries were cuts, lacerations, bruises, or contusions; fingers, hands, and arms were most frequently injured.

It is noteworthy that machines accounted for 48 of the 51 reported amputations and over a fifth of the fractures. Most of these more serious injuries occurred when the worker was caught in moving parts of machines.

Paper products ranked second as an agency of injury, producing 18 percent of all disabling injuries. About two-thirds of these were strains from lifting heavy cartons and rolls of paper. In addition, 13 of the 30 reported hernias resulted from handling paper products. Many of the injuries attributed to paper products occurred when workmen were struck by paper cartons or rolls of paper which fell from piles of materials

or from hands of workmen. As a result, bruised hands, fingers, legs, feet, and toes were frequent. Many cuts and lacerated fingers resulted from workmen rubbing against the edges of some of the materials.

Vehicles were the third most important agency of injury. These were predominantly hand trucks. Of these injuries, two-thirds were experienced by workmen who were caught between vehicles and other objects or were struck by moving vehicles. The results, generally, were bruised or fractured legs, feet, or toes. Overexertion accidents in which workmen strained themselves as they attempted to move heavily loaded hand trucks were also quite common. Most of these were back injuries although injuries to the abdomen were not infrequent. Only slightly less common were injuries resulting from workers bumping into or against stationary vehicles.

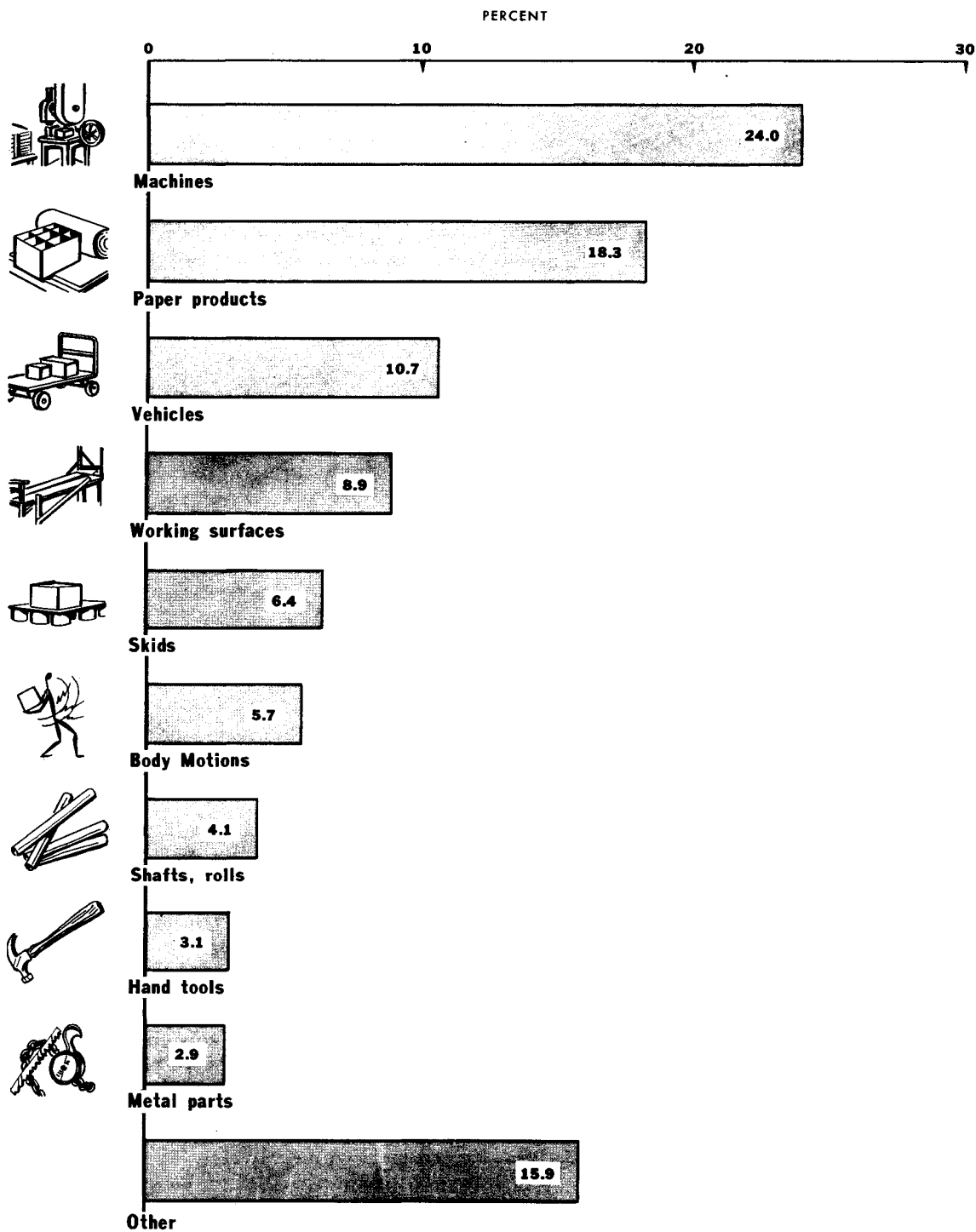
Contact with working surfaces accounted for about 9 percent of the disabling injuries. About half of these occurred when employees slipped or stumbled and fell on the surfaces on which they were working. Only slightly less common were accidents in which workmen fell from elevations. Bruises, contusions, strains, and sprains were the most common, but fractures, the generally more severe injuries, were also quite frequent. On an average, 1 of every 6 reported fractures was attributed to contact with a working surface.

About 6 percent of the disabling injuries in the industry were inflicted by skids; falling skids accounted for nearly half of these injuries. In most instances, the skids fell from the hands of workers, but improperly placed skids frequently toppled over, striking workmen. Bruised feet, toes, and legs were, therefore, common. Strains due to overexertion in lifting skids were second in importance in this group of accidents.

About 6 percent of the disabling injuries resulted directly from straining movements of the injured workmen rather than from contact with physical objects or substances. In practically all of these instances, the worker slipped or stumbled and strained himself while he was trying to regain his balance. About two of every three injuries in this group involved a foot or a leg. Most of the others were strains of the back or abdomen.

Metal shafts and rolls were responsible for about 4 percent of all injuries. More

CHART 3. MAJOR AGENCIES OF INJURY IN THE PAPERBOARD-CONTAINER INDUSTRY



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than half the injuries in this group were bruised or fractured toes, feet, fingers, or hands. Most of these injuries resulted from shafts or rolls being dropped during handling operations. In a few instances workers strained themselves while lifting heavy shafts or through faulty handling of them.

Among the less common agencies of injury were hand tools, metal parts, and foreign bodies (in eyes). Hand-tool injuries were principally cuts or bruises to hands, fingers, arms, and legs. In most of these accidents the workman struck himself with his tool or dropped the tool on his foot or toes.

The foreign bodies, which inflicted eye injuries, were primarily small particles, either airborne or thrown from the point of operation of some machine or hand tool. The metal parts were mostly machine parts. Many of the resulting injuries occurred when the parts fell from machines or from other equipment. Other injuries in this group included strains from lifting heavy metal parts and bruises or cuts from bumping against the parts.

Accident Types

More than 80 percent of all the recorded accidents fell into four general categories. These were accidents in which workmen were caught in, on, or between moving objects; were struck by moving objects; struck against or bumped into objects; or strained themselves while handling materials or equipment (appendix, tables 11-15).

Reflecting the wide use of machines in the manufacture of paperboard containers, a sixth of all the disabling injuries resulted from workmen being caught in the moving parts of powered equipment. These accidents tended to produce severe injuries--nearly a fourth were death or permanent disability cases. One of every 6 injuries in the group was an amputation and 1 of every 8 was a fracture. Most of these accidents occurred as workmen were feeding stock into machines and most of the injuries were to hands or fingers. In over two-thirds of the cases the accident occurred at the point of operation of the machine. There were, however, many accidents in which the workers were caught in gears, pulleys, and belts. The setup-box plants had a very high proportion of accidents of this type. In that group of plants,

30 percent of all injuries were due to employees being caught in moving equipment. In contrast, only 15 percent of the accidents in corrugated-box plants and 14 percent in folded-box plants were so classified. Although statistical verification is lacking, it appears that the predominance of these accidents in setup box plants is due to two factors: First, proportionately more work in setup-box plants is machine work; and second, many of the machines are hand-fed and guarded.

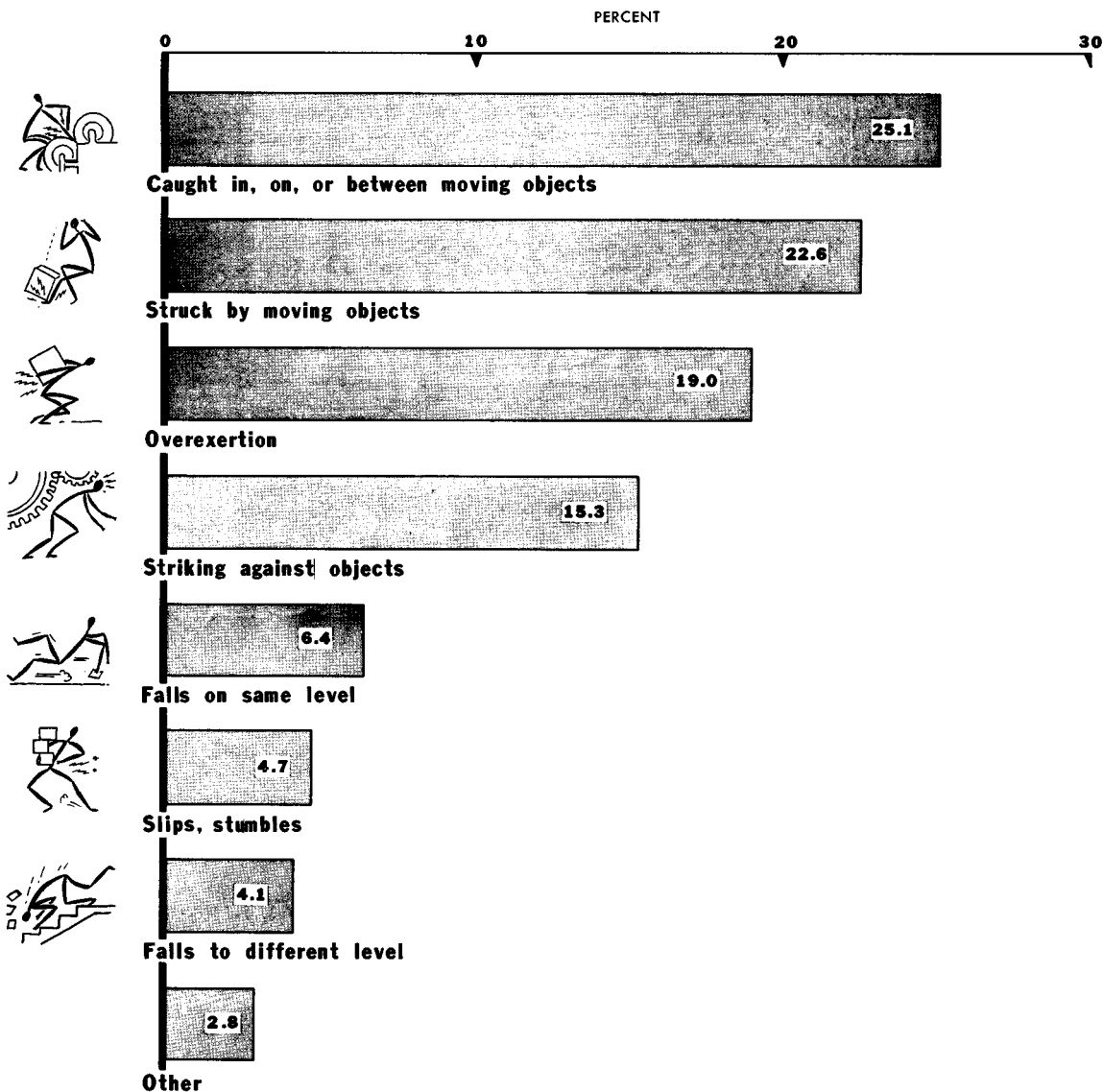
Next in importance in the caught in, on, or between group of accidents were those in which workmen were caught and pinched or crushed by rolling or falling objects. In contrast to the accidents involving moving parts of equipment, nearly all the resulting injuries were only temporarily disabling. Vehicles constituted the most important agency of injury in this group. In most instances, the worker's toe or foot was caught between the vehicle and another object. However, fingers and hands were frequently injured when they were crushed between the handles of vehicles and walls or other objects. Bruises and fractures were the most common varieties of injuries.

In nearly a fourth of all accidents, workmen were struck by moving objects. Falling objects were most frequently involved in these accidents, and nearly half of the falling objects originated in manual handling operations. Most commonly, these were instances in which workmen dropped skids, metal shafts, hand trucks, paper products, hand tools and other objects on their feet or toes. About a fifth of the falling objects fell from machines--metal shafts being listed most frequently as the falling objects in this group. Material falling from piles also produced numerous injuries. Most commonly, these falling objects were bundles of paper boxes or cartons. The injuries produced by falling objects were primarily bruises or fractures to toes or feet. Proportionately, folded-box plants and corrugated-box plants reported nearly twice as many "struck by falling objects" accidents as the setup-box plants.

Flying or thrown objects, mostly small particles, were responsible for the second largest group of "struck by" accidents. In most instances these accidents produced only minor eye injuries.

Proportionately, accidents of this variety were more common in corrugated-box

CHART 4. MAJOR TYPES OF ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY



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plants than in either folding- or setup-box plants. Silicate used in the corrugating operation was primarily responsible for this circumstance. Small pieces of this adhesive, which becomes hard and brittle when dry, are frequently thrown off during the fabricating of the corrugated board into boxes. It was also observed that large plants had relatively more accidents of this

kind than small plants. Part of this difference can be explained by the fact that corrugated-box plants are, on an average, larger than folded- and setup-box plants. Therefore, the experience of the large plants would be weighted heavily by that of the corrugated-box plants with their silicate-particle hazard. Nevertheless, the disparity held even for the plants manu-

facturing corrugated boxes exclusively. In corrugated-box plants employing fewer than 100 workmen, only 2 percent of the accidents involved flying or thrown objects. On the other hand, this type of accident accounted for nearly 6 percent of the accidents in plants averaging 100 to 249 workers and 4 percent in plants employing more than 250 workmen. Although the explanation for this difference has not been definitely established, it appears that it may be due to better control of other kinds of accidents in the larger plants. A tendency to concentrate safety activities on the elimination of machine and material-handling hazards, which produce more serious injuries, would give the flying-particle cases greater importance in the total volume of accidents. In any event, it is evident that more general use of goggles is desirable, particularly in corrugated-box plants.

Accidents in which workers were struck by hand-operated equipment or hand-wielded objects were also quite numerous. Workmen using hand tools frequently misjudged their swings and struck themselves or fellow workers. Similarly, errors in judgment in moving hand trucks contributed to many "struck by" accidents. Another group of accidents included in this general category were those in which workmen were struck by paper or its products when those products were hastily withdrawn from machines. In those accidents sharp edges of paper inflicted cuts or lacerations to eyes or fingers.

Overexertion accidents accounted for approximately 1 of every 5 injuries in the industry. However, only 1 of the 285 accidents in this group resulted in serious disability. In that instance, a workman suffered a permanent back injury while unloading a coil of wire from a railroad car.

More than two-thirds of the overexertion accidents occurred while employees were lifting materials or equipment. Frequently, that lifting was incidental to the operation of a machine--i. e., feeding or removing stock. Paper and paperboard in some form were, therefore, involved in a majority of these cases. As might be expected, "lifting" accidents were most common in the smaller plants where mechanical-handling equipment is not widely used. The injuries most commonly resulting from these accidents were backstrains.

Second in importance in the overexertion group were those accidents in which work-

men were injured while pushing or pulling equipment such as hand trucks. Here, too, strained backs were common.

Repetitive movements required in operations such as stripping also contributed to many strains or sprains. However, in contrast to other overexertion accidents, arms and hands were most frequently injured in these operations.

About a seventh of the accidents were cases of striking against or bumping into objects. Machines, paper, vehicles, and skids were involved in approximately two-thirds of these accidents. Cuts, lacerations, bruises, and contusions were common, with fingers, hands, feet, and legs most frequently injured. In many cases, the workmen rubbed objects which they were handling or walked into equipment as they were moving about the working area; but, in most instances, they merely bumped the machines or other equipment with which they were working. About half of the rubbing cases involved paper and half of the "walking into" accidents involved skids.

Falls and near falls were only slightly less frequent than "striking against" accidents. Falls accounted for about two-thirds of this group, with falls on 1 level outnumbering falls to lower levels by 3 to 2. However, the latter generally produced the more severe injuries. About 1 of every 12 falls to a lower level produced a permanent disability. In contrast, none of the reported falls on the same level resulted in permanent injury. Piles of materials, platforms, ramps, and motor trucks were the most common points from which people fell to lower levels. Falls on the same level were mostly to floors or on stairways. Bruised or fractured legs, feet, and arms and strained backs were the most frequent injuries.

The near falls were principally slips on floors and stairs and trips or stumbles over objects lying on those surfaces. In many instances, poor housekeeping was a contributing factor to the occurrence of the accident. Generally, in these accidents, the workman violently wrenched his body as he attempted to regain his balance. As a result, strained or sprained feet, legs, and backs were the most common injuries.

ACCIDENT CAUSES

Modern accident analysis is based upon two premises: First, that there is an

identifiable cause for every accident; and, second, that when an accident cause is known, it is usually possible to eliminate or counteract it as the probable source of future accidents of the same character. In many instances a variety of circumstances contribute to the occurrence of an accident, and the course accident prevention should take may seem confused because of the multiplicity of the possible avenues of action. It is commonly accepted, however, that every accident may be traced to the existence of some hazardous working condition, to the commission of an unsafe act by some individual, or to a combination of these accident-producing factors.

The sole purpose of accident analysis, as applied to large groups of cases, is to determine what specific factors within each of these two categories of accident causes are most frequently involved in the occurrence of accidents. With this knowledge available, it is then possible to plan a safety program concentrating upon the elimination of these specific accident factors with assurance that success in this objective should lead quickly to a substantial reduction in the volume of injuries.

It must be recognized, however, that accident analysis has definite limitations. At best it can furnish clues only as to the directions in which accident-prevention activities can most effectively be pointed. What those activities should be and how they are to be carried out must be determined by the individual in control of each safety program after his general objectives have been indicated through accident analysis. It must also be recognized that accident analysis cannot go beyond the reported facts. In other words, the accuracy of any analysis is wholly dependent upon the accuracy and completeness of the original accident reports. In this respect, it has been consistently apparent in the Bureau's surveys that the inadequacies of reporting seriously limit the possibilities of effective analysis. The limitations are not great in broad studies of this type, which bring a sufficient volume of adequate reports into consideration to support an analysis. The shortcomings are specifically at the company or establishment level where the most effective analysis can be performed only when the necessary facts are available.

In interpreting the findings relating to hazardous conditions and unsafe acts, it is essential to recognize that these two factors

are not necessarily exclusive. In other words, the analysis procedure was not directed toward the determination of a single major cause of each accident. This determination would involve an exercise of analytical judgment seldom possible from the available facts. On the contrary, an effort was made to determine independently for each accident whether there was a hazardous condition which contributed directly to the occurrence, and whether the event could be directly associated with an unsafe act.

Because many of the reports were inadequate for the determination of one or the other of these factors, it is impossible to draw any conclusion as to whether hazardous conditions or unsafe acts were the leading cause of accidents. For the accident preventionist, however, this is a limitation of little consequence. For his purposes, the pattern of the specific factors within each general category is of more importance than the interrelationship between the major groups of accident causes. This results from the fact that his approach to the elimination of accident causes in the two categories necessarily must be different.

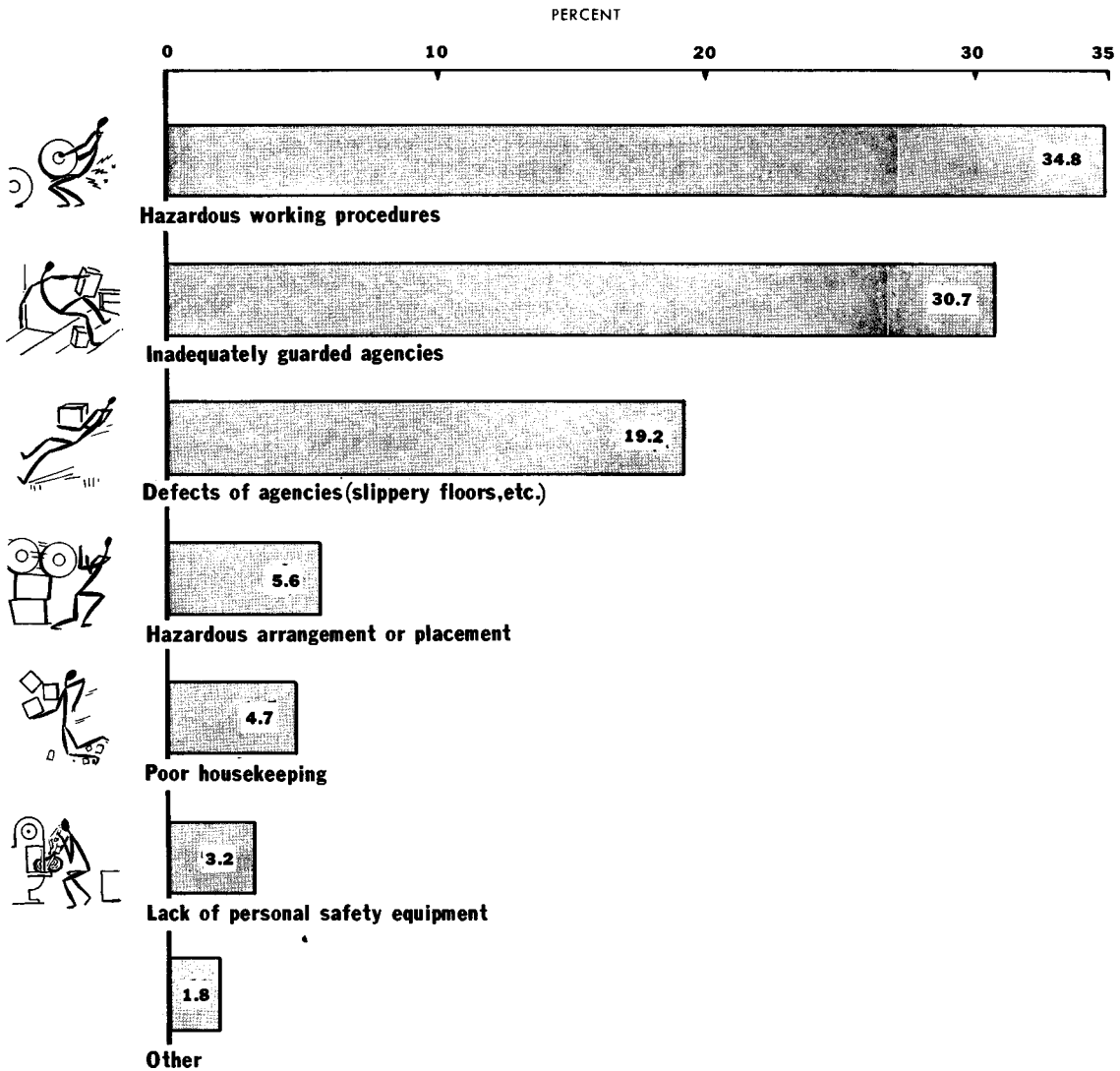
The correction of hazardous working conditions usually is entirely within the powers of management and can be accomplished by direct action. The avoidance of unsafe acts, on the other hand, requires cooperation and understanding by both management and workers. To achieve this understanding, management must take the lead by providing safety-minded supervision and by making sure that all workers are acquainted with the hazards of their operations and are familiar with the means of overcoming them.

Hazardous Working Conditions

Three general groups of hazardous working conditions accounted for nearly 85 percent of all accidents in the industry: hazardous working procedures, 35 percent; inadequately guarded agencies, 31 percent; and defects of agencies, 19 percent. Two other groups, hazardous arrangements and poor housekeeping, caused an additional 10 percent (appendix, tables 16-18).

Hazardous Working Procedures.--Relatively few of the plants participating in the survey had fully mechanized their material-handling operations. This circumstance was

CHART 5. MAJOR TYPES OF HAZARDOUS WORKING CONDITIONS IN THE PAPERBOARD-CONTAINER INDUSTRY



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responsible for a large proportion of the reported accidents. Strains from overexertion in moving rolls of paper, boxes, cartons, loaded hand trucks, skids, and heavy shafts were common. Similarly there were many foot injuries inflicted by objects which were dropped in manual handling operations.

Hand-feeding and manual off-bearing at

the machines were also responsible for a substantial volume of overexertion accidents. In off-bearing most of these were cases of overlifting. In feeding, however, many of the injuries could be traced to the repetitive motions or to the twisting and turning of the body necessary in moving the stock into the machines.

Manual shafting of rolls of paper for the

corrugating machines was the source of many accidents producing injuries to hands and feet. As these shafts are quite heavy and are difficult to handle, it was not unusual for the workmen to drop them on their toes or to have their fingers pinched as they were placing the shafts in position. Plants which had adopted mechanical shafting procedures reported very few accidents from this operation.

Congested working areas and inadequate provision for plant traffic were responsible for a variety of accidents, particularly in the older plants where operations had grown without a corresponding expansion of the premises. Many of the accidents resulting from these conditions were simple cases of bumping into obstructions. Others, generally producing more serious injuries, consisted of workers being caught and pinched or crushed between moving vehicles and fixed objects.

Inadequately Guarded Agencies.--Accidents attributable to inadequate guarding of hazard points on equipment characteristically tend to produce injuries of greater than average severity. The elimination of such sources of accidents, therefore, should be a primary objective in any safety program. Support for this widely accepted generality is evident in the fact that 1 of the 2 fatalities and 66 of the 78 permanent disabilities reported in this section of the paperboard-container-industry survey resulted from inadequate guarding.

About 60 percent of the accidents chargeable to inadequate guarding were "point of operation accidents." Most of these were cases in which the operator's hands were struck, caught, or crushed by moving machine parts.

Another 14 percent of the accidents in this group consisted of contacts with uncovered gears, pulleys, or other power transmission equipment. Most of these accidents occurred in the course of regular operations and the injured persons were generally the regular operators of the machines involved.

The remainder of the group consisted principally of falls from scaffolds or elevated platforms on which no guard rails had been provided.

Inadequate guarding was a particularly prominent source of accidents in the setup box plants. In these plants 45 percent of all accidents attributed to hazardous con-

ditions were specifically indicated as resulting from inadequate guarding. A similar comparison based upon plant size indicated that inadequate guarding accounts for a substantially higher proportion of accidents in small plants than in the large establishments. Inadequate guarding constituted 37 percent of all hazardous conditions recorded in the plants having fewer than 100 employees, 30 percent in those with 100 to 249 employees, and 28 percent in those with 250 or more employees.

Defects of Agencies.--The defective agencies most commonly encountered in the paperboard-container industry were slippery and uneven floors. These slipping and tripping hazards constituted prima facie evidence of inadequate attention to housekeeping and maintenance in many plants.

Inadequate maintenance also was evident in the considerable number of accidents chargeable to defective hand trucks and machines. Worn and rough handles on hand trucks were responsible for many punctured fingers and hands. In some instances loose handles or other damaged parts of hand trucks fell off and struck the operator's feet. Similarly, there were a number of instances in which machine operators were cut by contacting rough or sharp edges of worn machine parts or were struck by machine parts which came loose and fell because of wear on their supports.

Improper construction was the basic reason for the failure of some defective platforms and scaffolds. More commonly, however, the primary fault was inadequate design for the purpose used. Faulty design was also directly responsible for many machine accidents. On many machines the lubrication and adjustment points were so located as to invite or require exposure to moving parts in the performance of these essential tasks. In other instances, the point of operation was so located that the operator had to stretch or twist his body to operate his machine. Similarly, the inclusion of braking equipment in the design of industrial trucks might have avoided the accidents in which unattended hand trucks rolled from their parking spaces and struck persons working nearby.

Hazardous Arrangements.--Improperly placed objects constituted the predominant hazard in this group of accidents. Most

commonly these were accidents in which objects such as skids, steel shafts, hand trucks, and metal machine parts were placed in insecure positions from which they fell or rolled and struck nearby workers. Similarly, piled materials frequently fell on workers because the storage piles had been improperly constructed.

Poor Housekeeping.--Scraps of paper and other material lying on floors was the source of many slips, stumbles, and falls. The paper scraps were often the refuse from machine operations. Machine operators were, therefore, most frequently the victims of this hazard. Generally, this housekeeping condition was more of a problem in the larger plants than in small ones. In the small plants--fewer than 100 workers--only 2 percent of the unsafe conditions fell into this classification. Plants in the middle range--100 to 249 workers--averaged 4.5 percent and the larger plants--250 employees and over--averaged 6.1 percent.

Miscellaneous.--Gloves and goggles were the items most frequently missing in accidents attributed to the lack of personal safety equipment. Gloves would have eliminated many cuts resulting from contact with sharp edges of paper. The lack of goggles was most common in machine operations.

The lack of ladders and scaffolds in some operations caused a number of falls. Many machines with elevated working surfaces or requiring lubrication or adjustment at an elevation were not equipped with ladders, nor were ladders otherwise provided. As a result, workmen tried to reach those elevations by climbing on machines or other equipment.

Unsafe Acts

For the purpose of this analysis, an unsafe act was defined as that "violation of a commonly accepted safe procedure which occasioned or permitted the occurrence of the injury-producing accident." Literally, this definition means that no personal action shall be designated as unsafe unless there is a reasonable, less hazardous, alternative procedure. For example, the operation of a machine for which no guard was provided was classified as a hazardous condition and not as an unsafe act because the

worker had no choice but to use the unguarded machine. On the other hand, the operation of a machine from which the guard had been removed was classified as an unsafe act because the alternative safe procedure would have been the replacement of the guard before operating the machine.

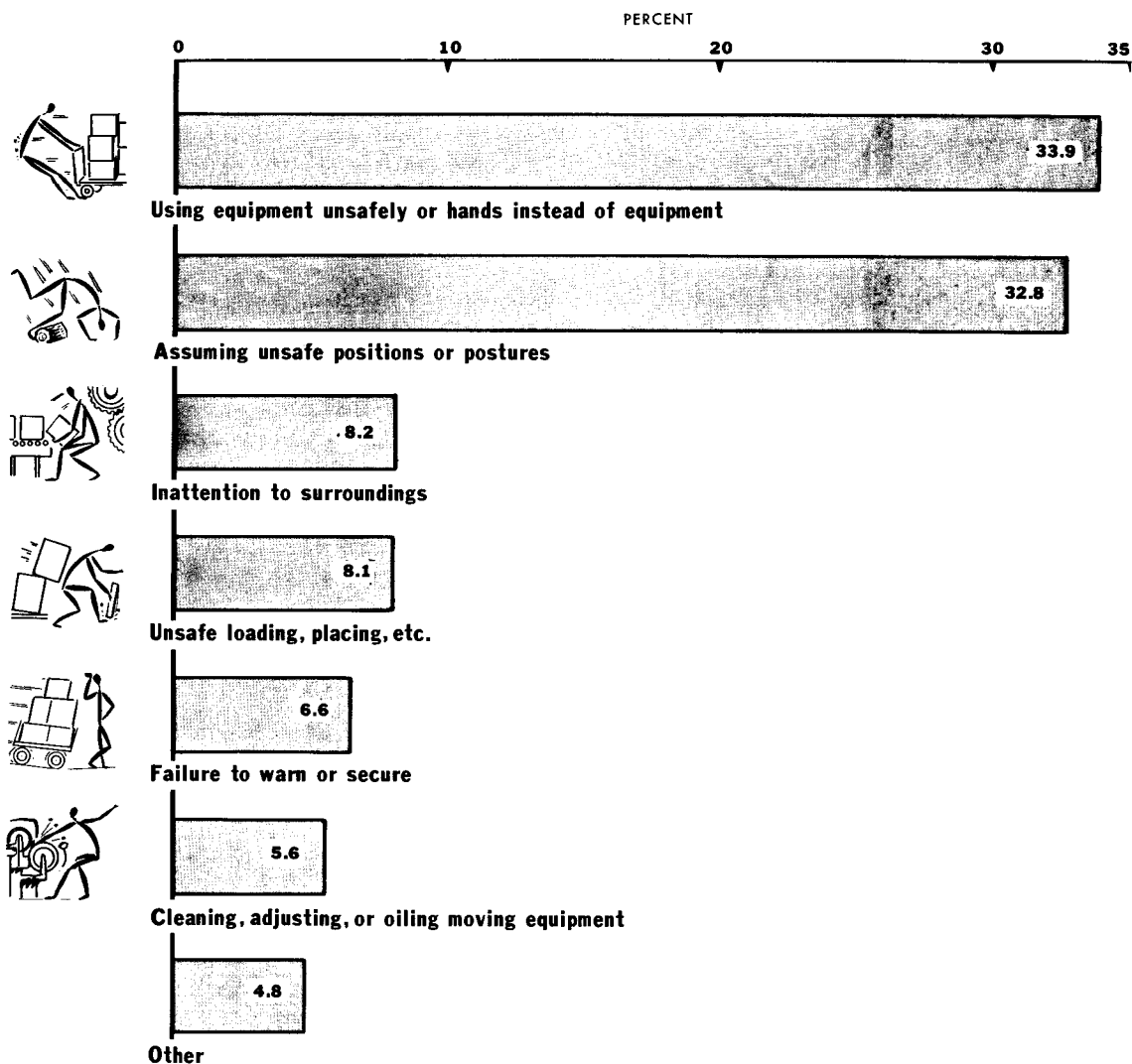
The definition does not imply, however, that the worker who committed the unsafe act was aware of the alternative safe procedure nor that his act was the result of a considered choice between the alternatives. From the analysis of the individual accidents, it is apparent that, in many cases, the worker knew the safe procedure but consciously decided not to follow it. In other cases, the individual acted unsafely simply because he did not know the safe method. There are, therefore, two steps in any safety program which are essential to the reduction of unsafe acts, namely, education and enforcement. All workmen should be carefully instructed in the safe methods of performing their duties and they should be taught to recognize hazards involved in deviations from the safe procedures. Management then should provide adequate supervision to assure that the safe procedures are followed.

Two general types of unsafe acts predominated. The unsafe use of equipment, or the use of hands instead of equipment, contributed to 34 percent of all the accidents analyzed, and taking unsafe positions or postures to 33 percent. Inattention to surroundings and unsafe loading, placing, or mixing were each responsible for an additional 8 percent of the accidents. (appendix, tables 19 and 20).

Using Equipment Unsafely, or Using Hands Instead of Equipment.--Most of the accidents in this group resulted from improper handling of materials and equipment, primarily while feeding materials into machines. The most common fault was that of grasping the materials in a way which resulted in the fingers being caught between the material and the machine. A somewhat similar fault--failure to take or maintain a good grip on objects being lifted or carried--was responsible for a high percentage of the foot and toe injuries.

Other unsafe acts in this group included: the incorrect use of hand trucks, such as pulling hand trucks instead of pushing them; and a number of instances of using the hands instead of the proper tool, such as the

CHART 6. MAJOR TYPES OF UNSAFE ACTS IN THE PAPERBOARD-CONTAINER INDUSTRY



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failure to use push sticks in operating power saws.

Assuming Unsafe Positions or Postures.--Nearly half the accidents in this group were slips or falls resulting from workers' failure to observe the oft-repeated warning "watch your step." These accidents usually occurred while workmen were

operating machines, stepping to or from equipment, or merely walking from one place to another in the plant. Frequently, poor housekeeping contributed to the occurrence of these accidents.

Incorrect postures in lifting, improper placing of hands, exposure to falling or rolling objects, and exposure to moving parts of equipment were among the less

frequent position or posture faults of workmen. Accidents ascribed to incorrect postures in lifting included lifting with a bent back and lifting from an awkward position. All of these accidents resulted in strains from overexertion. In most cases the objects being lifted were boxes or cartons.

The unsafe acts designated as improper placing of hands consisted primarily of unnecessarily exposing the hands to contact with gears, pulleys, belts, or other moving machine parts. In a considerable number of these instances, the workers were caught by the belts which convey stock through the machines. Exposure to moving or falling objects generally consisted of unnecessarily standing or walking in front of moving hand trucks or of failing to keep away from suspended rolls or cartons of paper products.

Inattention to Surroundings.--Most of the accidents attributed to inattention on the part of the worker were cases in which the injured persons bumped into fixed objects or struck against materials or equipment in the workplace. Generally, the resulting injuries were relatively minor bruises or abrasions produced by the contact. In some instances, however, the workers bumped into piled materials, skids which had been turned up on edge, or steel shafts which were standing on end, and caused the objects to topple over. These falling objects produced some rather severe injuries to feet and toes. In other instances workers knocked tools or machine parts off their work tables onto their feet.

Although it was obvious that greater attention would have avoided these accidents, it was also apparent that the basic cause in many instances was congestion in the workplace. The lack of facilities for temporary storage of materials and equipment, inadequate working areas, and narrow aisles were all contributing factors.

Unsafe Loading, Placing, Mixing, and Combining.--The bulk of the unsafe acts in this general group was of two varieties. First in importance was the practice of individual workers of trying to lift or carry objects which were obviously too heavy for one person to handle. Most of these were instances in which assistance was readily available, but for one reason or another the individual decided to undertake the lift alone. The resulting injuries were primarily back, leg, and arm strains. More extensive

provision of mechanical handling equipment might reduce the occurrence of these instances of poor judgment.

The second variety of unsafe acts produced somewhat fewer, but frequently more serious, injuries. This was the rather common practice of placing materials and pieces of equipment in precarious positions from which they could fall. Generally the hazard was obvious, but was ignored because it was not intended to leave the materials in such positions for any length of time. Prominent among these unsafe acts was the practice of standing skids on edge and of standing shafts on end against a wall.

Other Unsafe Acts.--Most machine operators are well aware of the fact that oiling and adjusting machinery while the equipment is in motion constitutes an invitation for an accident to happen. Most supervisors also know that this practice should not be condoned. Nevertheless, accidents attributed to this unsafe act were rather common, and a high percentage of them resulted in permanent disability.

Similarly, most workers know that removable machine parts are likely to vibrate and fall when the machine is started unless they are firmly locked in place. They also know that vehicles parked on a grade and near materials placed on a sloping surface frequently will roll away when left without proper blocking. The failure to take such precautions, however, was responsible for a considerable volume of accidents.

More often than not the person who commits an unsafe act is the one who suffers the resulting injury. In some instances, however, the consequences of a person's thoughtless action fall entirely upon another person. A particularly hazardous practice in the latter group is that of starting machines without first making sure that all other workers have been warned and are in the clear. Accidents chargeable to this fault were not common, but they occurred frequently enough to indicate that this variety of unsafe act is rather widespread in the industry.

Other unsafe practices recorded in considerable numbers included running in the workplace, operating industrial trucks at excessive speed, wearing loose or otherwise unsafe clothing around machines, failing to use available personal protective devices where necessary, and making safety devices inoperative.

ACCIDENT-PREVENTION SUGGESTIONS

To illustrate the general types of accident problems in the paperboard-container industry, a number of typical accidents were selected for detailed study. These accidents were analyzed by a member of the Division of Safety Standards of the United States Department of Labor's Bureau of Labor Standards and suggestions were made to indicate how these accidents might have been prevented.

This section of the report suggests that there is a simple approach to the prevention of nearly every type of accident. No attempt is made to present recommendations or safety rules for the industry. Many safety engineers, no doubt, would attack the problems involved in these accidents in different ways and would achieve equally good results. The method of prevention, however, is of secondary importance as long as it accomplishes its purpose.

Brief descriptions of the selected accidents accompanied by the recommendations of the Bureau of Labor Standards' safety specialist for the prevention of such accidents are given on the following pages.

CASE DESCRIPTIONS AND RECOMMENDATIONS

1. A pressman shut down his machine and started to clean the equipment. As he reached into the press, his elbow struck the start button, setting it in motion. His hand was caught between the ink slab and a rod of the press.

All starting switches should be designed to prevent their being operated unintentionally. In this case, a switch with a start button recessed into the box probably would have prevented the accident.

2. An employee, standing on the steps of a printing press to wash the ink press, slipped and fell against the machine. Investigation disclosed that the steps were metal and corrugated but very greasy.

Good housekeeping is essential to safety. All equipment should be cleaned at frequent, regular intervals. This practice would have prevented the accumulation of grease on the steps.

3. A printer's helper developed a rash after using naphtha to remove ink stains from his hands.

Naphtha should not be used for washing or cleaning the hands. It is a powerful solvent and can cause a serious dermatitis. The fact that naphtha is highly flammable should also rule against its use as a cleaning agent. All employees should be thoroughly instructed regarding the toxic and explosive hazards of the solvents provided for their use.

4. A helper on a printing press attempted to wipe some ink from the back form roll while the press was running. The wiping cloth was caught by the rolls, and pulled his hand into the rolls.

Supervisors should not permit employees to clean, oil, adjust, or repair equipment while it is in operation.

5. An employee was feeding boxboard to a platen printing press. When he failed to remove his hand from the operating zone, the press crushed his fingers.

(a) Wherever possible, platen presses should be fed automatically.

(b) A platen-press guard would have reduced the possibility of an accident although it would not eliminate the hazard.

6. A pressman was feeding heavy boxboard to a platen printing press. The constant motion of his hand and arm in lifting the board caused his arm to swell. Investigation disclosed that it was necessary to lift the boxboard about 24 inches.

All operations and procedures should be planned so that the handling of materials is kept at a minimum. In this case, most of the lifting could have been avoided by the use of an automatic adjustable platform from which the boxboard could be removed at press level.

7. A printing-press operator injured his thumb when it was caught between the rolls of a rotary press. Investigation disclosed that the rolls were unguarded.

All in-running rolls should be guarded.

8. A helper placed one end of a roll of paper on a printing press without locking it into position. In an attempt to place the other end of the roll in position it fell from the machine and crushed his foot. Investigation disclosed that the roll of paper weighed approximately 200 pounds.

(a) All employees should be carefully trained in the safe performance of their duties. Adequate supervision should be provided to assure adherence to the safe procedures. In this case, the helper should have locked the end of the roll into position.

(b) Employees engaged in handling heavy objects should be required to wear steel-toed safety shoes.

9. A stock handler in the printing department was injured when a skid, standing on end, toppled over and struck him. Investigation disclosed that it was common practice to place empty skids on end against the press.

Skids should always be stored flat and in a place reserved for that purpose.

10. A helper was placing a 2,000-pound roll of paper on the stand of the corrugator. Instead of lowering the stand, which was a little high, he tried to push the roll into the elevated position. His foot slipped and he strained his back.

All employees should be carefully trained in the safe performance of their duties and adequate supervision should be provided to make sure that safe procedures are followed. In this case, the stand should have been lowered to the level of the roll of paper.

11. A helper on the corrugator stood on the frame of the machine to thread the paper. In getting down, he stepped on a plug from a roll of paper and fell. Investigation disclosed that it was common practice to throw discarded plugs on the floor.

Good housekeeping is essential to safety in any operation. Containers should be provided for scrap material and supervisors should make sure that they are used. In addition, a regular cleaning schedule should be developed and followed strictly. In this case, a container for discarded plugs should have been placed near the paper feed on the corrugator.

12. A machine hand was helping to place a roll of paper stock on the corrugator. While he was lifting a shaft, it slipped from his hands and fell on his foot. Investigation disclosed that the shaft weighed about 75 pounds.

(a) Safe working procedures should be developed for all manual handling opera-

tions, and supervisors should make sure that the safe procedures are followed.

(b) Employees engaged in this work should be required to wear steel-toed safety shoes.

13. A helper on a slitter attempted to scrape wax from the knife roll while the machine was in motion. His finger was caught between the knife roll and the idle roll.

Employees should not be permitted to clean, adjust, lubricate, or repair equipment while it is in operation.

14. A punch-press operator stepped on the foot pedal before his hands were clear of the machine. The press caught his fingers.

The point-of-operation of punch presses should be adequately guarded. In this case a two-handed tripping device would have prevented the accident.

15. An employee was using a die press to punch holes in corrugated boxboard. As he was reaching for a piece of boxboard which was caught in the machine, the machine tripped unexpectedly and caught his hand. Investigation disclosed that the machine was old and worn and that heavy vibration of the floor could activate the press.

All equipment should be inspected frequently and regularly. Unsafe equipment should be made safe immediately or removed from service. In this case, the relocation of the machine to an area where vibration is a minimum may help, but properly maintained equipment should not trip unexpectedly.

16. When several boxboards clogged a slotting machine, the operator attempted to start the machine by pulling the belt. When it started, his hand was drawn into the pulley.

(a) All employees should be carefully instructed in the safe performance of their duties and adequate supervision should be provided to make sure that the safe procedures are followed. In this case, the operator should have opened the switch and then cleaned the machines.

(b) All belts and pulleys should be adequately guarded.

17. An employee was cutting boxboard on a band saw. As he was feeding the stock, his

hand touched the blade. Investigation of the accident disclosed that the portion of the blade between the guide and the upper wheel was unguarded, although the upper and lower wheels were enclosed.

The unused portion of a band-saw blade should be guarded. In this case, a guard should be installed and attached to the guide shielding that part of the blade between the guide and the upper wheel.

18. A scoring machine helper attempted to adjust the rolls while the machine was in motion. His hand was crushed between the revolving rolls.

Employees should not be permitted to adjust, clean, lubricate, or repair equipment while it is in operation. Adequate supervision should be provided to enforce this rule.

19. While an employee was stitching corrugated cartons, a piece of silicate entered his eye. Infection developed.

(a) This type of injury is common in corrugated-box plants. (See injury analysis of the report.) Employees in this work, therefore, should be provided, and required to wear, goggles.

(b) All injuries, regardless of severity, should be given adequate first-aid attention to prevent infection.

20. A stitcher operator was wiping oil from his machine. When a second workman unintentionally struck the foot pedal, a staple was driven into the operator's finger.

Foot pedals of powered equipment should be guarded to prevent unintentional contact.

21. A female taper operator was wearing a loose coat. The shaft of the machine caught the coat, pulling her against the machine.

Employees should not be permitted to wear loose-fitting garments near moving machinery.

22. Two strippers were working at the same table. One workman unintentionally struck the other with his stripping hammer.

All operations should be planned to assure safe working conditions. This accident indicates that insufficient room had been provided for this operation.

23. While an employee was "stripping", some particles of paper dust entered his eyes.

Employees engaged in this work should be provided with, and required to wear, goggles or face shields.

24. While removing a stack of cartons from a stripping table, an employee rubbed her hand against a rough spot on the table. Several splinters punctured her fingers.

All equipment should be inspected frequently and regularly. Unsafe equipment should be repaired immediately or removed from service.

25. An employee had stopped his covering machine to make an adjustment. While he was engaged in this work, a second employee attempted to frighten him by starting the machine. The operator's hand was caught in the unguarded gears.

(a) Horseplay should be strictly prohibited. Adequate supervision should be provided to enforce this rule.

(b) All gears should be completely enclosed.

26. A double-ender operator placed his foot on the side of the machine. His toes, projecting through the frame, were caught by a revolving cam and crushed.

Wherever possible, moving machine parts should be guarded. In this case, the opening in the machine frame should have been covered.

27. The string on a light switch had broken off. To reach the switch, one employee lifted another. As the second employee dropped to the floor, he struck a make-ready knife protruding from the pocket of the first employee.

(a) Supervisors should make sure that all necessary equipment is provided. In this case, a ladder should have been used to reach the light. Preferably, however, the supervisor should have called a maintenance man to replace the broken cord.

(b) When not in use, knives should be properly sheathed.

28. As a laborer pulled a large skid from a pile of small ones, several small skids fell on his foot.

(a) Adequate storage facilities should be provided and safe piling procedures should be established. In this case, skids should be piled according to size.

(b) Steel-toed safety shoes probably would have prevented or minimized the injury.

29. A laborer was helping to lift bales of waste paper from the stripping operation onto a truck. A nail, projecting from one of the bales, punctured his finger.

Employees engaged in this work should be provided and required to wear some form of hand protection--i. e., heavy gloves or hand leathers.

30. As a stripper picked up an empty skid, he cut his finger on a sharp piece of metal projecting from a corner of the skid.

A program of regular and frequent inspection of all equipment would have revealed the projecting piece of metal. Unsafe equipment should be repaired immediately or removed from service.

31. A female operator of a quad stayer was injured when a splinter went through the open-toed sandals which she was wearing and punctured her foot. Investigation disclosed that the plant floor was rough and splintered.

(a) Rough or worn floors should be repaired.

(b) Open sandals should not be permitted in industrial operations. Instead, employees should be required to wear substantial footgear, preferably steel-toed safety shoes.

32. A female employee was riding on a skid which was being towed by a lift truck. As the skid crossed a rough section of the floor, she was thrown from the skid. Investigation disclosed that the employee was riding the skid in violation of instructions.

(a) The rough section of the floor should be repaired.

(b) Adequate supervision should be provided to assure compliance of all instructions.

33. As a printing-press operator was walking to his machine, he slipped on a piece of gummed boxboard and fell. Investigation disclosed that the boxboard had been discarded in the gluing operation.

Good housekeeping is essential for safety. A tote box or similar container should be placed near all machine operations for discarded material. Supervisors should enforce their use.

34. An employee was bundling sheets as they were delivered from the corrugator and was placing them on a skid. One of the bundles fell from the skid, striking him on the back. Investigation disclosed that he had been overloading the skid.

All employees should be carefully instructed in the safe performance of their duties. Adequate supervision should be provided to make sure that the safe procedures are followed. In this case, the bundles should be carefully piled on the skids. The height to which the bundles may be safely loaded should be determined and that height should not be exceeded.

35. A special type truck crane, battery operated, was used for handling rolls of paper. As the operator entered the cab, he inadvertently brushed against the power control. The crane jumped, throwing the operator against a railing. Investigation disclosed that the operator, instead of setting the brakes, had left the crane in gear with the power off.

(a) All equipment operators should be carefully instructed in the safe use of their equipment. In this case, the truck should have been placed in neutral gear and the brake applied.

(b) The control button should be guarded or placed in a position where unintentional contact with it would be impossible.

36. A baler suffered a hernia while lifting bales of waste paper. Investigation disclosed that the bales weighed between 200 and 300 pounds.

Baled paper, which is not only heavy but bulky, should be handled mechanically by lift truck, crane, conveyor, or other equipment. If mechanical equipment is not available, several workers, trained to lift as a team, should be used.

37. A hand trucker injured his ankle when he slipped and fell as he was moving a truck loaded with waste paper. Investigation disclosed that the floor was littered with scraps of paper.

Good housekeeping is essential to safety in any operation. A regular, frequent cleaning schedule should be maintained. This is particularly important in the paperboard-container industry where large amounts of paper scrap are discarded during machine operations.

38. A hand trucker strained his back while moving a truckload of paper. Investigation disclosed that one of the truck wheels was broken.

Frequent, periodic inspections of all equipment should be made. Defective equipment should be repaired immediately or removed from service.

39. A warehouseman was guiding a fork-lift operator who was placing a pallet of boxboard blanks. When the operator lowered the lift, it caught the warehouseman's hand. Investigation disclosed that the operator misunderstood the warehouseman's signals.

A standard set of signals should be developed for giving directions by hand. Only workers, familiar with the standard, should be permitted to give directions by hand signals.

40. A laborer, moving a wooden skid, was injured when the skid fell apart and dropped on his foot. Investigation disclosed that the skid was old and badly worn.

All equipment should be inspected periodically. Worn and defective equipment should be repaired immediately or removed from service.

41. While a warehouse supervisor was climbing a ladder, the base slipped away from the wall. The supervisor jumped to the floor, injuring his ankle.

Straight ladders should be equipped with anti-slip safety shoes.

42. A maintenance mechanic was using a lift truck as a platform while repairing roof timbers. One of the cables on the movable platform broke and he fell to the floor. Investigation disclosed that the cable was frayed due to extended use.

(a) Supervisors should not permit equipment to be used for purposes other than that for which it is designed. Lift trucks are not intended for use as working

platforms. Therefore, supervisors should not permit trucks to be used in that way. In this case, a working platform or a scaffold should have been provided.

(b) Periodic inspection of all equipment should be made. Defective equipment should be repaired immediately or removed from service. In this instance, the frayed cable probably would have broken had any load been placed on the lift truck.

43. A female employee bent over to pick up a tube while operating a crimping machine in a fiber-tube plant. The spinning chuck of the machine caught her hair and pulled a small area from her scalp.

All women working near moving machinery should be required to wear caps or snoods large enough to cover or confine their hair.

44. A shipping clerk was filling a barrel with silicate. When he struck a match to determine the quantity of silicate in the barrel, an explosion occurred.

(a) Flashlights, instead of matches, should be used to supplement general illumination.

(b) This accident indicates that there may be a need for more general illumination in this plant. A study should be made, therefore, to determine whether the general lighting is adequate.

45. A laborer crawled under a printing press to clean. When the operator started the press, the traveling bed crushed the cleaner. Investigation disclosed that the operator had not been informed of the cleaner's presence.

Powered equipment which is being cleaned or repaired should have the starting switch tagged "Do not operate" or, preferably, should be locked if the operator cannot readily see the cleaner or repairman.

46. A shipping department employee fell between a truck and the loading platform. Investigation disclosed that no dock plate was available and the truck had not been parked close to the dock.

(a) Management should provide all necessary equipment. In this case, suitable dock plates should be provided and stored in a convenient location.

(b) All employees should be thoroughly trained in the safe performance of their duties. At loading platforms, trucks should be parked close enough to eliminate openings between the trucks and the platforms.

47. A shipping laborer was loading bundles of boxes into a freight car. When the dock plate slipped off the car, the employee fell between the freight car and the dock. Investigation disclosed that the dock plate had not been fastened into place.

Dock plates should be anchored to prevent them from slipping. Compliance with this rule can reasonably be assured by using dock plates equipped with a lug

or other device so arranged that they will not fit properly unless fastened into place.

48. An employee was looking for a specified skid load of stock. As he attempted to step from one skid load of paper to another, he slipped and fell between the loaded skids. Investigation disclosed that storage space was inadequate and, as a result, paper stock, stored in disorder, projected into the aisles.

Proper planning in the layout of all operations is essential for safety. Sufficient aisle space and ample storage facilities should be provided.

APPENDIX--STATISTICAL TABLES

The injury frequency rate is the average number of disabling work injuries for each million employee-hours worked. A disabling work injury is any injury which (a) results in death or any degree of permanent physical impairment, or (b) makes the injured worker unable to perform the duties of any regularly established job, which is open and available to him, throughout the hours corresponding to his regular shift on any one or more days after the day of injury

(including Sundays, days off, or plant shut-downs).

The severity rate is the average number of days lost for each 1,000 employee hours worked. The computations of days lost include standard time charges for fatalities and permanent disabilities as listed in the American Standard Method of Compiling Industrial Injury Rates, approved by the American Standards Association, 1945.

TABLE 1.--WORK-INJURY RATES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY PLANT PRODUCT AND PLANT SIZE, 1950

Product and size of plant	Number of establishments	Number of employees	Employee-hours worked (thousands)	Injury-frequency rates of--				Injury-severity		Severity rate
				All disabling injuries	Deaths	Permanent-partial disabilities	Temporary-total disabilities	Average time lost per--		
								Disabling injury	Temporary-total disability	
Total ¹	851	73,281	151,690	17.9	(²)	1.2	16.7	85	15	1.5
PRODUCT										
Corrugated and fiber boxes.....	172	25,679	53,807	23.0	0.1	.9	22.0	67	14	1.5
Fiber cans, tubes, drums.....	35	5,116	10,647	16.5	(²)	5.1	11.4	289	21	4.8
Folded boxes.....	189	19,875	41,903	16.7	(²)	.8	15.9	69	14	1.2
Setup boxes.....	424	20,043	39,898	12.9	(²)	1.1	11.8	76	17	1.0
SIZE OF PLANT										
1 to 19 employees.....	199	2,297	4,399	11.6	.....	.9	10.7	100	19	1.2
20 to 49 employees.....	279	9,168	18,211	13.6	.....	.9	12.7	62	17	.8
50 to 99 employees.....	160	11,260	23,191	19.1	.1	1.1	17.9	107	13	2.0
100 to 249 employees.....	146	23,089	48,592	20.5	(²)	.9	19.6	47	15	1.0
250 to 499 employees.....	53	17,541	36,062	19.0	(²)	1.4	17.6	101	15	1.9
500 employees and over.....	14	9,926	21,235	13.8	.1	2.0	11.7	160	15	2.2

¹ Includes figures not shown separately because of insufficient data.

² Less than 0.05.

TABLE 2.--DISTRIBUTION OF WORK-INJURY FREQUENCY RATES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY SIZE OF PLANT, 1950

Size of plant	Number of establishments with frequency rates of--															
	0	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-69	70-79	80 and over
Total.....	373	23	49	85	66	55	40	31	32	19	14	17	10	15	7	15
1 to 19 employees.....	166	.....	.....	.....	.....	1	3	1	5	2	2	3	4	4	1	7
20 to 49 employees.....	159	.....	1	21	21	23	10	5	11	4	6	7	1	5	2	3
50 to 99 employees.....	38	1	23	20	20	8	12	11	5	7	2	3	1	1	4	4
100 to 249 employees.....	10	12	19	28	15	16	8	11	8	4	3	3	3	5	.....	1
250 to 499 employees.....	.....	9	4	9	9	6	5	3	3	.....	1	1	1	.....	.....	.....
500 employees and over.....	.....	1	2	7	1	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 3.--INJURY-FREQUENCY RATES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY TYPE OF PLANT, GEOGRAPHIC AREA, AND STATE, 1950

Geographic area and State	Average all plants	Injury-frequency rates of plants manufacturing--			
		Corrugated and fiber boxes	Fiber cans, tubes, drums, etc.	Folded boxes	Setup boxes
Total.....	19.1	23.0	16.5	16.7	12.9
New England area: Total.....	21.9	37.1	.....	23.7	13.2
Connecticut.....	21.8	.....	.....	23.9	15.3
Massachusetts.....	23.4	41.7	.....	23.1	14.1
Rhode Island.....	13.9	.....	.....	.....	.....
Middle Atlantic area: Total.....	19.1	25.1	21.7	18.9	13.4
New Jersey.....	18.3	20.0	26.0	16.5	11.8
New York.....	19.1	25.2	.....	19.6	11.7
Pennsylvania.....	19.4	27.9	10.6	19.8	15.3
East North Central area: Total.....	15.2	21.2	8.6	11.6	9.3
Illinois.....	11.5	15.4	.....	9.3	7.1
Indiana.....	25.6	41.1	.....	14.1	.....
Michigan.....	13.9	18.0	.....	12.6	.....
Ohio.....	16.8	22.9	8.4	12.3	.....
Wisconsin.....	12.1	11.4	.....	10.3	14.1
West North Central area: Total.....	18.4	24.4	.....	13.2	16.6
Minnesota.....	32.3	.....	.....	.....	.....
Missouri.....	13.1	21.3	.....	11.6	8.5
South Atlantic area: Total.....	15.3	21.9	.....	14.5	10.8
Florida.....	10.8	10.7	.....	.....	.....
Maryland.....	19.3	.....	.....	18.0	.....
North Carolina.....	13.1	.....	.....	.....	12.9
South Carolina.....	12.6	.....	.....	.....	.....
Virginia.....	15.7	.....	.....	.....	.....
West Virginia.....	28.0	29.8	.....	.....	.....
East South Central area: Total.....	24.2	26.5	.....	.....	.....
Tennessee.....	26.4	28.4	.....	.....	.....
West South Central area: Total.....	19.5	14.7	.....	25.6	.....
Louisiana.....	17.3	.....	.....	.....	.....
Texas.....	23.3	16.7	.....	24.4	.....
Pacific area: Total.....	15.3	12.5	.....	17.1	15.9
California.....	15.3	13.4	.....	14.7	16.9

TABLE 4.--DISTRIBUTION OF ESTABLISHMENTS, EMPLOYEES, INJURIES, AND DAYS LOST IN THE PAPERBOARD-CONTAINER INDUSTRY, BY INJURY-FREQUENCY RATES, 1950

Frequency rates of establishments	Establishments			Employees			Injuries			Days lost		
	Number	Cumulative		Number	Cumulative		Number	Cumulative		Number	Cumulative	
		Number	Percent		Number	Percent		Number	Percent		Number	Percent
100 and over.....	8	8	0.9	190	190	0.3	40	40	1.5	503	503	0.2
90-99.....	4	12	1.4	222	412	.6	42	82	3.0	7,765	8,268	3.6
80-89.....	3	15	1.8	292	704	1.0	48	130	4.8	832	9,100	3.9
70-79.....	7	22	2.6	331	1,035	1.4	44	174	6.4	1,082	10,182	4.4
60-69.....	15	37	4.3	1,056	2,091	2.9	127	301	11.1	4,655	14,837	6.4
55-59.....	10	47	5.5	852	2,943	4.0	104	405	14.9	7,836	22,673	9.8
50-54.....	17	64	7.5	1,262	4,205	5.7	131	536	19.7	16,722	39,395	17.1
45-49.....	14	78	9.2	1,187	5,392	7.4	114	650	23.9	6,476	45,871	19.9
40-44.....	19	97	11.4	1,949	7,341	10.0	163	813	29.9	32,840	78,711	34.1
35-39.....	32	129	15.2	3,051	10,392	14.2	236	1,049	38.6	9,666	88,377	38.3
30-34.....	31	160	18.8	3,649	14,041	19.2	249	1,298	47.8	4,960	93,337	40.4
25-29.....	40	200	23.5	5,651	19,692	26.9	317	1,615	59.5	27,962	121,299	52.5
20-24.....	55	255	30.1	6,149	25,841	35.3	279	1,894	69.8	11,675	132,974	57.6
15-19.....	66	321	37.7	8,303	34,144	46.6	294	2,188	80.6	22,292	155,266	67.2
10-14.....	85	406	47.7	15,138	49,282	67.3	374	2,562	94.4	45,673	200,939	87.0
5-9.....	49	455	53.5	7,551	56,833	77.6	116	2,678	98.6	19,597	220,536	95.5
1-4.....	23	478	56.2	5,496	62,329	85.1	37	2,715	100.0	10,473	231,009	100.0
0.....	373	851	100.0	10,952	73,281	100.0	.....	.....	100.0	.....	.....	100.0

TABLE 5.--WORK-INJURY RATES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY OPERATION, 1950

Operations	Number of units reporting	Number of employees	Employee-hours worked (thousands)	Injury-frequency rate of--				Injury severity		Severity rate
				All disabling injuries	Deaths	Permanent partial disabilities	Temporary total disabilities	Average time lost per--		
								Disabling injury	Temporary total disability	
Total ¹	851	73,281	151,690	17.9	(²)	1.2	16.7	85	15	1.5
Production operations.....	704	34,431	71,376	18.2	(²)	1.0	17.2	57	14	1.0
Bending, breaking, folding.....	296	1,256	2,595	15.4	.....	.....	15.4	16	16	.2
Corner cutting.....	376	773	1,547	17.5	.....	3.9	13.6	83	22	1.5
Corrugating.....	115	2,185	4,703	42.5	0.2	1.5	40.8	91	15	3.9
Covering, topping, turning in-hand.....	360	2,309	4,599	6.3	.....	.4	5.9	43	24	.3
Creasing.....	155	838	1,804	17.2	.....	1.7	15.5	54	12	.9
Cutting.....	367	1,969	4,170	22.5	.....	1.7	20.8	70	15	1.6
Cutting and creasing: integrated.....	54	905	1,909	17.3	.....	1.0	16.3	69	11	1.2
Gluing.....	324	3,673	7,650	12.9	.....	.7	12.2	58	16	.7
Labeling.....	239	627	1,217	7.4	.....	.....	7.4	32	32	.2
Machine wrapping.....	362	2,555	5,088	15.1	.....	1.4	13.7	52	14	.8
Printing.....	391	5,507	11,730	22.7	.....	1.4	21.3	83	14	1.9
Scoring.....	391	806	1,678	14.3	.....	.....	14.3	18	18	.3
Slitting.....	308	1,126	2,320	16.4	.....	.9	15.5	26	11	.4
Slotting.....	131	506	1,047	17.2	.....	1.0	16.2	28	12	.5
Staying.....	453	2,562	5,229	18.2	.....	1.0	17.2	27	12	.5
Stitching.....	228	1,493	3,029	19.8	.....	2.0	17.8	51	12	1.0
Stripping.....	358	2,365	4,912	15.1	.....	.2	14.9	17	13	.3
Tying and bundling.....	555	2,976	6,149	14.1	.....	.....	14.1	10	10	.1
Service operations.....	600	13,985	29,046	14.6	.....	1.0	13.6	89	16	1.3
Administrative and clerical.....	587	7,172	14,521	1.7	.....	.....	1.7	13	13	(²)
Die making.....	254	603	1,297	8.5	.....	1.5	7.0	60	7	.5
Maintenance and power.....	455	2,700	5,737	24.8	.....	2.4	22.4	115	15	2.8
Shipping.....	217	1,989	4,226	30.8	.....	.7	30.1	42	17	1.3
Storage.....	279	1,521	3,271	35.8	.....	2.8	33.0	128	19	4.6

¹ Includes figures not shown separately because of insufficient data.
² Less than 0.05.

TABLE 6.--DISABLING INJURIES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY NATURE OF INJURY, PART OF BODY, AND TYPE OF PLANT, 1950

Nature of injury and part of body injured	Total injuries		Injuries in plants manufacturing--							
			Corrugated and fiber boxes		Fiber cans, drums, tubes, etc.		Folded boxes		Setup boxes	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	¹ 1,505	100.0	778	100.0	48	100.0	434	100.0	240	100.0
INJURY										
Bruises, contusions.....	461	30.6	239	30.6	12	24.9	144	33.3	66	27.5
Strains, sprains.....	419	27.8	221	28.3	8	16.7	118	27.2	70	29.2
Cuts, lacerations, punctures.....	310	20.6	154	19.8	11	22.9	86	19.8	58	24.2
Fractures.....	172	11.4	86	11.1	7	14.6	53	12.2	24	10.0
Amputations.....	51	3.4	16	2.1	5	10.4	16	3.7	14	5.8
Foreign bodies, (not elsewhere classified).....	33	2.2	24	3.1	1	2.1	6	1.4	2	.8
Hernias.....	30	2.0	16	2.1	2	4.2	8	1.8	4	1.7
Burns, scalds.....	19	1.3	16	2.1	1	2.1	1	.2	1	.4
Industrial diseases.....	7	.5	4	.5	1	2.1	1	.2	1	.4
Other.....	3	.2	2	.3	.....	.....	1	.2	.....	.....
PART OF BODY INJURED										
Head.....	98	6.5	59	7.6	4	8.3	25	5.8	10	4.2
Eye.....	51	3.4	36	4.6	1	2.1	11	2.6	3	1.2
Brain or skull.....	11	.7	7	.9	1	2.1	3	.7	.....	.....
Other.....	36	2.4	16	2.1	2	4.1	11	2.5	7	3.0
Trunk.....	371	24.7	178	22.9	11	22.9	120	27.6	61	25.4
Back.....	204	13.6	98	12.6	6	12.5	68	15.7	31	13.0
Abdomen.....	66	4.4	35	4.5	3	6.2	14	3.2	14	5.8
Shoulder.....	50	3.3	24	3.1	1	2.1	17	3.9	8	3.3
Chest (lungs, ribs, etc.).....	30	2.0	13	1.7	1	2.1	11	2.5	5	2.1
Hip, pelvis.....	10	.7	5	.6	.....	.....	3	.7	2	.8
Other.....	11	.7	3	.4	.....	.....	7	1.6	1	.4
Upper extremities.....	585	38.9	284	36.5	19	39.6	164	37.8	116	48.3
Arm.....	82	5.4	48	6.2	.....	.....	22	5.1	12	5.0
Hand.....	165	11.0	82	10.5	5	10.4	50	11.5	27	11.2
Finger, thumb.....	338	22.5	154	19.8	14	29.2	92	21.2	77	32.1
Lower extremities.....	434	28.8	247	31.7	13	27.1	120	27.6	52	21.7
Leg.....	128	8.5	73	9.4	5	10.5	36	8.3	13	5.4
Foot.....	194	12.9	114	14.6	4	8.3	48	11.0	27	11.3
Toe.....	112	7.4	60	7.7	4	8.3	36	8.3	12	5.0
Body--general.....	17	1.1	10	1.3	1	2.1	5	1.2	1	.4

¹ Includes figures not shown separately because of insufficient data to classify.

TABLE 7.--DISABLING INJURIES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY NATURE OF INJURY AND PART OF BODY INJURED, 1950

Part of body injured	Total number of injuries	Bruises, contusions	Strains, sprains	Cuts, lacerations, punctures	Fractures	Amputations	Foreign bodies, (n.e.c.)	Hernias	Burns, scalds	Industrial diseases	Other
Total.....	1,505	461	419	310	172	51	33	30	19	7	3
Head.....	98	34	3	23	1	.....	33	.....	4	.....	.....
Eye.....	51	7	.....	9	.....	.....	33	.....	2	.....	.....
Brain or skull.....	11	9	.....	2	.....	.....	.....	.....	.....	.....	.....
Other.....	36	18	3	12	1	.....	.....	.....	2	.....	.....
Trunk.....	371	77	252	1	11	.....	.....	30	.....	.....	.....
Back.....	204	21	179	.....	4	.....	.....	.....	.....	.....	.....
Abdomen.....	66	14	21	1	.....	.....	.....	30	.....	.....	.....
Shoulder.....	50	10	39	.....	1	.....	.....	.....	.....	.....	.....
Chest (lungs, ribs, etc.).....	30	19	7	.....	4	.....	.....	.....	.....	.....	.....
Hip, pelvis.....	10	5	4	.....	1	.....	.....	.....	.....	.....	.....
Other.....	11	8	2	.....	1	.....	.....	.....	.....	.....	.....
Upper extremities.....	585	139	74	248	60	50	.....	.....	10	4	.....
Arm.....	82	24	27	12	9	.....	.....	.....	9	1	.....
Hand.....	165	50	38	62	11	1	.....	.....	1	2	.....
Finger, thumb.....	338	65	9	174	40	49	.....	.....	.....	1	.....
Lower extremities.....	434	205	90	37	99	1	.....	.....	1	.....	1
Leg.....	128	68	31	21	8	.....	.....	.....	.....	.....	.....
Foot.....	194	86	58	11	38	.....	.....	.....	1	.....	.....
Toe.....	112	51	1	5	53	1	.....	.....	.....	.....	1
Body-general.....	17	6	.....	1	1	.....	.....	.....	4	3	2

TABLE 8.--DISABLING INJURIES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY NATURE OF INJURY AND AGENCY OF INJURY, 1950

Agency of injury	Total number of injuries	Bruises, contusions	Strains, sprains	Cuts, lacerations, punctures	Fractures	Amputations	Foreign bodies, (n.e.c.)	Hernias	Burns, scalds	Industrial diseases	Other
Total.....	1,505	461	419	310	172	51	33	30	19	7	3
Machines.....	359	109	13	150	36	48	.....	.....	3	.....	.....
Printing presses.....	70	25	2	26	8	9	.....	.....	.....	.....	.....
Creasers and cutters.....	36	6	.....	19	5	6	.....	.....	.....	.....	.....
Saws.....	29	.....	.....	22	2	5	.....	.....	.....	.....	.....
Gluing machines.....	27	13	3	7	2	2	.....	.....	.....	.....	.....
Staying machines.....	27	12	1	6	3	5	.....	.....	.....	.....	.....
Stitchers.....	23	5	.....	13	3	2	.....	.....	.....	.....	.....
Wrapping machines.....	23	8	1	11	1	2	.....	.....	.....	.....	.....
Taping machines.....	23	13	3	4	2	1	.....	.....	.....	.....	.....
Corrugators.....	19	7	.....	6	2	1	.....	.....	3	.....	.....
Other machines.....	82	20	3	36	8	15	.....	.....	.....	.....	.....
Paper products.....	273	47	170	34	8	1	.....	13	.....	.....	.....
Boxes, cartons.....	126	21	86	13	2	.....	.....	4	.....	.....	.....
Rolls.....	42	15	18	1	4	1	.....	3	.....	.....	.....
Other paper products.....	105	11	66	20	2	.....	.....	6	.....	.....	.....
Vehicles.....	161	78	33	17	30	.....	.....	3	.....	.....	.....
Hand trucks.....	132	67	30	10	23	.....	.....	2	.....	.....	.....
Other vehicles.....	29	11	3	7	7	.....	.....	1	.....	.....	.....

TABLE 8.--DISABLING INJURIES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY NATURE OF INJURY AND AGENCY OF INJURY, 1950--Continued

Agency of injury	Total number of injuries	Bruises, contusions	Strains, sprains	Cuts, lacerations, punctures	Fractures	Amputations	Foreign bodies (n.e.c.)	Hernias	Burns, scalds	Industrial diseases	Other
Working surfaces.....	134	55	34	12	30			3			
Floors.....	87	34	24	6	23						
Ground.....	22	9	5	3	3			2			
Ramps and platforms.....	21	9	5	3	3			1			
Other working surfaces.....	4	3			1						
Skids.....	96	47	20	8	18			3			
Bodily motions.....	86	1	81		1			3			
Shafts, rolls.....	62	28	9	5	20						
Hand tools.....	47	13	7	22	4	1					
Metal parts.....	44	12	8	12	9			2			1
Foreign bodies.....	39	2		3			33		1		
Tables.....	16	8	3	5							
Other agencies.....	182	60	40	42	14	1		2	15	7	1
Unclassified; insufficient data.....	6	1	1		2			1			1

TABLE 9.--DISABLING INJURIES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY PART OF BODY INJURED AND AGENCY OF INJURY, 1950

Agency of injury	Total number of injuries	Head				Trunk							Upper extremities				Lower extremities				Body general
		Total	Eye	Brain or skull	Other	Total	Back	Abdomen	Shoulder	Chest	Hip or pelvis	Other	Total	Arm	Hand	Finger	Total	Leg	Foot	Toe	
Total.....	1,505	98	51	11	36	371	204	66	50	30	10	11	585	82	165	338	434	128	194	112	17
Machines.....	359	5	1	3	1	13	5	2	2	3	.....	1	312	22	66	224	27	15	8	4	2
Printing presses.....	70	2	.....	1	1	5	1	.....	1	2	.....	1	58	7	21	30	5	5	.....	.....	.....
Creasers and cutters.....	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33	2	5	26	2	1	1	.....	1
Saws.....	29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29	.....	3	26	.....	.....	.....	.....	.....
Gluing machines.....	27	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	25	3	6	16	1	.....	1	.....	.....
Staying machines.....	27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26	.....	3	23	1	1	.....	.....	.....
Stitchers.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22	.....	3	19	1	.....	.....	1	.....
Wrapping machines.....	23	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	22	3	5	14	.....	.....	.....	.....	.....
Taping machines.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	3	5	5	9	3	4	2	1
Corrugators.....	19	1	1	.....	2	.....	.....	1	1	.....	.....	.....	14	3	4	7	2	2	.....	.....	.....
Other machines.....	82	2	.....	2	.....	4	3	1	.....	.....	.....	.....	70	1	11	58	6	3	2	1	.....
Paper Products.....	273	18	11	.....	7	141	83	30	16	8	2	2	89	21	43	25	25	15	6	4	.....
Boxes, cartons.....	126	11	6	.....	5	64	41	9	8	6	.....	.....	45	11	23	11	6	4	2	.....	.....
Rolls.....	42	.....	.....	.....	21	9	8	3	.....	1	.....	.....	7	2	2	3	14	7	3	4	.....
Other paper products.....	105	7	5	.....	2	56	33	13	5	2	1	2	37	8	18	11	5	4	1	.....	.....
Vehicles.....	161	8	.....	1	7	38	20	8	4	4	1	1	19	4	4	11	96	18	45	33	.....
Hand trucks.....	132	7	.....	1	6	32	16	7	4	3	1	1	11	3	4	4	82	11	40	31	.....
Other vehicles.....	29	1	.....	.....	1	6	4	1	.....	1	.....	.....	8	1	.....	7	14	7	5	2	.....

TABLE 9.--DISABLING INJURIES IN THE PAPERBOARD-CONTAINER INDUSTRY, BY PART OF BODY INJURED AND AGENCY OF INJURY, 1950--Continued

Agency of injury	Total number of injuries	Head				Trunk							Upper extremities				Lower extremities				Body general
		Total	Eye	Brain or skull	Other	Total	Back	Abdomen	Shoulder	Chest	Hip or pelvis	Other	Total	Arm	Hand	Finger	Total	Leg	Foot	Toe	
Working surfaces.....	134	5	.....	2	3	44	20	3	9	5	5	2	27	16	7	4	54	27	24	3	4
Floors.....	87	5	.....	2	3	28	12	.....	7	3	4	2	20	14	4	2	32	15	16	1	2
Ground.....	22	.....	.....	.....	11	5	2	2	.....	.....	.....	.....	3	2	1	.....	6	4	2	.....	2
Ramps and platforms.....	21	.....	.....	.....	4	3	1	.....	.....	.....	.....	.....	3	.....	1	2	14	6	6	2	.....
Other working surfaces..	4	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	1	.....	1	.....	2	2	.....	.....	.....
Skids.....	96	.....	.....	.....	22	12	6	2	2	.....	.....	.....	9	1	3	5	64	16	31	17	1
Bodily motions.....	86	1	.....	.....	1	40	26	5	8	.....	1	.....	1	1	.....	.....	44	12	32	.....	.....
Shafts, rolls.....	62	3	.....	.....	3	9	5	.....	2	1	.....	1	20	.....	5	15	30	1	10	19	.....
Hand tools.....	47	2	.....	1	1	6	1	1	1	1	.....	2	27	5	11	11	12	7	2	3	.....
Metal parts.....	44	1	.....	.....	1	11	6	3	2	.....	.....	.....	11	.....	4	7	19	2	9	8	2
Foreign bodies.....	39	36	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	2	.....	1	.....	.....	.....	.....	.....
Tables.....	16	1	.....	.....	1	6	2	1	.....	2	.....	1	7	1	.....	6	2	2	.....	.....	.....
Other agencies.....	182	18	3	4	11	40	24	6	4	4	1	1	56	8	21	27	61	13	27	21	7
Unclassified; insufficient data.....	6	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	4	1	1	2	.....	.....	.....	.....	1

TABLE 10.--WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER

Accident type	Total number of accidents	Machines	Paper products			Vehicles		Working surfaces	
			Total ¹	Boxes, cartons	Rolls	Total ¹	Hand trucks	Total ¹	Floors
Total.....	1,505	359	273	126	42	161	132	134	87
Caught in, on, or between: Total.....	376	258	10	2	7	68	59	6	.....
Moving parts of equipment: Total.....	258	252	.....	.....	.....	2	1	.....	.....
Points of operation.....	175	175	.....	.....	.....	.....	.....	.....	.....
Gears, pulleys, belts, etc.....	48	48	.....	.....	.....	.....	.....	.....	.....
Other parts.....	35	29	.....	.....	.....	2	1	.....	.....
Rolling or falling objects.....	77	1	8	1	7	62	56	1	.....
Other.....	41	5	2	1	.....	4	2	5	.....
Struck by moving object: Total.....	339	9	53	28	12	39	34	4	.....
Falling objects: Totals.....	211	.....	30	16	8	17	17	4	.....
From hands of workers.....	100	.....	9	4	4	10	10	2	.....
From equipment.....	43	.....	4	.....	3	.....	.....	.....	.....
From piles of materials.....	26	.....	16	11	1	.....	.....	.....	.....
From other elevations.....	42	.....	1	1	.....	7	7	2	.....
Flying or thrown objects: Total.....	49	.....	5	3	.....	.....	.....	.....	.....
Small particles.....	39	.....	.....	.....	.....	.....	.....	.....	.....
Other.....	10	.....	5	3	.....	.....	.....	.....	.....
Hand-operated or -wielded objects.....	46	.....	9	5	.....	9	9	.....	.....
Rollings objects.....	5	.....	4	.....	4	1	1	.....	.....
Other.....	28	9	5	4	.....	12	7	.....	.....
Overexertion: Total.....	285	8	177	84	21	25	24	1	.....
Due to lifting.....	196	2	140	60	17	3	3	1	.....
Due to pulling or pushing.....	46	4	9	3	4	20	19	.....	.....
Due to prolonged motions.....	31	.....	25	19	.....	.....	.....	.....	.....
Other.....	12	2	3	2	.....	2	2	.....	.....
Striking against objects: Total.....	229	77	32	11	2	22	12	6	2
Rubbing against objects.....	48	2	24	8	.....	.....	.....	.....	.....
Walking into objects.....	29	2	.....	.....	.....	5	5	.....	.....
Other.....	152	73	8	3	2	17	7	6	2
Falls on same level: Total.....	96	3	1	1	.....	6	3	63	50
As a result of slips.....	49	3	.....	.....	.....	1	.....	31	25
As a result of trips.....	26	.....	.....	.....	.....	2	2	19	16
Other.....	21	.....	1	1	.....	3	1	13	9
Slips and stumbles: Total.....	70	3	.....	.....	.....	.....	.....	1	1
On loose objects.....	23	.....	.....	.....	.....	.....	.....	.....	.....
On floors.....	22	1	.....	.....	.....	.....	.....	1	1
Other.....	25	2	.....	.....	.....	.....	.....	.....	.....
Falls to different levels: Total.....	62	1	.....	.....	.....	1	.....	53	34
From platforms, ramps, etc.....	19	.....	.....	.....	.....	1	.....	17	6
From other elevations.....	43	1	.....	.....	.....	.....	.....	36	28
Exposure to extreme temperatures.....	14	.....	.....	.....	.....	.....	.....	.....	.....
Other accident types.....	29	.....	.....	.....	.....	.....	.....	.....	.....
Unclassified; insufficient data.....	5	.....	.....	.....	.....	.....	.....	.....	.....

¹ Totals include figures not shown separately because of insufficient space.

INDUSTRY, BY AGENCY OF INJURY AND ACCIDENT TYPE, 1950

Accident type	Skids	Bodily motions	Shafts, rolls	Hand tools	Metal parts	Foreign bodies	Other	Unclassified
Total.....	96	86	62	47	44	39	198	6
Caught in, or between: Total.....	8		12				14	
Moving parts of equipment: Total.....							4	
Points of operation.....								
Gears, pulleys, belts, etc.....								
Other parts.....							4	
Rolling or falling objects.....	3		1				1	
Other.....	5		11				9	
Struck by moving objects: Total.....	46		39	35	24	39	51	
Falling objects: Total.....	45		38	10	22		45	
From hands of workers.....	28		21	8	5		17	
From equipment.....	2		12	2	14		9	
From piles of materials.....			2		1		7	
From other elevations.....	15		3		2		12	
Flying or thrown objects: Total.....				2	2	39	1	
Small particles.....						39		
Other.....				2	2		1	
Hand-operated or -wielded objects.....	1		1	23			3	
Rolling objects.....								
Other.....							2	
Overexertion: Total.....	18		8	7	10		31	
Due to lifting.....	12		8		9		21	
Due to pulling or pushing.....	5						8	
Due to prolonged motions.....				6				
Other.....	1			1	1		2	
Striking against objects: Total.....	17		2	5	9		58	1
Rubbing against objects.....	1			2	4		14	1
Walking into objects.....	13				3		6	
Other.....	3		2	3	2		38	
Falls on same level: Total.....	5		1		1		16	
As a result of slips.....	1		1		1		11	
As a result of trips.....	3						2	
Other.....	1						3	
Slips and stumbles: Total.....		65					1	
On loose objects.....		23						
On floors.....		20						
Other.....		22					1	
Falls to different levels: Total.....	2						5	
From platforms, ramps, etc.....							1	
From other elevations.....	2						4	
Exposure to extreme temperatures.....							14	
Other accident types.....		21					8	
Unclassified; insufficient data.....								5

TYPE 11.--WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY NATURE OF INJURY AND ACCIDENT TYPE, 1950

Accident type	Total number of injuries	Bruises, contusions	Strains, sprains	Cuts, lacerations, punctures	Fractures	Amputations	Foreign bodies, (n.e.c.)	Hernias	Burns, scalds	Industrial diseases	Other
Total.....	1,505	461	419	310	172	51	33	30	19	7	3
Caught in, on, or between: Total.....	376	140	12	117	58	45	.....	.....	4	.....	.....
Moving parts of equipment: Total.....	258	74	3	100	33	44	.....	.....	4	.....	.....
Points of operation.....	175	43	1	70	27	31	.....	.....	3	.....	.....
Gears, pulleys, belts, etc.....	48	17	1	17	3	10	.....	.....	.....	.....	.....
Other parts.....	35	14	1	13	3	3	.....	.....	1	.....	.....
Rolling or falling objects.....	77	42	6	6	22	1	.....	.....	.....	.....	.....
Other.....	41	24	3	11	3	.....	.....	.....	.....	.....	.....
Struck by moving objects: Total.....	339	169	10	51	72	1	33	1	1	.....	1
Falling objects: Total.....	211	122	7	11	69	.....	.....	1	.....	.....	1
From hands of workers.....	100	59	1	6	34	.....	.....	.....	.....	.....	.....
From equipment.....	43	22	1	2	17	.....	.....	.....	.....	.....	1
From piles of materials.....	26	15	4	.....	6	.....	.....	1	.....	.....	.....
From other elevations.....	42	26	1	3	12	.....	.....	.....	.....	.....	.....
Flying or thrown objects: Total.....	49	7	1	6	.....	1	33	.....	1	.....	.....
Small particles.....	39	2	.....	3	.....	.....	33	.....	1	.....	.....
Other.....	10	5	1	3	.....	1	.....	.....	.....	.....	.....
Hand-operated or-wielded objects.....	46	20	1	23	2	.....	.....	.....	.....	.....	.....
Rolling objects.....	5	3	1	1	.....	.....	.....	.....	.....	.....	.....
Other.....	28	17	.....	10	1	.....	.....	.....	.....	.....	.....
Overexertion: Total.....	285	1	263	.....	1	.....	.....	20	.....	.....	.....
Due to lifting.....	196	1	178	.....	1	.....	.....	16	.....	.....	.....
Due to pulling or pushing.....	46	.....	42	.....	.....	.....	.....	4	.....	.....	.....
Due to prolonged motions.....	31	.....	31	.....	.....	.....	.....	.....	.....	.....	.....
Other.....	12	.....	12	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 11.--WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY NATURE OF INJURY AND ACCIDENT TYPE, 1950--Continued

Accident types	Total number of injuries	Bruises, contusions	Strains, sprains	Cuts, lacerations, punctures	Fractures	Amputations	Foreign bodies, (n.e.c.)	Hernias	Burns, scalds	Industrial diseases	Other
Striking against objects: Total.....	229	73	15	127	7	5	.....	2	.....	.....	.....
Rubbing against objects.....	48	9	1	38	.....	.....	.....	.....	.....	.....	.....
Walking into objects.....	29	16	2	9	2	.....	.....	.....	.....	.....	.....
Other.....	152	48	12	80	5	5	.....	2	.....	.....	.....
Falls on same level: Total.....	96	47	24	10	13	.....	.....	1	1	.....	.....
As a result of slips.....	49	22	14	5	7	.....	.....	.....	1	.....	.....
As a result of trips.....	26	12	5	4	5	.....	.....	.....	.....	.....	.....
Other.....	21	13	5	1	1	.....	.....	1	.....	.....	.....
Slips and stumbles: Total.....	70	5	60	1	1	.....	.....	3	.....	.....	.....
On loose objects.....	23	.....	22	.....	.....	.....	.....	1	.....	.....	.....
On floors.....	22	2	20	.....	.....	.....	.....	.....	.....	.....	.....
Other.....	25	3	18	1	1	.....	.....	2	.....	.....	.....
Falls to different levels: Total.....	62	25	13	4	18	.....	.....	2	.....	.....	.....
From platforms, ramps, etc.....	19	10	4	1	4	.....	.....	.....	.....	.....	.....
From other elevations.....	43	15	9	5	14	.....	.....	2	.....	.....	.....
Exposure to extreme temperatures.....	14	.....	.....	.....	.....	.....	.....	.....	12	1	1
Other accident types.....	29	1	21	.....	.....	.....	.....	.....	1	6	.....
Unclassified; insufficient data.....	5	.....	1	.....	2	.....	.....	1	.....	.....	1

TABLE 12. --WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY PART OF BODY INJURED AND ACCIDENT TYPE, 1950--Continued

Accident type	Total number of injuries	Head				Trunk							Upper extremities				Lower extremities				Body general
		Total	Eye	Brain or skull	Other	Total	Back	Abdomen	Shoulder	Chest	Hip or pelvis	Other	Total	Arm	Hand	Finger	Total	Leg	Foot	Toe	
Striking against objects.....	229	5	.....	2	3	19	7	5	1	4	1	1	153	16	50	87	52	24	25	3	....
Rubbing against objects.....	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44	2	21	21	4	1	1	2	....
Walking into objects.....	29	.....	.....	.....	4	.....	.....	.....	1	1	1	1	4	2	1	1	21	10	11	.....	....
Other.....	152	5	.....	2	3	15	7	5	.....	3	.....	.....	105	12	28	65	27	13	13	1	....
Falls on same level.....	96	6	.....	2	4	34	16	2	6	5	2	3	18	9	8	1	37	25	11	1	1
As a result of slips.....	49	1	.....	.....	1	15	4	1	4	3	1	2	13	5	7	1	19	11	7	1	1
As a result of trips.....	26	3	.....	.....	3	10	7	.....	.....	2	1	.....	4	3	1	.....	9	7	2	.....	....
Other.....	21	2	.....	2	.....	9	5	1	2	.....	.....	1	1	1	.....	.....	9	7	2	.....	....
Slips and stumbles.....	70	.....	.....	.....	.....	24	15	4	4	.....	1	.....	.....	.....	.....	.....	46	14	32	.....	....
On loose objects.....	23	.....	.....	.....	.....	7	4	2	1	.....	.....	.....	.....	.....	.....	.....	16	4	12	.....	....
On floors.....	22	.....	.....	.....	.....	12	9	.....	2	.....	1	.....	.....	.....	.....	.....	10	3	7	.....	....
Other.....	25	.....	.....	.....	.....	5	2	2	1	.....	.....	.....	.....	.....	.....	.....	20	7	13	.....	....
Falls to different levels...	62	4	.....	2	2	26	10	2	5	5	3	1	11	8	2	1	18	4	14	.....	3
From platforms, ramps, etc.....	19	.....	.....	.....	.....	9	4	.....	3	2	.....	.....	4	3	.....	1	5	.....	5	.....	1
From other elevations.....	43	4	.....	2	2	17	6	2	2	3	3	1	7	5	2	.....	13	4	9	.....	2
Exposure to extreme temperatures.....	14	2	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	5	5	.....	.....	2	.....	1	1	5
Other accident types.....	29	2	1	.....	1	17	11	1	5	.....	.....	.....	5	2	2	1	3	2	.....	1	2
Unclassified; insufficient data.....	5	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	3	1	.....	2	.....	.....	.....	.....	1

TABLE 13.--WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY TYPE OF PLANT AND ACCIDENT TYPE, 1950

Accident type	Total number of accidents		Accidents in plants manufacturing--							
			Corrugated and fiber boxes		Fiber cans, drums, tubes, etc.		Folded boxes		Setup boxes	
	Number	Percent ²	Number	Percent ²	Number	Percent	Number	Percent ²	Number	Percent ²
Total ¹	1,505	100.0	778	100.0	48	100.0	434	100.0	240	100.0
Caught in, on, or between.....	376	25.1	178	22.9	12	25.0	98	22.7	87	36.4
Moving parts of equipment.....	258	17.3	114	14.7	10	20.8	60	13.9	73	30.6
Points of operation.....	175	11.8	67	8.6	8	16.6	40	9.3	60	25.1
Gears, pulleys, belts.....	48	3.2	21	2.7	1	2.1	17	3.9	9	3.8
Other parts.....	35	2.3	26	3.4	1	2.1	3	.7	4	1.7
Rolling or falling objects.....	77	5.1	43	5.5	.....	.....	26	6.0	8	3.3
Other.....	41	2.7	21	2.7	2	4.2	12	2.8	6	2.5
Struck by moving objects.....	339	22.6	190	24.6	14	29.1	104	24.1	31	13.0
Falling objects.....	211	14.0	112	14.6	11	22.9	69	16.0	19	8.0
From hands of workers.....	100	6.6	53	7.0	3	6.2	34	7.9	10	4.3
From equipment.....	43	2.9	18	2.3	4	8.4	16	3.7	5	2.1
From piles of materials.....	26	1.7	16	2.1	3	6.2	5	1.2	2	.8
From other elevations.....	42	2.8	25	3.2	1	2.1	14	3.2	2	.8
Flying or thrown objects.....	49	3.3	34	4.4	3	6.2	10	2.3	2	.8
Small particles.....	39	2.6	28	3.6	1	2.1	8	1.8	2	.8
Other.....	10	.7	6	.8	2	4.1	2	.5	.....	.....
Hand-operated or -wielded objects.....	46	3.1	25	3.2	.....	.....	16	3.7	5	2.1
Rolling objects.....	5	.3	4	.5	.....	.....	.....	.....	1	.4
Other.....	28	1.9	15	1.9	.....	.....	9	2.1	4	1.7
Overexertion.....	285	19.0	139	18.0	8	16.7	85	19.7	51	21.3
Due to lifting.....	196	13.0	92	11.9	6	12.5	60	13.9	37	15.5
Due to pulling or pushing.....	46	3.1	30	3.9	1	2.1	8	1.9	6	2.5
Due to prolonged motions.....	31	2.1	14	1.8	.....	.....	11	2.5	6	2.5
Other.....	12	.8	3	.4	1	2.1	6	1.4	2	.8
Striking against objects.....	229	15.3	117	15.1	9	18.7	67	15.5	35	14.6
Rubbing against objects.....	48	3.2	24	3.1	2	4.2	10	2.3	12	5.0
Walking into objects.....	29	1.9	15	1.9	1	2.1	8	1.9	5	2.1
Other.....	152	10.2	78	10.1	6	12.4	49	11.3	18	7.5
Falls on same level.....	96	6.4	46	5.9	.....	.....	35	8.1	15	6.3
As a result of slips.....	49	3.3	23	2.9	.....	.....	20	4.6	6	2.5
As a result of trips.....	26	1.7	10	1.3	.....	.....	9	2.1	7	3.0
Other.....	21	1.4	13	1.7	.....	.....	6	1.4	2	.8
Slips and stumbles.....	70	4.7	46	5.9	1	2.1	14	3.2	9	3.8
On loose objects.....	23	1.5	19	2.4	.....	.....	2	.5	2	.8
On floors.....	22	1.5	14	1.8	1	2.1	6	1.4	1	.4
Other.....	25	1.7	13	1.7	.....	.....	6	1.3	6	2.6
Falls to different levels.....	62	4.1	35	4.5	1	2.1	19	4.4	6	2.5
From platforms, ramps.....	19	1.3	9	1.2	.....	.....	8	1.9	2	.8
From other elevations.....	43	2.8	26	3.3	1	2.1	11	2.5	4	1.7
Exposure to extreme temperatures.....	14	.9	11	1.4	1	2.1	1	.2	1	.4
Other accident types.....	29	1.9	14	1.8	2	4.2	9	2.1	4	1.7
Unclassified; insufficient data.....	5	.....	2	.....	.....	.....	2	.....	1	.....

¹ Totals include figures not shown separately because of insufficient data to classify.
² Percents are based on classified cases only.

TABLE 14.--WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY ACCIDENT TYPE AND ACTIVITY OF INJURED, 1950

Activity of injured	Total number of accidents	Caught in, on, or between	Struck by moving objects	Over-exertion	Striking against objects	Falls on same level	Slips and stumbles	Falls to different levels	Exposure to extreme temperatures	Other accident types	Unclassified; insufficient data
Total.....	1,505	376	339	285	229	96	70	62	14	29	5
Operating machines.....	767	283	138	125	138	24	21	17	2	15	4
Setting-up or adjusting.....	152	70	19	11	33	7	4	2	1	4	1
Feeding.....	292	140	42	43	45	4	5	8	.....	4	1
Off-bearing.....	110	12	23	35	30	3	2	.....	.....	5	.....
Other and unclassified.....	213	61	54	36	30	10	10	7	1	2	2
Operating hand trucks.....	126	43	28	22	9	11	10	1	.....	2	.....
Walking.....	77	3	13	.....	15	31	8	6	1	.....	.....
Using hand tools.....	59	.....	33	12	6	2	1	1	3	1	.....
Stripping hammers.....	25	.....	10	8	4	1	1	.....	.....	1	.....
Other.....	34	.....	23	4	2	1	.....	1	3	.....	.....
Loading trucks and cars.....	50	6	12	14	4	5	2	7	.....	.....	.....
Stepping up or down.....	50	2	2	.....	8	7	19	11	.....	1	.....
Other and unclassified.....	376	39	113	112	49	16	9	19	8	10	1

TABLE 15.--WORK ACCIDENTS IN THE PAPERBOARD-

Accident type	Total number of accidents	Hazardous working procedures					Inadequately guarded		
		Total ¹	Moving heavy loads by hand	Feeding stock by hand	Working in confined areas	Unsafe layout of traffic	Total ¹	Lack of point-of-operation guards	Lack of power-transmission guards
Total.....	1,461	404	196	41	40	33	356	207	90
Caught, in, on, or between.....	368	49	11	1	2	23	251	165	46
Moving parts of equipment.....	251	.....	.....	.....	.....	.....	244	165	46
Points of operation.....	169	.....	.....	.....	.....	.....	164	164	.....
Gears, pulleys, belts.....	48	.....	.....	.....	.....	.....	47	1	46
Other parts.....	34	.....	.....	.....	.....	.....	33	.....	.....
Rolling or falling objects.....	77	31	6	1	.....	23	2	.....	.....
Other.....	40	18	5	.....	2	.....	5	.....	.....
Struck by moving objects.....	334	87	55	4	4	5	22	1	3
Falling objects.....	208	68	53	1	.....	.....	9	.....	.....
From hands of workers.....	99	68	53	1	.....	.....	.....	.....	.....
From equipment.....	42	.....	.....	.....	.....	.....	3	.....	.....
From piles of materials.....	26	.....	.....	.....	.....	.....	.....	.....	.....
From other elevations.....	41	.....	.....	.....	.....	.....	6	.....	.....
Flying or thrown objects.....	48	.....	.....	.....	.....	.....	6	.....	3
Small particles.....	38	.....	.....	.....	.....	.....	2	.....	.....
Other.....	10	.....	.....	.....	.....	.....	4	.....	3
Hand-operated or -wielded objects.....	45	16	1	3	4	3	.....	.....	.....
Rolling objects.....	5	2	1	.....	.....	1	1	.....	.....
Other.....	28	1	.....	.....	.....	1	6	1	.....
Overexertion.....	266	185	128	28	1	.....	.....	.....	.....
Due to lifting.....	182	124	97	7	1	.....	.....	.....	.....
Due to pulling or pushing.....	43	29	27	.....	.....	.....	.....	.....	.....
Due to prolonged motions.....	31	28	.....	21	.....	.....	.....	.....	.....
Other.....	10	4	4	.....	.....	.....	.....	.....	.....
Striking against objects.....	222	40	1	8	19	5	90	41	.....
Rubbing against objects.....	48	8	.....	4	.....	.....	1	.....	.....
Walking into objects.....	29	12	.....	.....	10	2	.....	.....	.....
Other.....	145	20	1	4	9	3	49	41	.....
Falls on same level.....	96	13	1	.....	9	.....	2	.....	.....
As a result of slips.....	49	3	1	.....	.....	.....	.....	.....	.....
As a result of trips.....	26	7	.....	.....	7	.....	.....	.....	.....
Other.....	21	3	.....	.....	2	.....	2	.....	.....
Slips and stumbles.....	69	5	.....	.....	2	.....	2	.....	.....
On loose objects.....	23	1	.....	.....	1	.....	.....	.....	.....
On floors.....	22	3	.....	.....	1	.....	1	.....	.....
Other.....	24	1	.....	.....	.....	.....	1	.....	.....
Falls to different levels.....	59	15	.....	.....	1	.....	23	.....	1
From platforms, ramps.....	19	2	.....	.....	.....	.....	13	.....	.....
From other elevations.....	40	13	.....	.....	1	.....	10	.....	1
Exposure to extreme temperatures.....	14	5	.....	.....	.....	.....	5	.....	.....
Other accident types.....	29	5	.....	.....	2	.....	1	.....	.....
Unclassified; insufficient data.....	4	.....	.....	.....	.....	.....	.....	.....	.....

¹ Totals include figures not shown separately because of insufficient space.

CONTAINER INDUSTRY, BY HAZARDOUS WORKING CONDITION AND ACCIDENT TYPE, 1950

Accident type	Defects of agencies				Hazardous arrangement or placement	Poor house-keeping	Lack of personal safety equipment	Other	Unclassified; insufficient data
	Total ¹	Improperly designed	Slippery	Worn, rough					
Total.....	222	56	49	34	65	54	37	21	302
Caught in, on, or between.....	35	15	1	7	5				28
Moving parts of equipment.....	6	1		4					1
Points of operation.....	5	1		4					
Gears, pulleys, belts.....	1								
Other parts.....									1
Rolling or falling objects.....	23	11	1	1	5				16
Other.....	6	3		2					11
Struck by moving objects.....	63	24		12	41		15		106
Falling objects.....	40	13		6	39				52
From hands of workers.....	7	4		2	3				21
From equipment.....	21	4		1	6				12
From piles of materials.....	2	1		1	15				9
From other elevations.....	10	4		3	15				10
Flying or thrown objects.....	6	1		1	1				22
Small particles.....	4	1					13		20
Other.....	2			1	1		1		2
Hand-operated or -wielded objects.....	2	1					2		25
Rolling objects.....	1	1							1
Other.....	14	8		5	1				6
Overexertion.....	5	3		1	6				7
Due to lifting.....	2	2			3				53
Due to pulling or pushing.....	3	1		1	2				9
Due to prolonged motions.....									3
Other.....					1				5
Striking against objects.....	43	6		3	6	6	18	5	54
Rubbing against objects.....	12	1		1			17		10
Walking into objects.....	5				5	2			5
Other.....	26	5		2	1	4	1	5	39
Falls on same level.....	41	4	29	6	3	23		4	10
As a result of slips.....	30	1	29			12			4
As a result of trips.....					3	11		4	1
Other.....	11	3		6					5
Slips and stumbles.....	20		17	2	4	25		3	10
On loose objects.....					1	21			
On floors.....	12		11	1	1	4			1
Other.....	8		6	1	2			3	9
Falls to different levels.....	10	3	2	2				8	3
From platforms, ramps.....	2	2							2
From other elevations.....	8	1	2	2				8	1
Exposure to extreme temperatures.....	3	1		1					1
Other accident types.....	2						4	1	16
Unclassified; insufficient data.....									4

TABLE 16.--WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY,

Hazardous working conditions	Total number of accidents	Machines					Working surfaces		
		Total	Printing	Corrugating	Cutting and creasing	Other	Total	Floor	Other
Total.....	1,461	451	80	60	47	264	216	169	47
Hazardous working procedures.....	404	97	12	41	8	36	81	72	9
Moving heavy loads by hand.....	196	2	.....	.....	.....	2	5	.....	5
Feeding stock by hand.....	41	41	10	.....	7	24	.....	.....	.....
Working in confined areas.....	40	.....	.....	.....	.....	.....	35	35	.....
Unsafe layout of traffic.....	33	.....	.....	.....	.....	.....	33	33	.....
Shafting rolls by hand.....	28	28	.....	28	.....	.....	.....	.....	.....
Removing stock from machines by hand.....	23	23	2	13	1	7	.....	.....	.....
Other.....	43	3	.....	.....	.....	3	8	4	4
Inadequately guarded.....	356	296	51	14	30	201	18	3	15
Lack of point-of-operation guards.....	207	207	32	8	21	146	.....	.....	.....
Lack of power-transmission guards.....	50	50	9	3	6	32	.....	.....	.....
Lack of guardrails, etc.....	29	4	2	.....	.....	2	17	3	14
Lack of bolts, locks, etc.....	13	.....	.....	.....	.....	.....	1	.....	1
Other.....	57	35	8	3	3	21	.....	.....	.....
Defects of agencies.....	222	41	13	3	6	19	55	40	15
Improperly designed.....	56	13	4	.....	3	6	6	.....	6
Slippery.....	49	3	2	1	.....	.....	37	31	6
Worn, rough, uneven.....	34	6	.....	.....	.....	6	9	7	2
Loose.....	27	10	4	1	2	3	.....	.....	.....
Hidden defects.....	19	5	1	1	1	2	.....	.....	.....
Projecting slivers, etc.....	17	2	.....	.....	.....	2	1	1	.....
Sharp edged.....	13	2	2	.....	.....	.....	.....	.....	.....
Other.....	7	.....	.....	.....	.....	.....	2	1	1
Hazardous arrangement or placement.....	65	.....	.....	.....	.....	.....	3	1	2
Unsafely placed objects.....	33	.....	.....	.....	.....	.....	2	.....	2
Unsafely piled objects.....	29	.....	.....	.....	.....	.....	.....	.....	.....
Other.....	3	.....	.....	.....	.....	.....	1	1	.....
Poor housekeeping.....	54	.....	.....	.....	.....	.....	54	51	3
Lack of personal safety equipment.....	37	7	1	1	2	3	.....	.....	.....
Lack of gloves.....	21	.....	.....	.....	.....	.....	.....	.....	.....
Lack of goggles.....	13	7	1	1	2	3	.....	.....	.....
Other.....	3	.....	.....	.....	.....	.....	.....	.....	.....
Lack of ladders, scaffolds.....	17	10	3	1	1	5	1	.....	1
Improper illumination.....	4	.....	.....	.....	.....	.....	4	2	2
Unclassified; insufficient data.....	302	.....	.....	.....	.....	.....	.....	.....	.....

BY AGENCY OF ACCIDENT AND HAZARDOUS WORKING CONDITION, 1950

Hazardous working conditions	Paper products				Vehicles			Other	Unclas- sified
	Total	Rolls	Boxes, cartons	Other	Total	Hand trucks	Other		
Total.....	137	46	38	53	85	65	20	270	302
Hazardous working procedures.....	95	40	25	30	23	22	1	108	
Moving heavy loads by hand.....	83	37	20	26	22	22		84	
Feeding stock by hand.....									
Working in confined areas.....					1		1	4	
Unsafe layout of traffic.....									
Shafting rolls by hand.....									
Removing stock from machine by hand.....									
Other.....	12	3	5	4				20	
Inadequately guarded.....	1	1			10	5	5	31	
Lack of point-of-operation guards.....									
Lack of power-transmission guards.....									
Lack of guardrails, etc.....					1		1	7	
Lack of bolts, locks, etc.....	1	1			5	5		6	
Other.....					4		4	18	
Defects of agencies.....	2			2	43	33	10	81	
Improperly designed.....					19	17	2	18	
Slippery.....					1		1	8	
Worn, rough, uneven.....					8	5	3	11	
Loose.....					11	9	2	6	
Hidden defects.....					3	2	1	11	
Projecting sliver, etc.....	1			1				13	
Sharp edged.....								11	
Other.....	1			1	1		1	3	
Hazardous arrangement or placement.....	23	5	8	10	5	5		34	
Unsafely placed objects.....	2	2			5	5		24	
Unsafely piled objects.....	19	3	7	9				10	
Other.....	2		1	1					
Poor housekeeping.....									
Lack of personal safety equipment.....	16		5	11				14	
Lack of gloves.....	16		5	11				5	
Lack of goggles.....								6	
Other.....								3	
Lack of ladders, scaffolds.....					4		4	2	
Improper illumination.....									
Unclassified; insufficient data.....									302

TABLE 17. --WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY TYPE OF PLANT AND HAZARDOUS WORKING CONDITION, 1950

Hazardous working conditions	Total number of accidents		Accidents in plants manufacturing--							
			Corrugated and fiber boxes		Fiber cans, drums, tubes, etc.		Folded boxes		Setup boxes	
	Number	Percent ¹	Number	Percent ¹	Number	Percent	Number	Percent ¹	Number	Percent ¹
Total.....	1,461	100.0	770	100.0	48	100.0	418	100.0	225	100.0
Hazardous working procedures.....	404	34.8	243	39.4	11	26.9	104	32.5	46	25.4
Moving heavy loads by hand.....	196	16.9	101	16.4	8	19.7	57	17.8	30	16.4
Feeding stock by hand.....	41	3.5	18	2.9	1	2.4	15	4.7	7	3.9
Working in confined areas.....	40	3.5	25	4.1	1	2.4	11	3.4	3	1.7
Unsafe layout of traffic.....	33	2.8	24	3.9	1	2.4	5	1.6	3	1.7
Shafting rolls by hand.....	28	2.4	28	4.5	.....	.....	.....	.....	.....	.....
Removing stock from machines by hand.....	23	2.0	18	2.9	.....	.....	5	1.6	.....	.....
Other.....	43	3.7	29	4.7	.....	.....	11	3.4	3	1.7
Inadequately guarded.....	356	30.7	169	27.4	16	39.1	89	27.8	82	45.2
Lack of point-of-operation guards.....	207	17.9	89	14.4	12	29.4	42	13.1	64	35.2
Lack of power-transmission guards.....	50	4.3	22	3.6	1	2.4	18	5.6	9	5.0
Lack of guardrails, etc.....	29	2.5	15	2.4	.....	.....	11	3.4	3	1.7
Lack of bolts, locks, etc.....	13	1.1	9	1.5	.....	.....	4	1.3	.....	.....
Other.....	57	4.9	34	5.5	3	7.3	14	4.4	6	3.3
Defects of agencies.....	222	19.2	99	16.0	11	26.8	80	25.0	32	17.7
Improperly designed.....	56	4.9	25	4.0	3	7.3	19	6.0	9	4.9
Slippery.....	49	4.3	23	3.7	1	2.4	19	5.9	6	3.3
Worn, rough, uneven.....	34	2.9	17	2.8	1	2.4	12	3.8	4	2.2
Loose.....	27	2.3	14	2.3	1	2.4	10	3.1	2	1.1
Hidden defects.....	19	1.6	5	.8	4	9.9	10	3.1	.....	.....
Projecting splinters, etc.....	17	1.5	8	1.3	1	2.4	3	.9	5	2.8
Sharp edged.....	13	1.1	4	.6	.....	.....	4	1.3	5	2.8
Other.....	7	.6	3	.5	.....	.....	3	.9	1	.6
Hazardous arrangement or placement.....	65	5.6	36	5.8	1	2.4	18	5.6	10	5.5
Unsafely placed objects.....	33	2.8	16	2.6	.....	.....	11	3.4	6	3.2
Unsafely piled objects.....	29	2.5	18	2.9	1	2.4	7	2.2	3	1.7
Other.....	3	.3	2	.3	.....	.....	.....	.....	1	.6
Poor housekeeping.....	54	4.7	33	5.3	1	2.4	13	4.1	7	3.9
Lack of personal safety equipment.....	37	3.2	27	4.4	1	2.4	8	2.5	1	.6
Lack of gloves.....	21	1.8	14	2.3	.....	.....	6	1.9	1	.6
Lack of goggles.....	13	1.1	11	1.8	.....	.....	2	.6	.....	.....
Other.....	3	.3	2	.3	1	2.4	.....	.....	.....	.....
Lack of ladders, scaffolds.....	17	1.5	9	1.5	.....	.....	5	1.6	3	1.7
Improper illumination.....	4	.3	1	.2	.....	.....	3	.9	.....	.....
Unclassified; insufficient data.....	302	.....	153	.....	7	.....	98	.....	44	.....

¹ Percents are based on classified cases only.

TABLE 18.--WORK ACCIDENTS IN THE PAPERBOARD-CORRUGATED INDUSTRY, BY ACCIDENT TYPE AND UNSAFE ACT, 1950

Unsafe acts	Total number of accidents	Caught in, on, or between	Struck by moving objects	Over-exertion	Striking against objects	Falls on same level	Slips and stumbles	Falls to different levels	Exposure to extreme temperatures	Other accident types	Unclassified; insufficient data
Total.....	1,343	351	295	240	211	86	66	57	13	21	3
Using equipment unsafely or hands instead of equipment.....	338	155	117	14	48	.....	.....	1	1	2	.....
Taking wrong hold of objects.....	157	118	15	10	13	.....	.....	.....	.....	1	.....
Gripping objects insecurely.....	119	5	93	3	16	.....	.....	1	.....	1	.....
Inattention while using hand trucks.....	35	28	7	.....	.....	.....	.....	.....	.....	.....	.....
Using hands instead of tools.....	15	.....	.....	.....	15	.....	.....	.....	.....	.....	.....
Other.....	12	4	2	1	4	.....	.....	.....	1	.....	.....
Making unsafe positions or postures.....	327	68	30	47	26	56	55	37	4	4	.....
Inattention to footing.....	170	5	1	.....	19	55	54	35	1	.....	.....
Lifting incorrectly.....	36	.....	.....	36	.....	.....	.....	.....	.....	.....	.....
Unsafe placing of hands.....	34	28	4	.....	2	.....	.....	.....	.....	.....	.....
Exposure to moving objects.....	27	15	11	1	.....	.....	.....	.....	.....	.....	.....
Exposure to moving machinery.....	20	17	2	.....	1	.....	.....	.....	.....	.....	.....
Other.....	40	3	12	10	4	1	1	2	3	4	.....
Inattention to surroundings.....	82	1	16	.....	55	1	.....	6	3	.....	.....
Unsafe loading, placing, etc.....	81	2	28	48	3	.....	.....	.....	.....	.....	.....
Lifting excessive loads.....	44	.....	.....	44	.....	.....	.....	.....	.....	.....	.....
Placing objects unsafely.....	34	1	28	2	3	.....	.....	.....	.....	.....	.....
Other.....	3	1	.....	2	.....	.....	.....	.....	.....	.....	.....
Failure to secure or warn.....	66	46	13	.....	2	2	.....	3	.....	.....	.....
Failure to lock or block.....	47	34	11	.....	.....	2	.....	.....	.....	.....	.....
Failure to give proper signal.....	17	12	1	.....	1	.....	.....	3	.....	.....	.....
Other.....	2	.....	1	.....	1	.....	.....	.....	.....	.....	.....
Cleaning, adjusting, moving equipment.....	56	45	1	.....	10	.....	.....	.....	.....	.....	.....
Working at unsafe speeds.....	17	2	2	.....	7	1	2	2	.....	1	.....
Failure to use safe attire.....	17	2	4	.....	9	.....	1	.....	1	.....	.....
Other.....	14	2	2	1	5	1	.....	.....	2	1	.....
Unclassified; insufficient data.....	345	28	82	130	46	25	8	8	2	13	3

TABLE 19. --WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY TYPE OF PLANT AND UNSAFE ACT, 1950

Unsafe acts	Total number of accidents		Accidents in plants manufacturing--							
			Corrugated and fiber boxes		Fiber cans, drums, tubes, etc.		Folded boxes		Setup boxes	
	Number	Percent ¹	Number	Percent ¹	Number	Percent ¹	Number	Percent ¹	Number	Percent ¹
Total.....	1,343	100.0	729	100.0	32	100.0	353	100.0	224	100.0
Using equipment unsafely or hands instead of equipment.....	338	33.9	169	32.2	8	33.3	90	34.5	71	38.5
Taking wrong hold of objects.....	157	15.8	64	12.2	4	16.6	40	15.3	49	22.6
Gripping objects insecurely.....	119	11.9	71	13.6	4	16.7	29	11.2	15	8.1
Inattention while using hand trucks.....	35	3.5	19	3.6	.....	.....	13	5.0	3	1.6
Using hands instead of tools.....	15	1.5	7	1.3	.....	.....	4	1.5	4	2.2
Other.....	12	1.2	8	1.5	.....	.....	4	1.5	.....	.....
Taking unsafe positions or postures.....	327	32.8	180	34.3	6	25.0	87	33.5	52	28.1
Inattention to footing.....	170	17.1	101	19.2	1	4.2	42	16.3	25	13.7
Lifting incorrectly.....	36	3.6	15	2.9	.....	.....	10	3.8	11	5.9
Unsafe placing of hands.....	34	3.4	14	2.7	2	8.3	12	4.6	6	3.2
Exposure to moving objects.....	27	2.7	18	3.4	2	8.3	6	2.3	1	.5
Exposure to moving machinery.....	20	2.0	12	2.3	1	4.2	4	1.5	3	1.6
Other.....	40	4.0	20	3.8	.....	.....	13	5.0	6	3.2
Inattention to surroundings.....	82	8.2	42	8.0	.....	.....	26	10.0	14	7.6
Unsafe loading, placing, etc.....	81	8.1	49	9.3	1	4.2	20	7.7	11	5.9
Lifting excessive loads.....	44	4.4	25	4.7	.....	.....	12	4.6	7	3.7
Placing objects unsafely.....	34	3.4	22	4.2	1	4.2	7	2.7	4	2.2
Other.....	3	.3	2	.4	.....	.....	1	.4	.....	.....
Failure to secure or warn.....	66	6.6	24	4.6	2	8.3	19	7.3	20	10.8
Failure to lock or block.....	47	4.7	16	3.1	2	8.3	13	5.0	16	8.6
Failure to give proper signal.....	17	1.7	8	1.5	.....	.....	4	1.5	4	2.2
Other.....	2	.2	.....	.....	.....	.....	2	.8	.....	.....
Cleaning, adjusting, moving equipment.....	56	5.6	31	5.9	4	16.7	13	5.0	8	4.3
Working at unsafe speeds.....	17	1.7	11	2.1	.....	.....	3	1.2	3	1.6
Failure to use safe attire.....	17	1.7	11	2.1	1	4.2	.....	.....	5	2.7
Other.....	14	1.4	8	1.5	2	8.3	2	.8	1	.5
Unclassified; insufficient data.....	345	.....	204	.....	8	.....	93	.....	39	.....

¹ Percents are based on classified cases only.

TABLE 20.--WORK ACCIDENTS IN THE PAPERBOARD-CONTAINER INDUSTRY, BY SIZE OF PLANT, ACCIDENT TYPE, HAZARDOUS WORKING CONDITION, AND UNSAFE ACT, 1950

Accident types, hazardous working conditions, and unsafe acts	Plant size					
	Less than 100 employees		100-249 employees		250 employees and over	
	Number	Percent ¹	Number	Percent ¹	Number	Percent ¹
<u>Accident types</u>						
Total.....	290	100.0	640	100.0	575	100.0
Caught in, on, or between.....	84	29.1	156	24.5	136	23.6
Struck by moving objects.....	55	19.0	150	23.6	134	23.3
Overexertion.....	56	19.4	116	18.2	113	19.7
Striking against objects.....	52	18.0	89	14.0	88	15.3
Falls on same level.....	19	6.6	36	5.7	41	7.1
Slips and stumbles.....	9	3.1	32	5.0	29	5.0
Falls to different levels.....	5	1.7	36	5.7	21	3.7
Exposure to extreme temperatures.....	4	1.4	6	.9	4	.7
Other accident types.....	5	1.7	15	2.4	9	1.6
Unclassified; insufficient data.....	1	.....	4	.....	.....	.....
<u>Hazardous working conditions</u>						
Total.....	273	100.0	613	100.0	575	100.0
Hazardous working procedures.....	65	29.8	180	37.2	159	34.9
Moving heavy loads by hand.....	34	15.6	79	16.3	83	18.3
Other.....	31	14.2	101	20.9	76	16.6
Inadequately guarded.....	81	37.2	147	30.4	128	28.0
Lack of point-of-operation guards.....	57	26.2	86	17.8	64	14.0
Other.....	24	11.0	61	12.6	64	14.0
Defects of agencies.....	46	21.1	76	15.7	100	21.9
Hazardous arrangement or placement.....	11	5.0	33	6.8	21	4.6
Poor housekeeping.....	4	1.8	22	4.5	28	6.1
Lack of personal safety equipment.....	7	3.2	17	3.5	13	2.8
Lack of ladders, scaffolds.....	3	1.4	8	1.7	6	1.3
Improper illumination.....	1	.5	1	.2	2	.4
Unclassified; insufficient data.....	55	.....	129	.....	118	.....
<u>Unsafe Acts</u>						
Total.....	250	100.0	577	100.0	516	100.0
Using equipment unsafely or hands instead of equipment.....	80	40.8	136	30.8	122	33.8
Taking wrong hold of objects.....	54	27.5	63	14.3	40	11.1
Other.....	26	13.3	73	16.5	82	22.7
Taking unsafe positions or postures.....	56	28.6	161	36.5	110	30.5
Inattention to footing.....	29	14.8	80	18.1	61	16.9
Other.....	27	13.8	81	18.4	49	13.6
Inattention to surroundings.....	17	8.7	39	8.8	26	7.2
Unsafe loading, placing, etc.....	13	6.6	43	9.8	25	6.9
Failure to secure or warn.....	11	5.6	17	3.9	38	10.5
Cleaning, adjusting, moving equipment.....	10	5.1	24	5.4	22	6.1
Working at unsafe speeds.....	2	1.0	7	1.6	8	2.2
Failure to use safe attire.....	5	2.6	6	1.4	6	1.7
Other.....	2	1.0	8	1.8	4	1.1
Unclassified; insufficient data.....	54	.....	136	.....	155	.....

¹ Percents are based on classified cases only.