HEALTH HAZARD EVALUATION REPORT

HETA 92-001-2444
SANCAP ABRASIVES, INC.
ALLIANCE, OHIO

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer and authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to federal, state, and local agencies; labor; industry; and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

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I. SUMMARY

On September 22-23, 1992, the National Institute for Occupational Safety and Health (NIOSH) conducted a health hazard evaluation (HHE) at SANCAP Abrasives, in Alliance, Ohio. The request, submitted by the International Chemical Workers Union (ICWU), concerned musculoskeletal problems reported by AT-6 press operators. The AT-6 is a semi-automatic abrasive belt production machine that converts large sheets of abrasive paper or cloth into belts.

The objectives of the HHE were to characterize worker musculoskeletal symptoms, to identify job tasks which may cause or contribute to musculoskeletal illnesses, and propose recommendations to reduce the likelihood of developing these illnesses. The medical evaluation consisted of confidential health interviews with AT-6 workers, review of the Occupational Safety and Health Administration Log of Injuries and Illnesses (OSHA form 200), and informal discussions with the employees regarding musculoskeletal hazards associated with their jobs. The ergonomic evaluation included measurement of workstation dimensions, as well as a work methods and biomechanical analysis aided by videotaping and photography of the AT-6 process.

All ten AT-6 workers present on September 22 participated in confidential interviews. The average age was 29, with duration of employment ranging from 1-8 months. None of the current employees reported sustaining musculoskeletal illnesses on the AT-6 machine. Video analysis and process observation suggested that the major ergonomic stressors of the press operating job were associated with the upper extremities and torso, due to repetitive movements as well as postural and muscular force demands. The following risk factors for the potential development of cumulative trauma disorders were observed: repetitive 30 second task cycle; awkward and static postures; significant truncal flexion and twisting; impact force with the palm of the hand (or clinched fist); pinch grips; and extended reaches.

> Ergonomic evaluation of the AT-6 press operation found exposures to several factors, including repetition, stressful postures, and muscular force demands, that increase the risk of developing musculoskeletal disorders. Recommendations for engineering, administrative, and work practice controls are contained in Section VIII of this report.

KEYWORDS: SIC 3291 (Abrasives Products), ergonomics, cumulative trauma disorders, lumbar stress, truncal flexion, awkward and static posture, pinch grip.

II. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received a request dated September 26, 1991, from the International Chemical Workers Union to conduct a health hazard evaluation (HHE) at the Swiss Industrial Abrasives/SIA America facility, now known as SANCAP Abrasives, Inc., in Alliance, Ohio. The request stated that at least three employees reported (lumbar) musculoskeletal problems due to work practices and equipment design utilized at the AT-6 press, especially during the manufacture of large-size abrasive belts.

A NIOSH site visit to the facility was scheduled for January 6-7, 1992. This site visit was postponed after NIOSH representatives were informed on January 2, 1992, that the facility was to be sold and would not be engaging in normal production the week of the planned site visit.

In February 1992, the ownership of the facility was transferred from Swiss Industrial Abrasives/SIA America, Inc., to SANCAP Abrasives, Inc. After this change in ownership, the International Chemical Workers Union no longer represented workers at the facility. The NIOSH site visit was re-scheduled for June 10-12, 1992, but was again postponed because of SANCAP's refusal to allow NIOSH investigators access to the worksite.

On September 21, 1992, NIOSH investigators obtained a research inspection warrant, and on September 22-23, 1992, conducted the HHE.

III. BACKGROUND

The AT-6 machine is located in a building, constructed in 1935, originally used during World War II for aircraft manufacturing. Since 1948, the building has been owned and operated by different corporate entities, but has consistently been used for manufacturing sandpaper and other abrasive products. In 1977, the facility was purchased by Swiss Industrial Abrasives (SIA) and was renamed SANCAP, with SIA remaining the parent company. In 1985, the facility name was changed to SIA America, with SIA still the parent company. The facility complex was comprised of two manufacturing divisions, abrasives and cap liners, located in different buildings. In 1988, SIA divested the cap liner division. In February 1992, the abrasive division was also divested and sold to the same company that had purchased the cap liner division. The new owner operates under the name SANCAP Abrasives, Incorporated. This health hazard investigation focused on the AT-6 machine located in the abrasives division.

The AT-6 machine was built in Switzerland in 1980, transported to Alliance, Ohio, and installed at the SANCAP facility. With few modifications, the machine is currently operating in the same manner as it did at the time of installation. The addition of removable side rails on the AT-6 press platforms is one modification made under previous management of the facility.

The AT-6 machine is a semi-automatic manufacturing machine that produces large industrial-sized abrasive belts which are utilized in the steel, automotive, and other industries. The belts are typically constructed of an alumina compound grit with either a paper or cloth backing. The abrasive grit is applied to one side of the backing material prior to the AT-6 process.

Sheets of the abrasive paper are cut to size and hung on the transfer conveyor of the AT-6 machine. The abrasive grit is removed from two edges, an adhesive is applied, and the sheet is conveyed to the AT-6 press. Press operators remove the sheet from the conveyor, position the edges together, and activate the press to form the belt. The finished belt is removed from the press, packaged, and sent to the shipping department.

IV. WORK DESCRIPTION

The AT-6 press operation job is manually intensive work, requiring sustained eye-hand coordination. During the NIOSH site visit, operators were observed sequentially performing the following procedures: pick-up an abrasive sheet from a conveyor; carry it to, and place it on, the press; position and apply manual force to the two ends of the sheet, which have adhesive; activate the mechanical force of the press to convert the sheet to a belt; and, finally, remove any remaining adhesive from the press table or abrasive belt. Three workers were typically present during this operation during the NIOSH site visit - two press operators working with the same abrasive sheet on opposite sides of the press, and a material handler packaging the finished product. Refer to Figure 1 for diagrams of the operators' typical posture during each task of this work cycle that was observed from the videotape analysis. AT-6 press operators stand on movable platforms and lean forward to position the belt and operate the press. The length and width of the belts produced affect how the platforms are positioned at the AT-6 Press. Larger belts, especially wider belts, require the platforms to be moved farther apart to avoid damaging the product by contact with the platform.

Abrasive belts are manufactured by SANCAP according to specific customer orders, with length, width, grit type, backing (paper/cloth), and number of belts produced varying in each production run. The widths of the abrasive belts range from 15" to 64", and the lengths vary from 103" to 128". Two operators usually work together to operate the AT-6 press machine; during the production of 64" wide belts, four workers operate the press. The operators work 10 hours a day, from 6 a.m. to 4:30 p.m., four days a week. During a 10-hour shift, there are many production runs, each consisting of one customer's order. The smallest orders consist of 15-20 belts, and the largest orders as high as 250 belts. Within a given production run the manufacturing process is continuous; there is a half-hour machine "down-time" per process change to complete the machine adjustments. (The actual production time delay is dependant on the specific adjustments required between different products.) During the down-time, operators perform miscellaneous tasks. Hundreds of belts are produced daily on the AT-6 machine. The operators have one scheduled 30-minute lunch break and three scheduled 10-minute breaks during the 10 hour work day.

V. EVALUATION CRITERIA

In general, the evaluation of occupational musculoskeletal problems includes the investigation of human-machine interactions, and involves a field of study called ergonomics. Basic production information is necessary to understand the demands made on humans as they interact with machines in an industrial environment. The specific tasks performed by individuals, as well as the number of repetitive movements during a work cycle, duration of work cycles, and the rest-time between sets of repetitions, are some of the important factors in an ergonomic evaluation.

Cumulative Trauma Disorders

The occurrence of cumulative trauma disorders (CTDs) of the musculoskeletal system as a result of occupational and non-occupational factors has been reported over many years.[1,2,3,4] These musculoskeletal disorders frequently affect the tendons, tendon sheaths, muscles, and nerves of the upper extremities (UE). Common UE CTDs include tendinitis, synovitis, tenosynovitis, bursitis, ganglionic cysts, strains, DeQuervain's disease, and carpal tunnel syndrome. Musculoskeletal disorders affecting the lumbar regions are also frequently reported in the workplace.

NIOSH has identified acute and chronic work-related musculoskeletal disorders as one of the ten leading occupational health problems affecting workers.[5] Accurate estimates of work-related CTD prevalence are not available because existing databases were not designed for the surveillance of occupational musculoskeletal disorders.[6] The available injury reporting databases "confound occupational and non-occupational related disorders, fail to differentiate between acute and chronic injuries, and lack standard terminology and diagnostic criteria for defining cumulative trauma-related musculoskeletal disorders."[6] Nonetheless, it was reported in 1983 that musculoskeletal injuries account for one-third of annual workers compensation claims, and the prevalence of job-related musculoskeletal disorders has increased through the 1980's.[6,7]

Studies have shown that work-related musculoskeletal disorders of the upper extremities can be associated with job activities that require: (1) repetitive movements of the upper extremities; (2) forceful grasping or pinching of tools or other objects by the hands; (3) awkward positions of the hand, wrist, forearm, elbow, upper arm, shoulder, neck, or head; (4) direct pressure over the skin and muscle tissue; and/or (5) use of vibrating hand-held tools.[8,9,10] Postures often associated with UE CTDs are extension, flexion, ulnar, and radial deviation of the wrist; open-hand pinching; twisting movements of the wrist and elbow; shoulder abduction; and reaching over shoulder height.

Activities associated with UE CTDs are frequently observed in many manufacturing and assembly jobs in industry. Occupations associated with a high incidence of CTDs include, but are not limited to, electronic components assembly, garment manufacturing, automobile assembly, small appliance manufacturing and assembly, and meat and poultry processing.[11,12,13] Because repetitive and forceful movements are required in many service and industrial occupations, new occupational groups at risk for developing UE CTDs continue to be identified. CTDs can also be associated with non-occupational activities or pre-existing conditions. For example, individuals with diabetes, rheumatoid arthritis, certain thyroid conditions, and kidney dysfunction appear to be at an increased risk for developing carpal tunnel syndrome.[14]

One of the most disabling CTDs is carpal tunnel syndrome (CTS). CTS was first reported as a clinical entity as early as 1854; however, it was not fully described in the medical literature until 1927.[15] CTS is caused by compression of the median nerve inside the carpal tunnel at the wrist. Clinical manifestations include pain, numbness, burning and/or tingling sensations in the hand and fingers in the distribution of the median nerve. At advanced stages, atrophy of the thenar muscle may occur.[16,17]

Previous investigations have focused on the role of occupational risk factors in CTD development. One study reported that workers performing jobs with force levels of 4 kilograms (kg) or more were four times as likely to develop hand/wrist CTDs as those workers with jobs requiring muscular exertions of 1 kg or less.[10] Job tasks with cycle times of 30 seconds or less were associated with a three times greater incidence of UE CTDs than jobs where cycle time was more than 30 seconds.[10] In addition, several cross-sectional and case control retrospective studies have examined the association between job risk factors and musculoskeletal morbidity.[18,19,20,21,22,23] In general, these studies support the association between physical risk factors (repetition, force, awkward postures, and vibration) and CTDs.

The complexity of repetitive motion patterns has made it difficult to establish threshold limits for defining CTD risk. Previous reports have used various definitions of repetitiveness to distinguish between different jobs.[5] These definitions are intended merely to assist in judging the relative risk of hand intensive jobs. Other risk factors, such as awkward or stressful posture and increased level of muscular force, can exacerbate the CTD risk.

Control measures to reduce the probability of developing these disorders should be directed at the physical risk factors. The preferred control method are engineering controls that reduce ergonomic stresses; however, administrative controls such as work enlargement, job rotation, etc., can be used as an interim measures. Surveillance of CTDs (including the use of health-care-provider reports) can aid in identifying high-risk workplaces, occupations, and industries and in directing appropriate preventive measures.[24]

Low Back Pain

Low back pain is one of the most common and most costly work-related musculoskeletal disorders in the United States.[5,25,26] Occupational risk factors for low back injuries include manual handling tasks,[27] twisting,[28] bending,[28] falling,[29] reaching,[30] lifting excessive weights,[28,31,32] prolonged sitting,[29] and vibration.[28,33] Some nonoccupational risk factors for low back injury include obesity,[34] genetic factors,[35] and job satisfaction.[36,37]

Control and prevention of job-related low back pain can be accomplished through the evaluation of job activities, identification of occupational risk factors, and implementation of appropriate interventions. Excessive bending, twisting or reaching, handling of excessive loads, prolonged sitting, and exposure to vibration are recognized risk factors for back injuries. Redesign of jobs can lead to the reduction of these risk factors, and good job design initially can prevent or minimize the occurrence of back injuries.[38] Workstation and job task design should consider: (1) the optimum work height (from waist to elbow height) to reduce bending and reaching; (2) logical spacial arrangement in conjunction with task sequence to reduce twisting; (3) provision of sit/stand stations to reduce prolonged postures; (4) appropriate package design and size to allow the worker to hold the lifted load close to the body with an effective coupling; and (5) package weight not exceeding typical human capabilities.[39] Multiple approaches such as job redesign, worker placement, and training may be the best methods for controlling back injuries and pain.[40]

VI. EVALUATION METHODS

The medical evaluation component of this HHE consisted of confidential health interviews with AT-6 workers, review of the Occupational Safety and Health Administration log of occupational injuries and illnesses (OSHA form 200), and informal discussions with the employees regarding musculoskeletal hazards associated with their jobs. The ergonomic assessment of the AT-6 press operation included measurement of workstation dimensions, a work methods analysis, and a biomechanical evaluation aided by videotape and still photography of the AT-6 process.

The videotape of the AT-6 press operation was analyzed by both regular speed and slow motion play-back. This work methods analysis was used to determine the work content of the job and to recognize occupational risk factors for CTD. The CTD stressors included in this evaluation were repetitive movements, muscular force, awkward and static posture, mechanical stress, and vibration.

Biomechanical evaluation was utilized to identify job tasks associated with an elevated risk of developing musculoskeletal disorders. A manual video digitizing technique was used to quantify work postures. The University of Michigan Strength Prediction Program was used to assess whether allowable physical limits for body segments were exceeded for a sub-group of the worker population.[41] Body segments that were evaluated in the biomechanical evaluation included the upper extremities, back, hip, and lower extremities.

VII. RESULTS AND DISCUSSION

A. Medical Evaluation

1. Employee Profile

On the first day of the NIOSH site visit, ten employees were assigned to work on the AT-6 machine; all were interviewed. (On the second day of the NIOSH visit an 11th worker was assigned to the AT-6. Because this was the worker's first day on the AT-6, no attempt was made for inclusion in the interview process.)

The ten AT-6 employees had an average age of 29, with a range from 19 to 48. Eight of these workers were men, two were women. SANCAP operations started in February 1992, and eight AT-6 employees were hired at that time (including two former SIA America employees). One AT-6 employee was hired in June, and one at the beginning of September. All ten employees spent the majority of their time on the AT-6 machine, with occasional rotation to non-AT-6 tasks. Only two of the current employees had previous experience on the AT-6 machine under the former SIA America company.

Eight of the ten AT-6 employees had previously worked as press operators at one time or another. Three employees were on a regular six week rotational schedule: two weeks on one side of the press, two weeks on the other side of the press, and two weeks on a non-press task. Two other employees work 4-10 hours per week, providing lunch and relief breaks to the primary press operators. Two additional employees fill in as substitute press operators as needed. Another employee spent one month as a press operator, but was then assigned to other AT-6 tasks.

2. Confidential Interview Results

None of the ten interviewees reported sustaining chronic musculoskeletal injuries on the AT-6 machine. Two individuals reported occasional back difficulties but did not believe there was any association with work.

One interviewee was concerned with the potential of injury from the return of the carriage during operation of the press. The concern was that a striking injury could occur, with the carriage hitting an employee on its return path. Another employee knew of one unintentional injury occurring on the AT-6 machine under the previous facility owner; this involved an employee stepping on a cart in the hanging area.

Removable guard rails are available for use by the press operators. Certain belt sizes preclude the use of the rails due to potential damage from the product hitting the rail, otherwise rails may be installed and removed at the employee's discretion. Employees reported using the rails primarily when the belt size required the platforms to be further away from the press, thus necessitating leaning to reach the press. Rails were also used when the belts were heavy, either due to absolute belt size or due to the weight of the grit and backing material. Employees remarked that the rails were not always comfortable to work with, and some opted to never, or rarely, use the rails.

3. OSHA 200 Log

There were 12 entries in the OSHA 200 log between July 1, 1992, and September 22, 1992; none involved AT-6 employees. From February 1992 until May 1992, none of the AT-6 workers were SANCAP employees. They were employees of a temporary employment agency, and SANCAP did not include them in the OSHA 200 log during that time period. OSHA 200 logs for the period when SIA America operated the facility were not available.

B. Ergonomic Evaluation

1. Work Methods Analysis

The operators performed several steps to convert the pre-cut abrasive sheets to abrasive belts. According to management records, approximately 550 belts are produced each 10-hour shift. During the NIOSH site visit, the observed 10-hour shift of press operators included a one hour break and machine down-time for changing belt products. Motion analysis of the videotape indicates that the work cycle time for press operators during production periods was approximately 30 seconds per belt while manufacturing belts using sheets measuring 52" width x

103" length. The weight of each of these belts (52" width x 103" length) produced on September 22-23, 1992, was approximately 14 pounds. Table 1 describes the basic steps used at the AT-6 press to convert abrasive sheets to belts. The job task sequence for this process is diagrammed in Figure 1.

Press operation required frequent extended reaches, trunk twisting and bending, hand/wrist bending, and pinch grips. During the initial walk-through evaluation on the morning of September 22, the NIOSH researchers found that the AT-6 press operations were repetitive (30 seconds per cycle) and, at times, required awkward and static postures. The operators adopted prolonged awkward postures (approximately 50 degrees of trunk flexion) while positioning and matching the two ends of the abrasive sheets on the AT-6 press during a time when the guard rail was used between the worker and the press. Awkward postures of the torso have been shown to be linked with increasing the likelihood of developing CTDs. Working with the torso bent forward, backward, or twisted can place excessive stress on the low back.[38,39] Repetitive tasks, extended reaches, pinch grips, and repeated hand/wrist bending are also recognized risk factors for contributing to the development of CTDs.[9]

Some operators frequently pounded the abrasive material with the palms of their hands (or clinched fist) a few times while constructing each joint of the abrasive belts. This impact action can result in mechanical stress on the hands. In addition, the work procedure required intense eye-hand coordination and concentration with sustained exertion force of the hands, including repeated and prolonged pinch grips. This may cause the workers to maintain a posture for extended periods of time resulting in static loading of the hand, wrist, neck, shoulder, and back.

During the videotaping sessions on September 22 and 23, the operators were encouraged to adjust the press platforms to accommodate more comfortable work postures. Five operators were videotaped for two hours operating the AT-6 press during a time when the guard rails were not employed. Only one operator worked on the left side during the time period of videotaping. The other four operators worked sequentially on the right side while videotaping.

Two operators were selected for videotape posture analyses: the only operator who worked on the left side, and the operator on the right side who was videotaped for the longest period of time. Each measured observation was made on a separate section of the videotape. Without the side rails installed, trunk flexion angles were measured to be an average of 32 (± 6) degrees based on six observations of the left side operator. An average of 25 (± 8) degrees was found for the right side operator based on six observations.

After several adjustments of the platforms, the worker on the left side performed the job with an average of 19 (± 5) degrees of trunk flexion based on 12 observations. The worker observed on the right side attained an average of 14 (± 4) degrees of trunk flexion based on six observations. These reductions in torso flexion demonstrate the importance of properly adjusted platforms to accommodate the individual worker to the job conditions.

The two operators were also requested to install the side rails on the platforms and adjust the rail height to accommodate comfortable work postures. Based on six observations of each operator with the side rails installed, the workers were able to perform the work with an average of 25 (± 6) and 19 (± 3) degrees of trunk flexion on the left and right sides, respectively. The large difference between the measured flexion of the torso with the posture approximated during the initial walk-through provides an excellent example of the stress imposed by an improperly adjusted guard rail and work platform.

2. Biomechanical Evaluation

The biomechanical evaluation using the University of Michigan 2D Static Strength Prediction Program is presented in Figure 2. This analysis showed that the compressive forces for the low back and the strength required to perform the task did not exceed back compression design limits of 770 lbs. However, analyses of the postures assumed in operating the press indicated that the values for the hip, knee, and ankle for some postures exceeded the Strength Design Limit (SDL) reported in the 2D Static Strength Prediction Model published by the University of Michigan. This analysis revealed that since some work position postures exceeded the SDL, greater than 1% of men and 25% of women will <u>not</u> be able to attain the necessary strength to operate the AT-6 press with the observed postures. In addition, the biomechanical assessment revealed that some of the postures and force parameters examined would cause the workers to fall forward (i.e., postural imbalance).

C. Safety Issues

1. Falling Hazard

There is an open space between the two platforms at the AT-6 press, creating a potential hazard of falling from the platforms to the shop floor. The distance from the platforms is approximately 3-3½ feet above the floor. A previous owner of the facility developed the side rails to prevent falls. Press operators believed the side rails were present to support body weight, and to reduce the development of fatigue. Shorter stature operators stated that the side rails restricted their performance especially during the manufacture of large size belts. Side-rails were reported to be rarely used. The video analysis results indicate that the operators can work in more comfortable postures if they adjust the platforms (height and horizontal distance to the machine), as well as the side rails (height).

2. Tripping/Falling Hazard: Accommodation for Disability

The AT-6 machine has several sets of fixed industrial steps leading from the floor up to the work platform. There are also two ladders with rungs, fixed to either side of the movable platforms located at the AT-6 press. One employee was noted to have a below-the-knee amputation with a fitted prosthesis. This same employee was working as a relief press operator during the NIOSH site visit, and was observed ascending and descending the ladders. Ladder use is a potential safety hazard for this individual due to the decreased maneuverability and control of a prosthetic leg. In this circumstance, ascending and descending via the stairs would decrease the likelihood of unintentional injury, and would be an appropriate accommodation for this employee's disability.

VIII. RECOMMENDATIONS

A. Engineering Controls

1. The side rails should be in place at the AT-6 press at all times to prevent falls from the elevated platforms to the shop floor.

2. Currently the side rail height can be adjusted from 25" to 46". The lower height limit needs to be decreased to 23" in order to accommodate workers of shorter stature. The hardware of the rails should be redesigned to allow workers to make the adjustments with ease. Also, padding on the rail should be installed to reduce the mechanical pressure when a worker leans on the rail. Improving ease of adjustability and reducing discomfort associated with the use of the rail should encourage workers to utilize the guard rail properly, thereby reducing the static load on the lumbar region.

3. The use of bare hands to apply blunt mechanical force on the belt joint should be prohibited. Use of a rubber hammer or applying pressure to the joint of the belts by hand, without impact, to apply force is recommended. Repeated pounding with the palm of the hand is a risk factor for contributing to the development of CTD of the hand and wrist.

4. Install an inner "product" deflector bar, affixed to the press portion of the AT-6, to keep the abrasive belts toward the center line of the machine during the joint pressing process. This will allow the operators to move the platforms closer to the press table, thus reducing awkward trunk flexion. The deflector bar can be constructed of rubber, with rollers, or otherwise be designed to protect the product from contacting the platform and becoming damaged.

5. Provide a stool or install adjustable sit/lean workstations for the press operators so that they can relax fatigued muscle groups during portions of the work cycle.

6. A foot rail can also be installed on the work platforms below the AT-6 press so that operators rest one foot and change body posture to reduce the static loading of the lower extremities and back. The rail should be 4-6" above the platform surface.

B. Administrative Controls

1. Employees should be encouraged to adjust the side rails and platform to comfortable positions. Evaluation and recording of the platform and side rail positions should be established. The information to be recorded should include:

    a. identification of operator;

    b. platform position;

    c. rail height;

    d. length and width of product;

    e. grit type and backing of product.

    An individualized index of comfortable settings for each press operator, for multiple sizes and types of belts, may then be generated. Use of the information should facilitate making adjustments quickly for different production runs. Affixing measurement lines (or tape) to the floor, platform, and rails may be useful, both while developing the initial record, and to facilitate quick adjustments later.

2. All employees working as press operators should receive training on ergonomic hazards. Training should include the use of side rails and platforms at the AT-6 press. Workers should be able to demonstrate proficiency in making platform and side rail adjustments on-the-job. The use of the individualized indexes, as discussed in the paragraph above, should also be covered. New employees, or employees transferring to the AT-6 press, should receive similar training prior to beginning press work. An individualized index of settings should be developed for each new press operator.

3. Establish a medical surveillance program to evaluate workers' health status in regards to CTDs, including back injuries. Early intervention CTDs often results in more successful treatment of the injured worker.

C. Work Practices

1. Press operators and relief operators should adjust the platforms and side rails to obtain a comfortable posture before beginning operation. They should re-adjust the positions as needed during the working period.

2. Operators should avoid overreaching and excessive torso twisting while picking up the pre-cut abrasive sheets from the conveyor. Walking one step further to the transfer conveyor to obtain the abrasive sheet will reduce this problem. Overreaching may result in excess musculoskeletal stress and possibly injury.

3. Employees with disabilities which make ladder climbing a potential safety hazard should ascend and descend to the work platforms via the stairs which are available.

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2. International Chemical Workers Union, International, Akron, Ohio
3. OSHA, Region V

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

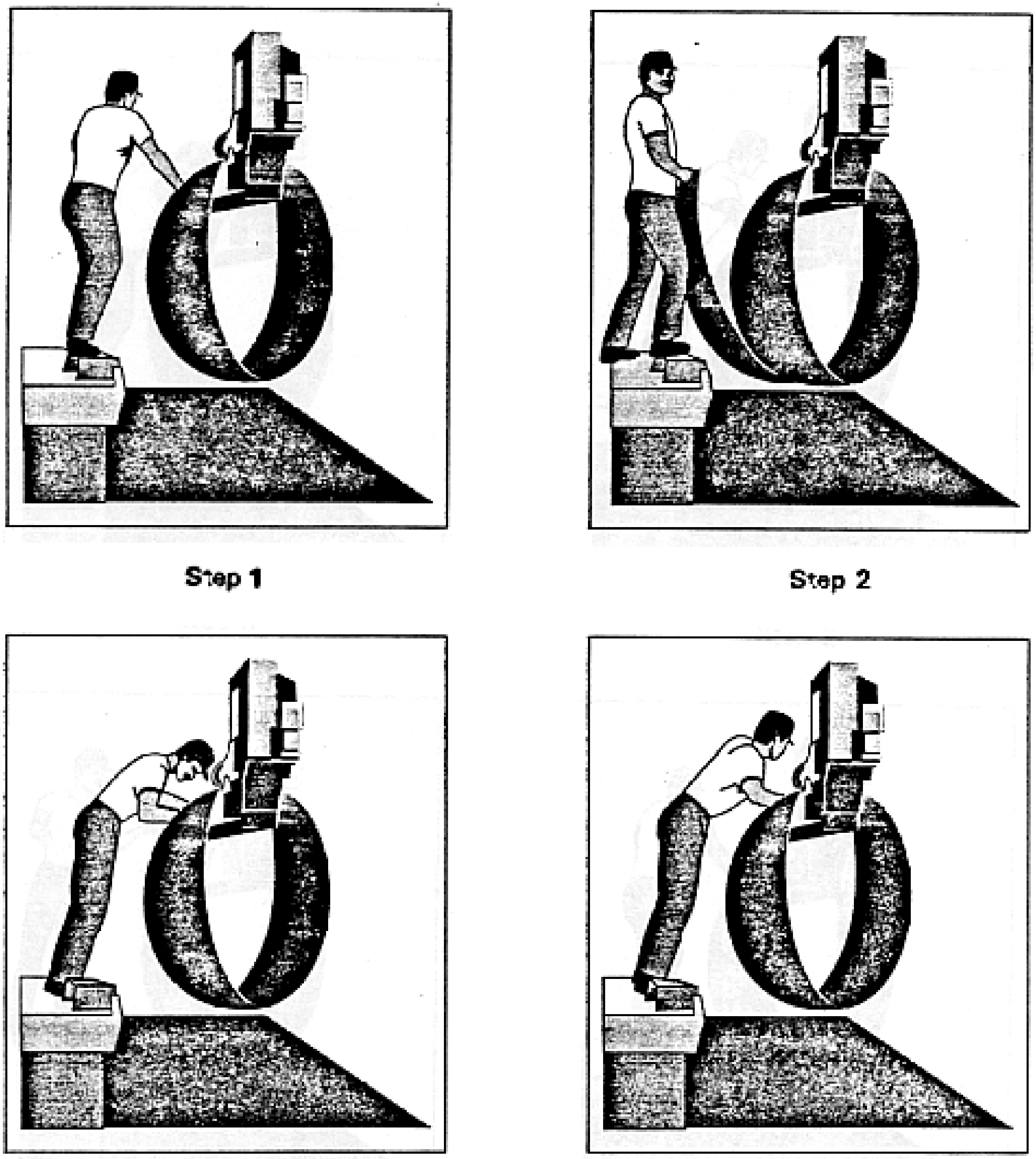
Table 1

Description of Motions Used by AT-6 Press Operators

SANCAP ABRASIVES, Inc.
HETA 92-001

Step	Number of repetitions	Description	Body part	Action
1	1	Get pre-cut abrasive sheet from AT-6 conveyor	right hand	pinch grip
2	1	Carry pre-cut abrasive strip to AT-6 press	both hands	pinch grip
3	1	Position and match the two ends of the abrasive strip on AT-6 press to form belt	both hands	pinch grip
4	1 or multiple	Apply pressure to the joint of the abrasive belt	both hands	finger or palmar pressure or pounding
5	1	Side-step on switches to activate press	one foot	step
6	1	Use brush to remove loose abrasive material	right hand	pinch grip
7	1	Remove any remaining adhesive from the press table or abrasive belt	left hand	pinch grip

Figure 1
Work Sequence at AT-6 Press
SANCAP ABRASIVES, Inc.
HETA 92-001



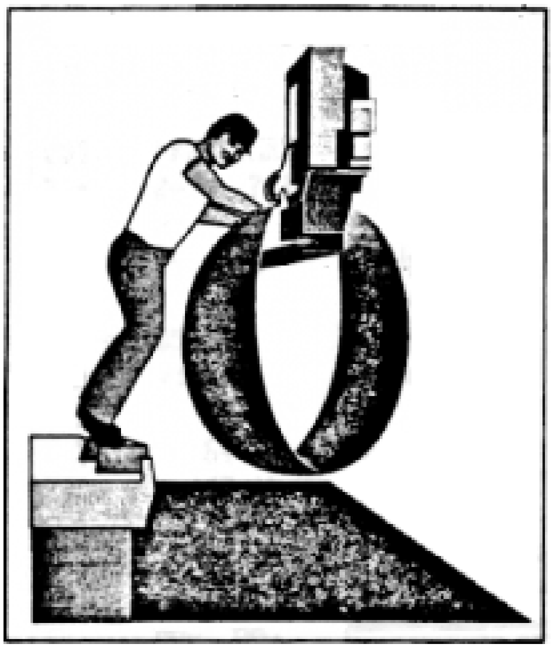
Step 1

Step 2

Step 3

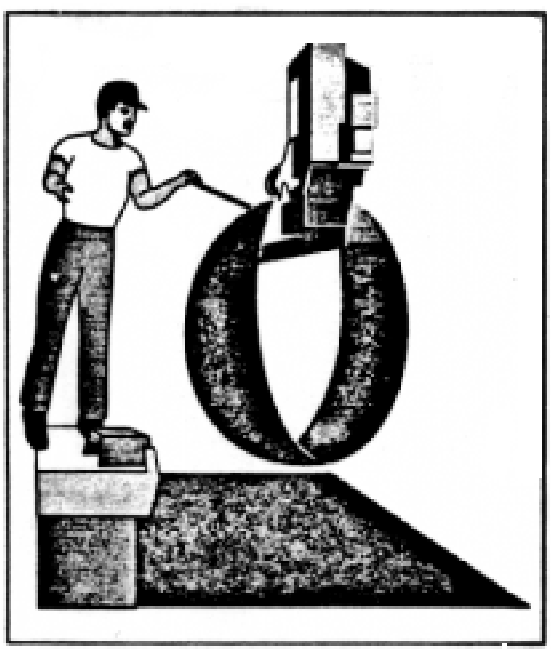
Step 4

Figure 1
(continued)
Work Sequence at AT-6 Press
SANCAP ABRASIVES, Inc.
HETA 92-001

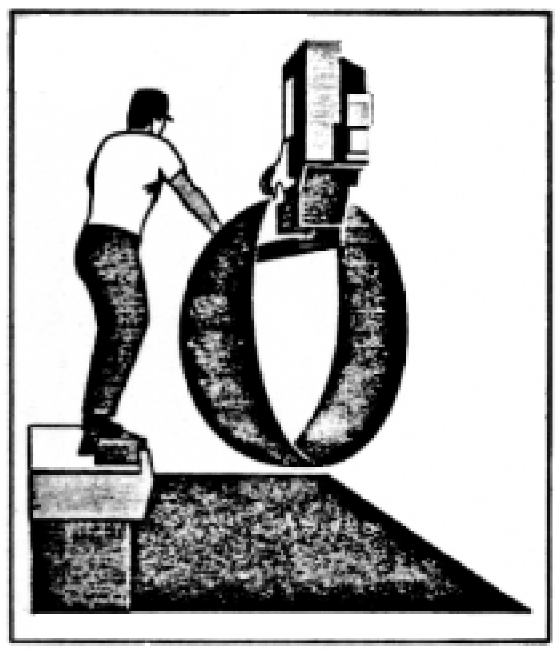


Step 5

Step 6



Step 7



Repeat Step 1

Figure 2
Biomechanical Evaluation
University of Michigan, 2D Static Strength Prediction Program
SANCAP ABRASIVES, Inc.
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