A Guide to
Safe Work Practices in the
Poultry Processing Industry

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Raleigh, NC 27699-1101

Cherie K. Berry
Commissioner of Labor

This guide is intended to be consistent with all existing OSHA standards; therefore, if an area is considered by the reader to be inconsistent with a standard, then the OSHA standard should be followed.

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Additional sources of information are listed on the inside back cover of this book.

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Foreword

New demands from changing lifestyles and dietary choices have prompted expansion in the poultry industry in our state. The workforce has grown and poultry processing methods have changed. There has been heightened attention to additional and different hazards that confront employees in the poultry industry. *A Guide to Safe Work Practices in the Poultry Processing Industry* addresses that need by focusing on particular hazards and suggesting preventive measures.

In North Carolina, state inspectors enforce the workplace safety laws. The N.C. Department of Labor is charged with this mission. NCDOL offers many educational programs to the public and produces publications, including this guide, to help inform people about their rights and responsibilities.

As you look through this guide, please remember our mission is greater than just enforcement. An equally important goal is to help citizens find ways to create safe workplaces. Everyone profits from working together for safety. *A Guide to Safe Work Practices in the Poultry Processing Industry* will help you form effective occupational safety and health practices in your work.

Cherie K. Berry
Commissioner of Labor
Introduction and Plant Walk-through

Introduction

The poultry industry can include places such as hatcheries and farms where chicks are grown; feed mills where grains are stored, selected and mixed for hatcheries; and processing plants. All fowl (turkey, chicken, duck, capon, quail, etc.) that are processed and made available for consumption could be considered part of the poultry industry. This guide focuses on the processing of chicken, but also applies to the processing of other poultry.

In the mid-1980s, the poultry processing industry began to focus on the problem of work related musculoskeletal disorders. These disorders include injury to the nerves, tendons, muscles and supporting structures of the hands, wrists, elbows, shoulders, neck and low back. In 1986, members of the poultry processing industry developed a guideline advocating training, the process of ergonomics and medical intervention as a means to reduce the occurrence of musculoskeletal disorders and their associated costs.

In August 1993, OSHA published its Ergonomics Program Management Guidelines for Meatpacking Plants (meatpacking guidelines). The meatpacking guidelines specifically recommended that employers implement an ergonomics process to identify and correct ergonomics-related problems in their worksites. While the meatpacking guidelines were directed primarily to meatpacking plants, many poultry processing facilities initiated ergonomics programs based upon the recommendations contained in the meatpacking guidelines.

The guidelines offered here regarding ergonomics are advisory in nature and informational in content. They are not a new standard or regulation and do not create any new OSHA duties. Under the Occupational Safety and Health Act of North Carolina, the extent of an employer’s obligation to address ergonomic hazards is governed by the general duty clause. For the state plan operated by N.C. Department of Labor Division of Occupational Safety and Health, the general statute 95-129 establishes the general duty clause. Specifically, the statute address rights and duties of employers that must include but are not limited to the following provisions: Each employer shall furnish to each of his employees conditions of employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious injury or serious physical harm to his employees. However, as it pertains to ergonomics, an employer’s failure to implement the guidelines mentioned is not a violation, or evidence of a violation of the general duty clause. Furthermore, the fact that OSHA has developed this document is not evidence of an employer’s obligations under the general duty clause. The fact that a measure is recommended in this document but not adopted by an employer is not evidence of a violation of the general duty clause. In addition, the recommendations contained herein were developed with the idea that they could be adapted to the needs and resources of each individual place of employment. Thus, implementation of the guidelines may differ from site to site depending on the circumstances at each particular site.

The U.S. Occupational Safety and Health Administration (OSHA) was created to establish and enforce standards to protect the safety and health of workers. The Occupational Safety and Health Act of North Carolina meets or exceeds the requirements of the federal plan. Authority for all matters related to occupational safety and health rests with the N.C. Department of Labor Division of Occupational Safety and Health. In most instances, the standards promulgated by OSHA are adopted and enforced by the N.C. Department of Labor.

Special standards have not been adopted for the poultry industry. Likewise, particular tasks within the poultry industry may not be covered by specific standards. Nonetheless, men and women working within the poultry industry are protected by the act and by general and specific occupational safety and health standards, such as the general duty clause (G.S. 95-129) stated previously and the following:

29 CFR 1910.22—Walking/Working Surfaces—This standard covers floor conditions, including wet surfaces.

29 CFR 1910.94—Occupational Health and Environment Control—Ventilation, including dust collectors, is addressed by this standard.

29 CFR 1910.95—Occupational Health and Environment Control—Employees are protected against exposure to excess noise by this standard. Where noise is excessive, a hearing conservation plan and other protections are required.
29 CFR 1910.132—Personal Protective Equipment—This standard is general in nature and includes, among other things, protection for employees’ hands against sharp knives.

29 CFR 1910.134—Personal Protective Equipment—The minimum elements of an acceptable respirator program, including proper fitting and employee training, are covered by this standard.

29 CFR 1910.212—Machinery and Machine Guarding—Machines, for example, those used for cutting bones, are required to be properly guarded by this standard.

The above standards are from North Carolina Occupational Safety and Health Standards for General Industry.

These guidelines provide recommendations for poultry processing facilities to reduce the number and severity of work-related musculoskeletal disorders. In preparing these recommendations, OSHA reviewed existing practices and programs as well as available scientific information on ergonomics, and reflected comments received from representatives of trade and professional associations, labor organizations, individual firms and other interested parties. These guidelines are designed specifically for the poultry processing industry; however, other industries may find the recommendations and solutions presented useful.

NCDOL recognizes that small employers in particular may not have or need as comprehensive a process as would result from implementation of every action described in this document. NCDOL also realizes that many small employers may need assistance in implementing an appropriate ergonomics process. Free consultation service is available to help them with ergonomics and other safety and health issues. The consultation services are independent of OSH’s enforcement activity. Information about NCDOL’s consultation service can be found on the department Web site at http://www.nclabor.com/osha/consult/bcs1.htm.

**Plant Walk-through**

A walk-through of the plant is an effective way to look at the variety of tasks involved in poultry processing. Usually chickens come into the processing plant by truck and in cages. In the receiving area, birds are stunned with an electric probe and live hung on a line that carries them through the kill room. They then pass to the scalers and pickers, where feet, head and feathers are removed. Birds then move to the eviscerating area where they are cut open. Liver and gizzards are removed and inspected prior to packaging, and lungs are removed. Viscera are inspected by U.S. Department of Agriculture (USDA) inspectors and then removed.

Next, birds move through final inspection and the wash. In accordance with USDA requirements, they are chilled to 40°F. When properly chilled, the birds move to the cutting and deboning lines where they can be placed on cones to move along a line where meat is removed according to the cut performed at each work station. Deboned meat is fine trimmed, and inspectors monitor both temperature and quality control. The meat is then packaged and shipped, either fresh or frozen, according to the purchaser’s request. Whole fryers and roasters are not cut up.

In recent years there has been an increased demand for chicken over some other types of meat. Chicken is relatively lean and has fewer calories. Similarly, American consumers have demanded the convenience of “fast foods,” pre-cut and packaged meats and boneless chicken pieces. The poultry industry has had to institute changes to meet these public demands. Changes in the industry have heightened the need for attention to safety and health concerns. Particular safety and health concerns of this industry include the need for appropriate guards around the moving parts of machinery and the blades of saws, adequate ventilation, the use of personal protective equipment, and good housekeeping practices.

Better training for employees is essential to the betterment of employee safety and health. New employees and employees assigned to new jobs require additional training and observation. Training lines with close supervision allow employees to gain job skills and become acclimated to their jobs while reducing the potential for injuries.

A number of conditions or practices in the poultry industry can be considered to pose hazards. The list includes tasks that could result in cuts or lacerations, repetitive motion disorders, slips and falls, exposure to cold and wet climates, exposure to dust, dermatitis, exposure to chemicals, and noise exposure. The remainder of this guide examines potential problems in the poultry industry and suggests preventive measures and possible solutions.
Potential Hazards and Preventive Measures

Cuts and Lacerations

Saws, knives and scissors are the tools used in cutting and deboning chicken. Saws are used to cut chickens into quarters and pieces. In the deboning process, the chicken carcass is placed on a cone on a conveyor line. At each work station a different cut is made, to remove the legs, wings, skin, breast meat and thighs. Each operator on the line makes one or more specific cuts with a very sharp knife to remove specific portions of meat. Scissors are used to trim bone, gristle and fat from the meat. Tools that are sharp enough to cut meat will easily cut fingers.

Preventive Measures

Personal protective equipment such as metal mesh gloves and arm guards will help to reduce the number of cuts or lacerations workers may experience in the deboning process. Employees can be trained in methods and techniques that produce clean cuts and prevent injuries. Knives and scissors must be kept very sharp so that the appropriate cut can be made. Sharp tools also help reduce the force required to make the cut. Accidental injuries can be reduced by keeping knives and scissors in scabbards when not in use. Sufficient space between operators will help prevent employees from accidentally cutting each other.

Saws used to cut birds into quarters should have appropriate guards on the blade to protect the operator from injury. Adjustments to the saw must be accomplished when the power is off and the machine is stopped. Particular saws should have a lower guard that retracts when the saw is in use then automatically returns to the guard position. Appropriate grounding and insulation of the saws (and all electrical equipment) are necessary to prevent electrical hazards.

Minor cuts and lacerations should immediately be thoroughly washed with soap and water and treated with an antiseptic and dressing. Deep cuts or lacerations with loss of motion to the affected area should be referred to a doctor for treatment. Prompt treatment will help reduce infection and promote early healing. All injuries should be reported to supervision.

Dermatitis

Skin disorders, or dermatitis, may be the most frequently occurring occupational illness. Conversely, the skin, as the largest organ of the human body, is one of our most valuable weapons in preventing illnesses. For example, the skin allows us to cope with extremes in our environment, including temperature, moisture, wind and weather. Yet responses prompted by the skin to the season of the year sometimes contribute to skin diseases. In warmer weather workers tend to wear less clothing so that there is greater likelihood of skin contact with irritants. In cold weather there is more potential for chapping from exposure to cold and wind. Overheated homes and workplaces can cause skin to become dry and more easily damaged.

Skin disorders can affect any worker, regardless of the type of job or the industry. Most occupational skin disorders begin on exposed skin such as hands or arms. Skin disorders include callouses and blisters caused by pressure and/or friction. Other skin disorders are burns and frostbite, which are caused by extremes of heat or cold. Biological agents such as plants or animals or bacteria can cause dermatitis.

Skin disorders range from red, chapped hands to lesions and eruptions. People with pre-existing skin diseases are more at risk of developing occupational dermatoses. Skin diseases unrelated to one’s present job can be aggravated by exposures at work. Individuals with skin allergies may react to very small amounts of a substance to which they are allergic.

Some employees who work in poultry processing develop skin rashes and dermatitis. This may be caused by contact with the water used to clean and rinse the chicken during preparation of the birds. It is important to wash hands and arms frequently with soap and water and to dry them thoroughly. Protective clothing such as gloves may be required for some operations. Individuals with pre-existing conditions should not work where the disorder could be aggravated. Because people who work in the poultry preparation department frequently expose their hands to temperature changes, chapped skin may be experienced.

Preventive Measures

Personal cleanliness is the most import measure for preventing skin irritations or rashes. Thorough washing and drying of hands, arms and other involved skin areas are essential.
The use of hand creams or water repellent protective barrier creams may help in the prevention of occupational dermatitis. Several times during the workshift, the creams should be removed by washing with soap and water. The skin should be dried, and the creams should be reapplied.

Particular jobs may require the use of rubber gloves to keep the skin out of contact with water. Protective equipment should fit correctly to prevent additional irritation from too tight a fit or from rubbing when the fit is too loose. Protective equipment should be inspected frequently, kept in good repair and replaced when necessary.

**Cold/Wet Environment**

As birds move along in processing, they are washed and cooled with cold water. Temperatures in the poultry processing facilities are kept cool to prevent meat spoilage and to conform to USDA requirements that meat of the chicken be kept at 40°F. This produces a work environment that is wet and cold.

Workers with poor circulation to the extremities (hands and/or feet) may experience increased discomfort in a cold and wet environment because of the additional constriction of blood vessels caused by the cold. Long-term exposure to a cool, damp environment also produces more discomfort for individuals with musculoskeletal disorders such as arthritis. Other chronic diseases that affect the nerves and blood vessels on the hands or feet can be aggravated by cold and wet work areas.

As previously noted, the cool and wet environment required for chicken processing contributes to chapping of the skin and may aggravate skin disorders.

**Preventive Measures**

Workers should wear warm clothing. Where possible, protective clothing such as rubber aprons should be worn to keep clothing dry. Rubber boots with heavy socks will keep the feet warm and dry. In some areas where there is frequent handling of very cold meat, cotton gloves can be worn under rubber gloves to keep the hands warm.

**Slips and Falls**

Floors and work areas in poultry processing will be wet because of the wet process and frequent cleaning required for sanitary reasons. Similarly, grease or fat from the birds will make floors and work areas slippery. Standing and walking in work areas with slippery floors increases the potential for slips and falls.

**Preventive Measures**

Good drainage is essential for work areas where there is wet processing. Boots and non-skid soles and floor mats with non-skid surfaces can be used to reduce the potential for slips and falls. Routinely scheduled cleaning during the workshift helps maintain a sanitary work environment and reduces the buildup of grease and fat. Aisles and passageways where mechanical handling equipment is used should be clearly marked and be of sufficient size for safe clearance.

**Respiratory Irritants**

Poultry industry employees can be exposed to a variety of respiratory irritants. Chicken handlers or chicken growers experience the greatest exposure to airborne contaminants because of dust from feed grains, gases from decomposing manure, dander and feathers. The level of air contaminants increases with older birds. Dust and gas levels are higher in colder months because buildings are open during warmer weather.

In the poultry processing operations, exposure to respiratory irritants is heavier in the receiving area because of the activity of excited, nervous birds. Exposure is heaviest when birds are removed from their cages and live hung on convey or lines. Individuals who are exposed to these respiratory irritants may have symptoms such as cough, shortness of breath, wheezing, stuffy nose or eye irritation.

There are other respiratory illnesses that are uncommon diseases but can occur from infectious pathogens. Some of these are believed to spread to humans from infected vapors from evisceration in poultry processing. Symptoms include fever, chills, aching muscles, headache and inflammation of the lungs.

Once the birds are killed and plucked, the potential for exposure decreases rapidly. After the birds are through the preparation areas and move to processing, there is no longer a problem with airborne respiratory irritants.
Airborne contaminants usually measure well below OSHA limits in poultry processing operations. Nonetheless, employees who are hypersensitive to respiratory irritants in the poultry processing environment will have difficulty working there.

**Preventive Measures**

Insofar as possible, the receiving area should be kept clean and free from trash. Workers who unload trucks and crates and live hang the birds should wear personal protective equipment such as nuisance dust respirators. Protective clothing and boots will help minimize exposure in this area. Eye protection is useful to prevent particles of dust and dirt from getting into the eyes. As the receiving area is primarily mechanized, good housekeeping practices and protective equipment are usually adequate to prevent problems associated with dust exposure. Workers with sensitivity to airborne contaminants should not work in this area.

**Chemical Exposures**

There are some areas in a poultry processing plant where workers may be exposed to harmful levels of chemicals or air contaminants. Where there are high levels of chemicals in the work area, engineering controls must be used to prevent or limit employee exposure to them. Protective equipment must be used as appropriate.

Carbon dioxide in the form of dry ice is used in many poultry processing plants to keep meat cold while in holding areas and to quick freeze meat for shipping. Carbon dioxide is an odorless gas. Inhalation of high levels of carbon dioxide may cause an increase in the breathing rate, which can progress to shortness of breath, dizziness or vomiting.

Ammonia or Freon may be present in a poultry processing plant as chemicals used for refrigeration. Ammonia may cause irritation of the respiratory tract and the eyes. Freon is hazardous only at extremely high exposure levels. Periodic monitoring of the work areas will help detect these chemicals before they can cause a serious health effect.

Chlorine is sometimes added to the water used for washing chickens. In a diluted form chlorine is a disinfectant and usually does not present a hazard. In a concentrated form, chlorine is a respiratory irritant that can cause breathing difficulties. Even at low levels, the prolonged exposure to chlorine may cause skin irritation for some workers.

Solvents or compounds used in cleaning and degreasing operations are potential health hazards. These materials are used in the maintenance of equipment and in housekeeping. When such materials are used improperly, there is the potential for inhalation of vapors that may cause a lack of coordination or drowsiness. Workers showing these symptoms should be immediately removed to fresher air.

Skin contact with cleaning compounds and solvents may cause dermatitis, ranging from simple irritation to skin damage. Products designed to remove fat and grease from equipment will also remove the natural oil barrier from the worker’s skin, leaving the skin unprotected. Workers who use such compounds should be required to use appropriate protective equipment, such as gloves or barrier creams. Cleaning compounds and solvents may pose the hazard of being splashed into employees’ eyes. Where strong concentrations or caustic solution agents are used, protective eyewear should be used and eye wash stations should be readily available.

Vats, tanks or other enclosed spaces that may contain organic matter (skin, feathers, fat, offal and so forth) should be tested for the presence of hydrogen sulfide or methane produced by the decomposing organic materials. When entering a confined space, specific work practices must be instituted and respirators must be worn. Ventilation controls should be in place. *A Guide to Safety in Confined Spaces*, NC-OSHA Industry Guide #1 (which includes suggested readings), is available through the Bureau of Education, Training and Technical Assistance, Division of Occupational Safety and Health, N.C. Department of Labor. (See the inside back cover of this publication for the address and telephone number.)

**Preventive Measures**

All workers who have the potential for exposure to chemicals should be medically evaluated prior to working in areas where they may be exposed to chemicals. Work areas that may expose workers to chemicals should be frequently monitored to detect exposure levels. Good ventilation and airflow is usually sufficient to protect workers from harmful exposure. Heavier concentrations may require local exhaust ventilation. When monitoring indicates the possibility of overexposure, workers should use appropriate respirators. Such respirators must be fitted to each individual, and employees must be trained to use the respirators.

Workers who handle chemicals such as dry ice should wear gloves to protect their hands and fingers from frostbite. Gloves and barrier creams can protect workers by preventing skin disorders from frequent contact with chemicals. Any
time there is the potential for exposure to strong concentrations of chemicals, planned work practices should be followed to prevent overexposure. Where strong concentrations and caustic agents are used, protective eyewear should be worn and eye wash stations should be readily available.

Any workplace that uses hazardous chemicals is required to have a written hazard communication program in place. Among other things, the hazard communication program requires a label and material safety data sheet (MSDS) for each hazardous chemical. The label and MSDS must provide numerous specified items of information to employees. Additionally, employee training is required. The hazard communication program is required by the Hazard Communication Standard, 1910.1200, which defines a hazardous chemical as “any element, chemical compound, or mixture that is a physical hazard or a health hazard.”

**Noise Exposure**

Excessive noise can cause permanent hearing damage. Figure 1 provides estimates of noise levels in different environments, maximum allowed daily exposure levels and the level of difficulty of voice communication within each environment.

**Figure 1**

*Noise Levels for Different Environments*

<table>
<thead>
<tr>
<th>Noise Sources</th>
<th>Sound Level dBA</th>
<th>Maximum Exposure Per Day dBA</th>
<th>Indicators of Level (Speaking Effort Required Between Two Persons at Various Distances)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumatic Chipper (at 5 ft.)</td>
<td>115</td>
<td>15 min.</td>
<td>Nearly impossible to communicate by voice</td>
</tr>
<tr>
<td>Chain Saw (at ear)</td>
<td>110</td>
<td>30 min.</td>
<td>Very difficult to communicate by voice</td>
</tr>
<tr>
<td>Rock ’n Roll Band</td>
<td>110</td>
<td>30 min.</td>
<td>Very difficult to communicate by voice</td>
</tr>
<tr>
<td>Wood Planer</td>
<td>105</td>
<td>1 hour</td>
<td>Shout with hands cupped between mouth and other person’s ear</td>
</tr>
<tr>
<td>Punch Press</td>
<td>100</td>
<td>1.5 hours</td>
<td>Shout at 0.5 foot</td>
</tr>
<tr>
<td>Pneumatic Air Hoist, 4000 lb.</td>
<td>100</td>
<td>2 hours</td>
<td>Shout at 1 foot</td>
</tr>
<tr>
<td>Newspaper Press</td>
<td>95</td>
<td>3 hours</td>
<td>Normal voice at 0.5 foot</td>
</tr>
<tr>
<td>Power Lawn Mower (at ear)</td>
<td>95</td>
<td>4 hours</td>
<td>Raised voice at 1 foot</td>
</tr>
<tr>
<td>Vane Axial Ventilating Fan (1500 CFM)</td>
<td>90</td>
<td>6 hours</td>
<td>Telephone use impossible</td>
</tr>
<tr>
<td>Boiler Room</td>
<td>90</td>
<td>8 hours</td>
<td>Normal voice at 1 foot</td>
</tr>
<tr>
<td>Diesel Truck (40 MPG at 50 ft.)</td>
<td>85</td>
<td></td>
<td>Raised voice at 1 foot</td>
</tr>
<tr>
<td>Arc Welder</td>
<td>85</td>
<td></td>
<td>Shout at 2 feet</td>
</tr>
<tr>
<td>Garbage Disposal (at 3 ft.)</td>
<td>80</td>
<td></td>
<td>Normal voice at 1.5 feet</td>
</tr>
<tr>
<td>Inside a Car (50 MPH)</td>
<td>75</td>
<td></td>
<td>Raised voice at 3 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shout at 6 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Normal voice at 2 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Raised voice at 4 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shout at 8 feet</td>
</tr>
</tbody>
</table>
OSHA standards require employers to maintain a hearing conservation program when employee exposure to noise is at or above an 8-hour TWA (time weighted average) of 85 dBA (decibels). The hearing conservation program requires noise or sound level monitoring. If the exposure is above 90 dBA, the program requirements include administrative or engineering controls to try to reduce exposure to or below 90 dBA.

Annual audiograms are required for all employees exposed at or above 85 dBA. For exposure between 85 and 90 dBA, use of hearing protection is required under certain conditions. Hearing protection is required if administrative and engineering controls do not reduce the exposure to 90 dBA or less.

**Preventive Measures**

There are several ways to protect against potentially harmful noise sources. Engineering controls, such as muffling noise by enclosing noisy equipment or moving parts, are preferred. Administrative controls, such as the rotation of workers, may in some instances be used to limit the amount of time each individual is exposed to high levels of noise. Hearing protectors may be necessary to attenuate noise levels. Whenever hearing protectors are used, each employee must be provided a choice of protector, must be individually fitted, and must be trained to use the protector(s). Figure 2 depicts three types of hearing protectors.

**Figure 2**

*Three Types of Hearing Protectors*

- **Disposable foam-type ear plugs.** One size fits most people. Comfortable and easy to use. Disposable after use.

- **Insert protectors** are most commonly used. Many types and sizes available to ensure fit. Made of rubber or silicone. Last up to six months.

- **Muffs** fit tightly over ears with cushions to ensure comfort. Various sizes and designs available. Cushions can be replaced.

*Whatever type of hearing protector is used, it must be properly fitted and used correctly to provide adequate protection. Hearing protectors must be kept clean and stored properly.*
Cumulative Trauma Disorders

Studies show that workers with jobs requiring frequent hand exertion may develop cumulative trauma disorders. Cumulative trauma disorders are injuries that develop gradually from repeated stress to a particular body part. Such disorders are also called “overuse” or “wear-and-tear” repetitive strain disorders. They occur primarily in the upper extremity and include soft tissue injuries such as muscle strain, tendinitis, neuritis and carpal tunnel syndrome.

A number of things contribute to cumulative trauma disorders. Standing in one position for long periods of time can cause discomfort or strain to muscles of the back and legs, because the muscles remain in a position of contraction without allowing for periods of relaxation or movement. Similarly, the height of a work area may contribute to muscle strain for a very short or very tall individual because he or she may be forced to reach beyond a comfortable point.

Often work requires the active use of the hand or arm, making the upper extremity vulnerable to trauma. The upper extremity includes the shoulder, upper arm, elbow, forearm, wrist, hand and fingers. The arm and hand move through actions of the joints, muscles and tendons. Upper extremity movement can range from large, sweeping motion to fine, precise manipulation. Hands and arms work best in a neutral or natural position. Figure 3 illustrates and identifies various hand-wrist positions.

**Figure 3**

*Hand-Wrist Positions*

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>Hand in neutral position</td>
</tr>
<tr>
<td>FLEXION</td>
<td>Bending the wrist down toward the palm</td>
</tr>
<tr>
<td>EXTENSION</td>
<td>Bending the wrist up and back</td>
</tr>
<tr>
<td>RADIAL DEVIATION</td>
<td>Bending the wrist toward the thumb</td>
</tr>
<tr>
<td>ULNAR DEVIATION</td>
<td>Bending the wrist toward the little finger</td>
</tr>
<tr>
<td>SUPPINE POSITION</td>
<td>Palm up</td>
</tr>
</tbody>
</table>

The joints of the upper extremity include the shoulder, elbow, wrist and fingers. Joints are formed where ligaments connect the end of one bone to another. When joints are twisted beyond their normal range of motion, an injury called a sprain occurs.

Muscles are fiber bundles that contract to produce movement. Aching and swelling can result from small strains to muscles. Other injuries may result from the tearing of muscle fibers or from a blow or crush that causes blood to seep out into a large area of the muscle. Such injuries can cause serious damage to the muscle. The upper arm muscle is depicted in figure 4.

Tendons are tough, ropelike structures that attach muscles to bones. When a joint, such as the elbow, is severely stretched or twisted, the tendon fibers can be torn like a rope that is frayed, causing a strain injury or tendinitis. Figure 4 shows a tendon.
Figure 4

Muscle in the Upper Arm

Tendons in the wrist and hand are surrounded by a sheath containing a lubrication called synovial fluid. With overuse this fluid can decrease in amount, causing rubbing or friction between the tendon and the sheath. This condition is called tenosynovitis.

Trigger finger is a condition that occurs when the tendon sheath in the finger becomes very swollen and the tendon locks and is unable to move. Trigger finger occurs on the palm side of the finger.

The carpal tunnel is a very small (2–3 centimeters) tunnel in the wrist. The walls of the tunnel are formed by the bones of the wrist and a tough ligament that wraps around the wrist bones. Tendons to flex the fingers, blood vessels and a nerve pass through the carpal tunnel from the arm to the hand. If there is swelling of the tendons or other conditions that use up space in the carpal tunnel, the nerve can be pinched or compressed. This can lead to pain, swelling and numbness in the fingers. As symptoms get worse, weakness and clumsiness will develop in the hand. Figure 5 depicts the carpal tunnel.

Nerves and blood vessels between the neck and shoulder can be compressed, causing numbness and tingling in the hand and fingers. This condition is called thoracic outlet syndrome. Thoracic outlet syndrome can frequently be corrected by early diagnosis and an exercise program.

Ganglion cysts are smooth, firm, round lumps often noticed on the back of the hand or wrist. These lumps are the most common to form on the hand. Usually they are painless, but a mild aching may be associated with them, especially if tendons are involved. These cysts have fibrous walls filled with mucous-like material. Ganglion cysts sometimes follow injury, but it is not always possible to know the cause of the cysts.

The speed of work may be determined by the speed of a conveyor belt. For example, in chicken processing, the faster the conveyor line, the more frequent is the requirement for the cutting of chicken (the repetition of a specific task). Jobs that require frequent repetition of the task cause muscles to contract frequently, requiring more muscle effort and less recovery time.

Force, for example, required to make a particular cut, either with a knife or scissors, can contribute to cumulative trauma disorders. Increasing the applied force increases muscle effort, decreases circulation to the muscles and causes greater muscle fatigue. Effort required to make a particular cut, either with a knife or scissors, can depend upon the sharpness of the tool. A dull instrument requires more force or exertion and contributes to cumulative trauma disorders.
Continuous muscle contraction can cause tendons in the fingers to swell and become irritated. Forceful gripping may cause pressure on nerves from muscles or tendons, as may repeated movement. Hand and arm motions may include grasping, turning, applying pressure and pinching. These movements frequently result in stressful hand and wrist positions.

Compression or pressure to nerves (and blood vessels) can also occur when tool handles are squeezed in the palm. Awkward hand motions are sometimes used to separate meat from chicken bones. One hand may hold meat while the other hand is holding the knife to make a specific cut. Scissors can rub on the sides of fingers, causing pressure and compression to nerves of the fingers.

Non-work-related factors may contribute to cumulative trauma disorders. A pre-existing condition such as arthritis or a joint injury resulting from sports activity may increase the risk of further injury at work. A worker recovering from illness or a worker with a chronic disease is at increased risk of developing cumulative trauma disorders. Age, sex and body build can all contribute to cumulative trauma disorders.

**Preventive Measures**

Early recognition of problems and treatment of complaints have been very effective in reducing and preventing cumulative trauma disorders. Work methods should be examined and corrections made where practical and appropriate. Workplaces may need to be redesigned to better accommodate the area to the worker (ergonomic necessities).

Workplace redesign may necessitate adjustable foot rests and stand/sit props to help relieve muscle strain and back pressure for workers in fixed, standing positions. Cushioned floor mats or shoes with cushioned soles will also be more comfortable for workers standing in one position. Frequent walk-around periods also help relieve muscle strain.
Stackable or adjustable work stands can raise shorter workers to a more comfortable work position. However, care must be taken to see that such stands do not create a fall or trip hazard. Conveyors should be designed so that the maximum reach for workers is no greater than 13”–18”. Upward reaches should be no higher than shoulder level (preferably even lower); the higher the upward reach, the shorter should be the forward reach. The important factors in deciding the proper dimensions of a work station are the kind of work being done, the height at which the work will take place, and the size of the worker.

Good knife sharpening equipment should be readily available for each worker required to use a knife. As previously noted, sharper knives reduce the force needed to make a cut. Preferably, sharpened knives and scissors should be issued on a regular schedule. However, if the employee is to touch up the cutting edge of a knife that has been sharpened by a full-time sharpener, he or she should be trained to perform the touch-up properly.

Handles on scissors, knives and other tools should be proportionate to the size of the worker and designed to keep hands or wrists in a neutral position. Figure 6 illustrates the effect of the shape of a knife handle upon the repetitive positioning of the wrist.

Figure 6

*Effect of Shape of Knife Handle Upon Wrist*

A. Straight knife handle causing deviation of the wrist when making a cut.
B. Curved knife handle keeping wrist straight when making a cut.

Early treatment of muscle soreness and strain requires early awareness. Employees must be aware of potential problems and the importance of seeking treatment when they first notice symptoms. Supervisors and managers need to support and promote this policy.

Warm-up exercise periods and interim stretch breaks may help keep workers in condition. Routine programs of stretching and strengthening exercises, particularly of the muscles of the hands, arms, shoulder and neck, may be of value in preventing cumulative disorder problems. Such exercises may reduce feelings of stress and promote a more positive attitude, which seem to play some role in the development and course of cumulative trauma disorders. (See the appendix I for illustrations of exercises that might be used by poultry processing workers.)
Appendix I

Illustrations of Exercises*

*Exercises should be performed gently until one feels the stretch, and should be repeated a minimum of five times.

1. Upper Back Stretch
   
   A. Reach Up: Raise both hands over your head and reach for the ceiling, up on your toes. Reach for five seconds and relax. Repeat.

   B. Reach Forward: Reach as far as you can in front of you. You should feel a good stretch between the shoulder blades. Reach for five seconds and relax. Repeat.

   C. Reach Backward: Reach behind you as far as you can. You should feel a good stretch across your chest. Reach for five seconds and relax. Repeat.

2. Shoulder Stretches
   
   A. Shrug Up: Raise your shoulders up toward your ears. Shrug as tightly as you can, and hold for five seconds. Then let them drop and relax.

   B. Roll Forward: With arms relaxed at sides, lift and roll shoulders forward in a circular motion. Relax.

   C. Roll Backward: Then roll your shoulders backward in a circular motion. Relax.
3. Neck Stretches
A. Chin Tuck: “Funky Chicken” Keep your head straight and tuck your chin into your neck. Hold for five seconds. Relax and repeat.

B. Ear to Shoulder: Move the right ear to the right shoulder. Don’t cheat and shrug your shoulder! You should feel a stretch along the left neck and shoulder. Hold for five seconds and relax. Repeat. Then do the same stretch on the left side.

4. Forearm Stretches
A. Hold the right arm out straight in front of you, with the elbow straight and palm down. Bend your wrist down with the left hand to get a good stretch over the top of your forearm. Hold for five seconds and relax. Repeat. Then do the same stretch for the left forearm.

B. Hold both arms straight out in front of you, lace your fingers together, and press your palms out and away from your body. You should feel the stretch on the underside of your forearm. Hold for five seconds and relax. Repeat.

5. Hand Stretches
A. Finger Stretch: Spread the fingers of both hands far apart. Hold for five seconds. Relax. Repeat.

B. Thumb Stretch: Gently pull the right thumb down and out, with the left hand. Hold for five seconds. Relax. Repeat. Then do the same stretch for the left thumb.
Ergonomics for the Prevention of Musculoskeletal Disorders

Guidelines for Poultry Processing

The poultry processing industry has reduced occupational injuries and illnesses by almost half over the last 10 years. Despite these efforts, musculoskeletal disorders are still prevalent in the poultry processing industry. According to the Bureau of Labor Statistics, of the 3,000 cases with days away from work that occurred in 2002, over 30 percent (976 cases) involved musculoskeletal disorders. Many poultry processing jobs involve physically demanding work. Some poultry workers make more than 25,000 cuts per day processing chickens and turkeys.

These processing tasks involve factors, including repetition, force, awkward and static postures, and vibration, which have been identified as increasing the risk of incurring injury. Many of the operations in poultry processing occur with a chilled product or in a cold environment. Cold temperatures in combination with the risk factors may also increase the potential for musculoskeletal disorders to develop. Excessive exposure to these risk factors can lead to musculoskeletal disorders.

In these guidelines, we use the term musculoskeletal disorder to refer to a variety of injuries and illnesses that occur from repeated use or overexertion, including:
- Carpal tunnel syndrome
- Tendinitis
- Rotator cuff injuries (a shoulder problem)
- Epicondylitis (an elbow problem)
- Trigger finger
- Muscle strains and low back injuries

Employers should consider a musculoskeletal disorder to be work-related if an event or exposure in the work environment either caused or contributed to the disorder, or significantly aggravated a pre-existing disorder as required by OSHA’s recordkeeping rule (29 CFR 1904). For example, when an employee develops carpal tunnel syndrome, the employer needs to look at the hand activity required for the job and the amount of time spent doing the activity. If an employee develops carpal tunnel syndrome and his or her job requires frequent hand activity, forceful exertions or sustained awkward hand positions, then the problem may be work-related. If the job requires very little hand activity, then the disorder may not be work-related.

Activities outside of the workplace that involve substantial physical demands may also cause or contribute to musculoskeletal disorders. In addition, development of musculoskeletal disorders may be related to genetic causes, gender, age and other factors. Finally, there is evidence that reports of musculoskeletal disorders may be linked to certain psychosocial factors such as job dissatisfaction, monotonous work and limited job control. These guidelines address only physical factors in the workplace that are related to the development of musculoskeletal disorders.

C. Wrist Circles: With both arms stretched outward, draw a circle with your finger tips. Repeat five times in both directions (clockwise and counterclockwise).

6. Back Arches: This can be done either sitting on the edge of your chair or standing. Put your hands in the small of your back and arch your back backwards. Hold for five seconds. Relax. Repeat.
These guidelines present recommendations for the workplace and work practices with the goal of reducing work-related musculoskeletal disorders. Poultry processors can usually meet this goal by changing work methods, equipment or workstations. Many changes can be made without significantly increasing costs and many ergonomic changes result in increased efficiency by reducing the time needed to perform a task. Many poultry processing companies have already instituted programs that reduce musculoskeletal disorders, reduce workers’ compensation costs and improve efficiency.\textsuperscript{8, 9}

Ergonomics is an effective approach to reducing the number and severity of these work-related injuries. Ergonomics is the practice of designing equipment, work tasks and work environments to conform to the capability of the worker to create more efficient work places and prevent injuries to employees.

Ergonomics is a broad topic. This guideline deals only with the identification and control of ergonomic hazards that may cause musculoskeletal disorders. A musculoskeletal disorder is an injury or disorder of the muscles, bones, nerves, tendons, ligaments, joints, cartilage and/or spinal disks that may be caused or contributed to by exposure to work activities and conditions involving certain risk factors.

**Musculoskeletal Disorders**

The term “work-related musculoskeletal disorders” refers to (1) musculoskeletal disorders to which the work environment and the performance of work contribute significantly or (2) musculoskeletal disorders that are made worse or longer lasting by work conditions. In general, musculoskeletal disorders develop when physical stressors overcome the body’s ability to heal and repair itself.

Physical risk factors in the workplace, or “ergonomic stressors,” along with personal characteristics and social factors, are thought to contribute to the development of musculoskeletal disorders (Cohen, 1997). Some musculoskeletal disorders are caused by physical exposures in nonworking activities such as sports and hobbies. Genetics, age and other medical conditions such as arthritis, diabetes or degenerative disease can cause or contribute to the development of musculoskeletal disorders. Musculoskeletal disorders can also result from certain psychosocial factors such as job dissatisfaction, monotonous work and limited job control (U.S. General, 1997). This guideline addresses only physical factors in the workplace.

Work-related musculoskeletal disorders may occur in the form of cumulative and acute trauma disorders.

**Cumulative Trauma Disorders**

Cumulative trauma disorders can result from exposure to repetitive, forceful or awkward tasks over a period of time. Each stressful situation results in microtraumas to the specific region of the body, such as a muscle or tendon. Without adequate recovery, the accumulation of microtraumas results in pain, discomfort, numbness, reduced strength and/or inhibited dexterity. Symptoms of cumulative trauma typically cannot be associated with one specific event in time.

**Acute Traumas**

Acute traumas, such as lacerations, fractures, strains, sprains, contusions or bruises, can generally be attributed to a one-time specific instantaneous event. These traumas are often easier to diagnose and treat because the causative stressors and affected body regions are more readily identified. Acute traumas considered “ergonomics-related” include such injuries as muscle strains, low back pain, lumbar strains and other back concerns.

**Common Musculoskeletal Disorders in the Workplace**

Common Cumulative Trauma Disorders in the Workplace

- **Tendinitis** is an inflammation of a tendon usually associated with overuse of that tendon or rubbing of the tendon against bone.
- **Epicondylitis** is an inflammation of the tendon attachments on the inside of the elbow.

Medial epicondylitis (often called golfer’s elbow) is associated with repetitive flexion of the wrist while exerting a grip force (manual screwdriver action). Lateral epicondylitis (often called tennis elbow) is associated with repetitive gripping exertions with an extended wrist.

- **Carpal tunnel syndrome** is a group of signs and symptoms associated with swelling within the carpal tunnel. The carpal region stretches from the lower palm to the tender portion of the wrist. A bundle of tendons and the median nerve are located within the carpal tunnel, which is about the size of a dime. Exposure to stressors can cause swelling within the tunnel. This can also cause the tendons to enlarge and impinge the median nerve resulting in pain and numbness.
Tenosynovitis is an inflammation of the synovial sheath that covers the tendon. De Quervain’s Syndrome is a common tenosynovitis of the thumb tendons resulting from the repetitive motions of the thumb.

Trigger finger is a common term for tendinitis or tenosynovitis that causes locking of the finger(s) while bending or flexing.

Raynaud’s or vibration syndrome is a circulatory disorder that is also called the “white finger syndrome.” Symptoms such as pain and whitening of hands and fingers are exacerbated by cold and vibration.

Thoracic outlet syndrome can be caused by several different problems. The thoracic outlet is the route utilized by nerves and blood vessels to pass from the upper body into the arms. Nerves and blood supply passing through the thoracic outlet may be pinched, which then causes pain and/or numbness down the arm and to the fingers. Repetitive reaching above the head or behind the body are thought to stress this region.

Low back pain of cumulative origin is thought to be a result of natural, gradual changes in the passive tissues of the spine (disks, ligaments and vertebrae) with age, but it is thought to be accelerated due to work activities involving repetitive lifting, awkward postures and forceful exertions.

Ergonomic-related Acute Trauma

Strained muscles can occur when a muscle is overloaded resulting in the partial tearing of fibers. Scar tissue may form, which can cause chronic tension and make the muscle susceptible to reinjury. Common muscle strains occur in the shoulders, upper arms, forearms and low back.

Low back pain of acute origin is generally attributed to muscle strains of the lumbar region. Poor lifting postures, heavy loads and/or repetitive exertions are often cited as activities that preceded the acute injury. In many cases the specific cause of acute low back pain is unknown.
Appendix II
Posture Identification Sheet

BACK
- Neutral
- Forward Flexed
- Extended Backwards
- Twisted

NECK
- Neutral
- Forward Flexed
- Extended Backwards
- Sidebent/Twisted

SHOULDER
- Neutral
- Elbows>30° from Body
- Forward Reach
- Backward Reach

ELBOW
- Neutral
- Flexed
- Extended (Reaching)

FOREARM
- Neutral
- Palm Down
- Palm Up

WRIST
- Neutral
- Flexed
- Extended
- Ulnar Deviation
- Radial Deviation

Ref: AFMA Voluntary Ergonomics Guideline for the Furniture Manufacturing Industry (American Furniture Manufacturers Association, P.O. Box HP-7, High Point, NC 27261; (336) 884-5000; www.afma4u.org)
Core Elements of an Ergonomics Program

From: Ergonomics Program Management Guidelines for Meatpacking Plants

An effective occupational safety and health program to address ergonomic hazards in the meatpacking industry includes the following four major program elements: worksite analysis, hazard prevention and control, medical management, and training and education.

1. Worksite Analysis

Worksite analysis identifies existing hazards and conditions, operations that create hazards and areas where hazards may develop. This also includes close scrutiny and tracking of injury and illness records to identify patterns of traumas or strains that may indicate the development of cumulative trauma disorders.

2. Hazard Prevention and Control

Once ergonomic hazards are identified through the systematic worksite analysis discussed above, the next step is to design measures to prevent or control these hazards. Thus, a system for hazard prevention and control is the second major program element for an effective ergonomics program. Ergonomic hazards are prevented primarily by effective design of the workstation, tools and job. To be effective, an employer’s program needs to use controls to correct or control ergonomic hazards including the following:

- Engineering controls
- Personal protective equipment (PPE)
- Work practice controls
- Administrative controls

3. Medical Management

Implementation of a medical management system is the third major element in the employer’s ergonomics program. Proper medical management is necessary both to eliminate or materially reduce the risk of development of cumulative trauma disorders through early identification and treatment of signs and symptoms and to prevent future problems through development of information sources.

4. Training and Education

The fourth major program element for an effective ergonomics program is training and education. The purpose of training and education is to ensure that employees are sufficiently informed about the ergonomic hazards to which they may be exposed, so that they are able to participate actively in their own protection. Employees must be adequately trained about the employer’s entire ergonomics program. The complete guidelines referenced can be found at http://www.osha.gov/Publications/osha3123.pdf.

Ergonomic Stressors

Factors that increase risk for musculoskeletal disorder development are called ergonomic stressors. The ergonomic stressors that poultry processing workers may face include the following:

- Force
- Static postures
- Environmental factors
- Repetition
- Vibration
- Awkward postures
- Contact stress

Force—Physical effort required to lift, push, pull, grasp and pinch items in the work environment. Heavy lifting places high forces on the back. Other jobs that require high force exertions from the hand, wrist and shoulder. Force is often required to handle and control equipment, tools, raw materials and finished products.

Repetition—Performing the same motion or series of motions continually or frequently.

Awkward Postures—Body postures that deviate from normal resting or neutral positions place unnecessary stress on muscles, tendons and bones. Examples of awkward postures include reaching above shoulder height, kneeling, leaning over an assembly or sanding table, bending the wrist during spray operations, and twisting the body while lifting. See appendix B for visual presentations of neutral and awkward postures.

Static Postures—Assuming and holding any posture for a long period of time can place stress on the body, particularly if the posture is not neutral. Static postures can accelerate the development of fatigue and discomfort.

Vibration—Vibration is the physical exposure to rapidly oscillating tools or machinery. Powered hand tools or anywhere an operator comes in contact with a vibration source, such as a tow motor operator, are places to look for this stressor.
Contact Stress—Physical contact between the body and sharp edges of tools, equipment and products. Pressing the body against a hard, sharp edge, such as the edge of a work table, is an example of this stressor.

Environmental Factors—Cold, heat, lighting and noise are factors in the work environment that can directly influence worker comfort and can indirectly influence risk of injury through interaction with the above-mentioned physical stressors. Other environmental factors such as slick work surfaces that are found in many poultry processing plants can directly increase the risk of injury.

Many jobs combine multiple stressors in a single job. For example, a single job might combine awkward shoulder and back postures in reaching across the work table, force in lifting, exposure to vibration, repetitive wrist motions, and contact stress with a sharp worktable edge. The combination of multiple stressors within a job or work task can create an increased risk of injury.

Identifying Problems

OSHA recommends that poultry processing facilities establish a three-step process to systematically identify ergonomic problems. This process should account not only for current workplace conditions but also for planned changes to existing and new facilities, processes, materials, and equipment. The three-step process for identifying ergonomic problems in poultry processing facilities includes:

- Gathering information from available sources;
- Conducting initial workplace surveys to determine which jobs need a closer analysis; and
- Performing ergonomic job hazard analyses of those workstations with identified risk factors.

Gathering Information From Available Sources

The first step in identifying ergonomic problems should be a review and analysis of available information. Information about problems or potential problems can be obtained from a variety of sources, including the OSHA 300 and 301 reports, first aid logs, reports of workers’ compensation claims, accident and near-miss investigation reports, and insurance company reports. Employers can also gain useful information from employee interviews and surveys, as well as from reviews and observations of workplace conditions.

Conducting an Initial Workplace Survey

The second step is to conduct an initial workplace survey. An initial workplace survey is typically performed with an ergonomics checklist to look for relevant workplace risk factors. According to poultry processing employers,8 the most important risk factors in poultry processing facilities are:

- Repetition—performing the same motion or series of motions continually or frequently.
- Force—the amount of physical effort required to perform a task (such as heavy lifting) or to maintain control of equipment or tools.
- Awkward and static postures—assuming positions that place stress on the body, such as reaching above shoulder height, kneeling, squatting, leaning over a worktable, twisting the torso while lifting, as well as holding or using tools (e.g., knives or scissors) in a nonneutral or fixed position.
- Vibration—utilizing hand-held power tools that can increase the stress on the hands and arms.

Cold temperatures in combination with the above risk factors may also increase the potential for musculoskeletal disorders to develop.1 Many of the operations in poultry processing occur with a chilled product or in a cold environment. Not all of these risk factors will be present in every job, nor is the existence of one or all of these factors necessarily sufficient to cause injury. Employers, however, should examine these factors when screening and analyzing jobs, operations or workstations to determine which risk factors are present. Jobs and tasks that have multiple risk factors have a higher probability of causing musculoskeletal disorders.2

Performing Ergonomic Job Hazard Analyses

The third step is to conduct a job hazard analysis of those jobs identified above as potentially hazardous. In many cases, job assessments can be accomplished by observation and discussing with employees the tasks they are performing. Discussing tasks with employees helps to ensure that a complete picture of the process is obtained. An adequate analysis should identify all risk factors present in each studied task.1, 2
Ergonomics Process

Many employers in the poultry processing industry have implemented OSHA’s recommendations contained in the 1993 meatpacking guidelines. OSHA does not intend for these guidelines to disrupt the effective programs employers have established based on those recommendations. However, these guidelines are specifically tailored to poultry processing operations and update and expand on the meatpacking guidelines while remaining consistent with them. For example, the Implementing Solutions section below describes some specific solutions that poultry processing employers can consider implementing in their facilities. These solutions reflect the more than 10 years of innovation in poultry processing since the meatpacking guidelines were published. At the same time, these guidelines provide some additional information that is specifically tailored to the jobs and processes in the poultry processing industry. For example, in the Implementing Solutions section below, OSHA describes 22 specific solutions that poultry processing employers can consider implementing in their facilities.

Implementing Solutions

The ergonomic solutions for poultry processing include engineering changes to workstations and equipment, work practices, personal protective equipment (PPE), and administrative actions. The recommended solutions presented in the following pages are not intended to be an exhaustive list, nor does OSHA expect that all of them will be used in any given facility. Poultry processing facilities are encouraged to develop innovative ergonomic solutions that are appropriate to their facilities. As with the meatpacking guidelines, OSHA recommends that employers use engineering techniques, where feasible, as the preferred method of dealing with ergonomic problems in poultry processing facilities. However, OSHA recognizes that a variety of solutions may be needed in any given facility. OSHA recommends that employers train employees to use proper work practices. Proper work practices include proper use and maintenance of pneumatic and power tools, good cutting techniques, proper lifting techniques and good knife care. Using and maintaining effective PPE is also important. For example, good fitting thermal gloves can help with cold conditions while maintaining the ability to grasp items easily.

Many poultry processors have found that administrative solutions can be used to reduce the duration, frequency and degree of exposure to risk factors. Some examples of administrative solutions used effectively by poultry processors follow:

- Job rotation may alleviate physical fatigue and stress of a particular set of muscles and tendons. To set up a job rotation system, employers typically classify the nature and extent of exertions of each task, and then create a schedule that rotates between high and low repetitions within the line and/or between bending and stretching movements in the same work area or whole plant as appropriate to reduce exposure. Also consider the body parts used and rotate so that body parts used repetitively or in awkward postures can either rest completely or work at slower rates and in better postures. Use a rotation schedule to address tasks considered to be high risk (e.g., using vibrating hand tools or deboning activities) or to minimize exposure to cold.
- Staffing “floaters” provide periodic breaks between scheduled breaks.
- New employees, reassigned employees and employees returning from an extended time off will need a conditioning or break-in period to get them accustomed to an activity and strengthen them for the physically demanding work they will be performing. To accommodate this, OSHA recommends that new and reassigned employees be gradually integrated into a full workload. OSHA also recommends that employees be assigned to an experienced trainer for job training and evaluation during the conditioning period.
- Allowing pauses relieves fatigued muscles and allows employees to rest affected muscle groups during that time period.
- Cross-train employees so that sufficient support is available for peak production, to cover breaks, to institute job enlargement programs and to provide additional rotation alternatives.
- Performing routine and preventive maintenance on equipment ensures that the equipment is working properly.

When combined with exposure to other risk factors, cold can increase the risk of developing a musculoskeletal disorder. Employers typically limit cold exposure by providing a warm dry area and allowing frequent short breaks to allow workers to warm up. It is also important to use appropriate clothing and personal protective equipment when working in cold environments.

The solutions on the following pages are not intended to be an exhaustive list and are only examples of ergonomic solutions. Individual poultry processing facilities should try to use these ideas as a starting point as they look for other innovative methods that will meet their facility’s needs.
**WORKSTATIONS: Cutouts**

**DESCRIPTION:**
Removal of a section of work surface to allow the employee to get closer to items located at the workstation.

**WHEN TO USE:**
Where excessive leaning or reaching is required to access material at a workstation.

**POINTS TO REMEMBER:**
- Placing items closer to the employee minimizes excessive reaching and bending. Maximum reach should not exceed arm's length with the torso upright.
- Placing the employee closer to the work through recessed designs at the knee and foot also reduces reaching and bending.
- Providing cutouts can increase the amount of usable space for placement of poultry parts, tools, supplies and other items.
- Ensure that workstation edges are rounded to avoid discomfort from direct contact.

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**WORKSTATIONS: Baggers and Other Packaging Systems**

**DESCRIPTION:**
Mechanisms and fixtures used to place whole birds or poultry products into packaging and packages into shipping containers.

**WHEN TO USE:**
When packaging finished product.

**POINTS TO REMEMBER:**
- Auto baggers allow whole birds or parts to slide sideways or vertically into bags. These systems may automatically count or weigh parts for inventory needs.
- Semiautomated systems may require manual placement of the bag while products drop or slide into the bag and may use a fan to automatically open bags in preparation for loading.
- Filled bags may be automatically crimped or fastened closed.
- Many systems are designed to allow employees to alternate hands.
- A hoist system is recommended to reload plastic film.
- If a hand scoop is used, it should have a bent handle to keep the wrist in a neutral posture. The handle should be rubber or roughened plastic for easier grip.
- Packaged meats may be dropped directly into packing boxes and then sent to autopackers for sealing, labeling and palletizing.

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**WORKSTATIONS: Tilters and Dumpers**

**DESCRIPTION:**
Mechanical device that tilts or inverts a container in order to release its contents.

**WHEN TO USE:**
For unloading the contents of a container into a machine, new container or waste receptacle or onto a workstation.

**POINTS TO REMEMBER:**
- May eliminate the need for shoveling, especially for ice.
- The position of the tilter or dumper can be adjusted to minimize bending and reaching.
- Use wheeled carts to transfer containers to the tilter or dumper.
WORKSTATIONS: Chutes

**DESCRIPTION:**
Tunnel-type mechanism attached to a hole in the workstation surface into which poultry parts or other items can be dropped and transported.

**WHEN TO USE:**
For transport of separated poultry parts or other items. Items may drop directly into a container or into a vacuum system for transport.

**POINTS TO REMEMBER:**
- Chute openings should be appropriate to the size of the part handled, so it does not interfere with the processing task and does not require extended reach.
- Delivering and placing parts closer to the employee minimizes excessive reaching and bending. Maximum reach should not exceed arm’s length with the torso upright.

WORKSTATIONS: Diverters

**DESCRIPTION:**
Mechanical device that directs material on a conveyor or slide.

**WHEN TO USE:**
Where excessive leaning or reaching is required to access material on a conveyor or slide.

**POINTS TO REMEMBER:**
- Delivering and placing parts closer to the employee minimizes reaching and bending. Maximum reach should not exceed arm’s length with the torso upright.
- Can be adjusted to split poultry parts delivery onto either side of a conveyor, slide or work area so that employees can work on both sides of the line.

WORKSTATIONS: Scales

**DESCRIPTION:**
Embedded scales that incorporate weighing into the production process to eliminate unnecessary handling of poultry, poultry parts, processed meats and waste.

**WHEN TO USE:**
When operations require that materials be weighed.

**POINTS TO REMEMBER:**
- A scale can be recessed into the floor so that carts can be rolled onto it for weighing without pushing carts uphill.
- Locate scales within easy reach, in the work area rather than at another work area behind the employee. Recess the scale to the same height as the countertop so that poultry can be placed on and removed from the scale without lifting.
- For boxed goods, a scale incorporated into the packing station can determine weight during initial loading and eliminate reweighing later.
- Scales can also be incorporated into conveyor and shackle systems.
**WORKSTATIONS: Shackles**

**DESCRIPTION:**
Mechanical devices used to position and stabilize poultry parts for processing and transporting to other work areas.

**WHEN TO USE:**
In all hanging processes.

**POINTS TO REMEMBER:**
- Automatic rehangers can reduce manual handling associated with hanging birds.
- Provide a rack or other support surface to hold the weight of the bird so that the legs can be easily placed into the shackles.
- Ensure that shackle length can adequately hold the bird to minimize the need for rehanging.
- Consider a rail or guide bar behind the birds to minimize bird movement and reaching by employees.
- Orient shackles so employees have direct access with minimal forward reach and no trunk twisting, while holding and lifting the bird.
- Design the conveyor system to move the legs toward the shackle for easy placement into the shackle while supporting the weight of the bird. Preferably, the bird and shackles are automatically aligned.
- Provide adequate spacing between shackles to prevent birds from tangling. Adequate spacing of shackles may reduce rework and the need to separate birds.

**WORKSTATIONS: Jigs, Fixtures, Mandrills and Other Devices for Positioning Product**

**DESCRIPTION:**
Mechanical devices used to position and stabilize poultry parts for processing.

**WHEN TO USE:**
In cutting and deboning operations where proper positioning of the product will minimize excessive use of force or awkward postures.

**POINTS TO REMEMBER:**
- Design a clamping device to hold the bird's breast securely when cutting or deboning, ensuring that the device does not damage the product. Once the bird has been stabilized, the employee is able to use a 2-handed method to pull meat off the bone. The device may be of mechanical or vacuum design.
- Clamps reduce gripping with the non-cutting hand. Height adjustability within the clamp allows the employee to work without awkward arm postures. Devices should be adjustable to at least 2 different angles to allow an in-line knife to be used without awkward arm postures.
- For tendon removal, the tip of the tendon can be placed into a vise that uses a mechanical arm to pull and separate it from the meat, leaving the meat in good condition. The vise reduces holding and pinching with the hand.
WORKSTATIONS: Seats, Stools and Backrests

DESCRIPTION:
Support devices for employees at fixed workstations.

WHEN TO USE:
At all stationary sitting and standing positions.

POINTS TO REMEMBER:
- Selecting the most appropriate support device promotes neutral body postures and reduces fatigue during seated, sit/stand and standing tasks.
- The use of these devices should not result in extended forward reaching, bending or trunk twisting.

Recommendations for Chairs:
- Chairs with backrests may be provided for tasks that require visual or tactile inspection as well as other disassembly or processing tasks. The chair should be adjustable to accommodate both the task being performed and the size of the employee.
- Tall chairs should include a mechanism for mounting and dismounting such as a footring. Prolonged use of a footring may obstruct bloodflow to the leg, therefore a footrest should be provided for long duration use.
- Footrest surface area should be deep enough to support the whole foot and large enough to allow some sideward and forward movement for position changes. Position the footrest to prevent an excessively bent or straight knee posture. A slight open angle of the knee is preferred. Height adjustability of the footrest is preferred. Select an adjustment mechanism that does not result in posture, force, or sanitation problems. Teach employees when and how to make proper adjustments.
- Where height adjustability is not provided, select at least 2 fixed height footrests to accommodate the smallest height person. Recess the upper footrest slightly so it does not become an obstacle for the lower footrest.
- Seat pan depth should support the thigh but should not touch the back of the knee.
- Seat angle should support the thigh evenly.
- The backrest should be height adjustable and large enough to support the upper and lower back. The shape of the backrest should provide support for the inward curve of the low back.
- Armrests may interfere with task requirements. Where used, armrests should be adjustable for height and width.

Recommendations for Sit/Stand Stools:
- A high stool or angled seat provides a surface on which the employee can lean, shift weight and change trunk angle.
- With an angled seat, only leaning can occur. With a flat seat, the employee may plant one foot on the floor and rest the other thigh on the seat for support.
- The base should be fixed so that it does not move unintentionally.

Recommendations for Backrests or Leaning Devices:
- Another type of leaning device is an independent back support without a seat that is stationary, stable and height adjustable. It should provide adequate support for both the upper and lower back. Provide clearance for required cleaning and sanitation. Many of the recommendations above also apply to backrests or leaning devices.
- Position the device to prevent forward trunk bending.
- Ensure clearance behind devices so as not to obstruct passage of other employees walking past the workstation.
WORKSTATIONS: Rework

DESCRIPTION:
Designated workstation or work area designed for evisceration and cutting.

WHEN TO USE:
For damaged birds that require extra handling to remove unwanted parts.

POINTS TO REMEMBER:
- Transporting these poultry parts away from the normal processing line allows the employee adequate time to closely examine and remove unwanted parts without interrupting the line.
- Use pneumatic or mechanical cutting devices where appropriate to minimize hand forces.
- The use of fixtures and/or a slightly forward slanted table may be appropriate to position poultry parts so that work can be completed using neutral body postures.
- May be used as an alternative work area or part of rotation plan since work is self-paced and slower than conventional assembly lines.

WORKSTATIONS: Workheight and Angle Adjustments

DESCRIPTION:
Properly adjusted work surfaces.

WHEN TO USE:
At all workstations.

POINTS TO REMEMBER:
- Proper workstation height minimizes excessive forward trunk bending and lifting of the arms when cleaning, preparing and packing whole birds and poultry parts.
- Proper hand height improves comfort and productivity.

Table height recommendations:
- For close visual inspection, position table so that hands are slightly higher than elbow height and below shoulder level.
- For light assembly (e.g., placing parts in boxes) position table height so that hands are slightly below elbow height. (Note: Table height may need to be lowered further to accommodate the height of a packing box.)
- For work requiring heavy force (e.g., some cutting or deboning), the table should be below elbow height, unless close visual inspection is required.
- Powered adjustable height work surfaces that are positioned for use by individual employees can be spring-loaded or electrically powered by a motor.
- Tables designed for taller employees should have standing platforms or height adjustable features to accommodate shorter employees. Teach employees how and when to adjust height. Provide adjustment controls that can be operated without causing a posture, force or sanitation problem.

Floor design recommendations:
- Provide standing platforms to prevent reaching above shoulder height.
- Provide adequate clearance so employees can take a step sideways along the conveyor when necessary and so the whole foot is supported when placed slightly forward or behind the body.
- A railing on the back edge of the platform that is open on both ends may be added to reduce fall hazards. Provide a platform depth that allows unobstructed passage behind employees when they are at their workstations.
- Provide non-slip flooring in areas that become wet or soiled with animal fat.
- Use perforated rather than slatted flooring where possible. Where slats are used, they should be flat and wide to minimize pressure points on the feet.
- Non-slip anti-fatigue mats that can be easily removed for cleaning may be added to solid floor for comfort.
TOOLS: Handle and Design

DESCRIPTION:
Designs that minimize exposure to risk factors when using hand tools.

WHEN TO USE:
For all hand tool applications.

POINTS TO REMEMBER:
- Handles should be perpendicular to the line of action, of adequate diameter to allow a power grip, extend at least the length of the palm, and have a non-slip surface.
- Angled and pistol grip handles are advised for cuts made with a downward stroke. These knives may not be widely used, however they keep the wrist in neutral while allowing for sufficient downward force to make a smooth cut.
- Inline handles are best for horizontal cuts (e.g., when parts are resting flat on a tabletop).

Temperature and vibration:
- Handles should help prevent transmission of cold from the tool to the hand and should work well when wet or covered with slippery material.
- Dead blow hammers partially filled with shot reduce repercussion into the hand.

Handle dimensions:
- Tools should comfortably fit the employee’s hand (not too wide or too narrow).
- Length should be slightly longer than the palm with or without gloves.

Handle options:
- Heavy tools should have 2 handles or be suspended or counterbalanced.
- A wraparound handle allows the tool to stay on the hand with minimal effort.
- A handle guard may be added to certain tools to prevent the hand from slipping forward onto the blade.

Reducing force:
- Keep finger pinch to a minimum, especially for repetitive work.
- Textured handles improve grip, reduce hand force and should be washable in warm water to remove grease build-up.
- Avoid concentrated pressure on small parts of the fingers (e.g., forceful opening of scissors) or on the palm of the hand.

TOOLS: Spray Nozzles

DESCRIPTION:
Designs that minimize hand force.

WHEN TO USE:
For all sanitation operations using spray nozzles for long time periods.

POINTS TO REMEMBER:
- Avoid single finger activation, especially using the index finger.
- Investigate options for hand actuators that are compatible with the shape, width, and size of the hand.
- Provide swivel handles for hoses such as those used for water.
- Provide pistol grip handles for spraying high-pressure hoses.
- Use the entire finger rather than just the fingertip to activate the trigger, minimizing tendon irritation.
- Consider systems that can be activated by either the hand or foot so the employee can switch at will when fatigue occurs.
TOOLS: Selection

DESCRIPTION:
Powered and manual tools for cutting, deboning and other operations.

WHEN TO USE:
For nearly all tasks in poultry processing, including evisceration, venting, deboning, filleting, peeling gizzards and separation of internal organs.

POINTS TO REMEMBER:
● Hand tools should be selected so that handle angle allows the wrist to work in a neutral posture.
● The addition of a universal joint between handle and blade may improve wrist posture.
● Spring-loaded handles eliminate thumb force required to open blades for sequential cuts.
● Spring force should be designed to minimize hand fatigue.
● A circular or electric saw is effective for cutting whole birds and breasts in half.
● Powered (pneumatic) or spring-loaded shears and pneumatic wheels with blades or manual knives are preferred for cutting smaller parts (e.g., trimming and eviscerating).
● Shears are preferred for heart and liver removal.
● Knives are preferred for deboning and filleting.
● A specialized tool has been developed for cleaning gizzards (a powered handheld device with a small bladed wheel).
● An inline thigh popper reduces required hand forces when compared to the traditional manual technique.

TOOLS: Use and Care of Knives, Saws and Scissors

DESCRIPTION:
Procedures for maintaining knives, saws and scissors in optimal functioning condition.

WHEN TO USE:
For all knife, saw and scissors use.

POINTS TO REMEMBER:
● The sharper the edge, the lower the force (and possibly repetitions) required to complete the task. Sharpening blades is a highly skilled task that requires specialized training and is usually completed away from the production area. Options for maintaining a sharp edge include having several knives assigned to an employee, trading out knives quickly and easily, and keeping the blade free of metal fragments or burrs.
● Keeping the blade free of metal fragments or burrs requires constant attention. Employees may be taught to manually “steel” or use a mousetrap for deburring or removing metal fragments. These fragments make it harder to cut product and may even cause damage. Both methods of deburring require running the full length of the blade edge along a honing stone or other file-type mechanism. Manual steeling is a two-handed operation requiring the employee to hold the honing mechanism in one hand and knife in the other, both unsupported. A customized tool can be developed that has one straight handle and two in-line steels positioned to ensure that the knife contacts both steels evenly. The mousetrap (with attached honing mechanism) is fixed to a stationary surface (such as a table or rail) or portable surface (such as a scabbord) and requires only a one-handed operation.
● Deburr or change knives if product damage becomes apparent, an increase in muscle force is required, or if the blade contacts bone, glove or other hard objects.
**MANUAL MATERIALS HANDLING: Hoppers and Augers**

**DESCRIPTION:**
Container used to hold and dispense contents into a machine, a new container, or onto a workstation through an open gate or using a screw-type mechanism.

**WHEN TO USE:**
When storage of product or other items is required at a workstation.

**POINTS TO REMEMBER:**
- Hoppers are generally preferred for dispensing larger objects such as poultry parts, whereas augers are generally preferred for smaller product such as ice, spices, and tenderizers in predetermined quantity to match recipe or packaging units.
- Hoppers are loaded from the top of the unit and have a gate to drop contents in bulk or premeasured quantities, whereas augers have screw-type mechanisms that lift smaller particles from a transport container and dispense in premeasured quantities.
- Operation can be automatic or employee initiated with activation controls located to avoid reaching and bending.
- May replace the need for shoveling, especially for ice.
- To load hoppers and avoid additional lifting, consider devices such as mechanical lifters, dumpers, augers, and conveyors.

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**MANUAL MATERIALS HANDLING: Carts and Hand Trucks**

**DESCRIPTION:**
Wheeled devices designed to transport materials.

**WHEN TO USE:**
For transporting containers of whole birds, bird parts, processed meats, waste products or supplies between work areas.

**POINTS TO REMEMBER:**
- A small lip around the edges is helpful to prevent items from slipping off.
- Ensure that the top stack height does not obstruct vision.
- Optimal shelf height range should be between knuckle (with arms at side) and shoulder height.
- Pushing is preferred to pulling.
- Balance loads and keep loads within manufacturer’s weight restrictions.
- Handles that are vertical, with some horizontal adjustability, will allow all employees to push with hands at elbow height and shoulder width apart. A swing-out design may be useful to improve access.
- Manually pushed carts and hand trucks should have full bearing wheels made of a material designed for the floor surface in the facility as well as brakes that are easy to operate. Brakes prevent unintentional movement of the cart or hand truck when left unattended or when loading. Larger wheels are generally easier to push. Rear swivel and front fixed wheel design improves ease of pushing, especially if the cart is long. In some designs, a third set of non-swivel wheels is placed centrally to add stability and improve ease of turning.
- Carts may be designed for general use or for specialized applications. Specialty carts that have contours or clamps to hold specific supplies (e.g., rolls of plastic) may be designed to aid in supply transfer directly to the machine or work surface that uses that product.
- Large bucket-type containers on carts should have an angled front to allow tipping for removal of contents (e.g., utility tilt trucks).
- Lift tables and height adjustable pallet stands that rotate allow parts and supplies to be positioned at proper working heights. They may be used in conjunction with staging for vacuum systems and a variety of other workstations. These devices improve working posture by reducing unnecessary bending and reaching.
- Pallet jacks may be manual or motorized. The motorized version is preferred for frequent or long-distance travel.
**MANUAL MATERIALS HANDLING: Racks and Shelves**

**DESCRIPTION:**
Rack and shelf design to optimize manual access.

**WHEN TO USE:**
Shelf systems can be configured to minimize excessive lifting, carrying and awkward postures associated with storage of any item used or produced at a workstation.

**POINTS TO REMEMBER:**
- For items that will be manually lifted, shelf height should be from approximately knuckle (with arms at side) to shoulder height. Store heavy and frequently used items in this range. Storage of lightweight and infrequently used items above and below this range is acceptable. Labels on shelves may help to quickly and easily identify materials to be lifted or carried.
- Bulk packages of supplies that are transported by mechanical devices can be stacked and stored as needed. However, once packages are opened and removed manually, placement on shelves should follow the recommendations listed above.
- Avoid closely spaced shelves as they limit visual and hand access.

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**MANUAL MATERIALS HANDLING: Vacuum Systems**

**DESCRIPTION:**
Vacuum systems for lifting and transport of materials.

**WHEN TO USE:**
Vacuum systems can be used for lifting and transporting poultry parts, boxes of product, spice bags, ice and other materials. Applications of vacuum systems include:
- Lifting of individual boxes and placement onto racks or pallets for storage or transport.
- Vacuum systems connected to chutes or transport tubes can transport individual poultry parts or collect poultry parts in a container.

**POINTS TO REMEMBER:**
- Vacuum entry points can be placed at individual work areas to gather product for transport to chillers or other holding areas for further processing or packaging.
- Vacuum systems can be designed specifically to handle internal transport of hearts, livers, gizzards and necks from harvesting area to giblet handling area.
**MANUAL MATERIALS HANDLING: Belt and Overhead Conveyors**

**DESCRIPTION:**
Mechanical systems such as belt-driven sheets of textured fabric or suspended shackles/hooks that continually move product.

**WHEN TO USE:**
For processing and cutting tasks, placing bags and smaller packages in boxes, and loading or unloading trucks. Eliminates lifting and carrying when transporting whole birds and parts through and between processing areas.

**POINTS TO REMEMBER:**
- Ensure that required forward reach does not extend beyond arm’s length in front of the body.
- Overhead conveyors should be designed so that the employee can grasp birds without reaching higher than mid-chest level. This can be accomplished by lowering the line or providing access for employees at their work area.
- Belt conveyors should be installed so that employees can grasp birds or bird parts while keeping their elbows close to the torso. The conveyor speed should allow sufficient time for the task being performed.
- Conveyors can be designed to reorient birds or bird parts.

**MANUAL MATERIALS HANDLING: Roller Tables**

**DESCRIPTION:**
Tabletop or work surface embedded with rollers or ball bearings to reduce friction and force when sliding items.

**WHEN TO USE:**
Recommended for transporting boxes, bins, and other containers over relatively short distances.

**POINTS TO REMEMBER:**
- Rollers are preferred for transport in a linear direction whereas ball bearings are preferred when change of direction is required.
- Pushing or sliding containers eliminates lifting and carrying that can be strenuous to the hands, arms, and back.
- Appropriate for product in containers, but not loose parts due to sanitation issues.

**PERSONAL PROTECTIVE EQUIPMENT: Selection Considerations**

**DESCRIPTION:**
Clothing and other work accessories designed to create a barrier against workplace hazards that take ergonomic considerations into account.

**WHEN TO USE:**
When selecting personal protective equipment for processing operations.

**POINTS TO REMEMBER:**
- Protective clothing should be selected for the specific task performed.
- Employees should be provided with a variety of options for rubber gloves worn under mesh gloves for optimal fit, dexterity and flexibility.
- Mesh gloves can include small barbs on the palm surface to reduce finger force when pinching and pulling meat away from bone. A mesh or cut resistant glove and forearm sleeve should be worn on the hand that does not hold the knife to protect against accidental cuts.
- Gloves should minimize the loss of tactile sensitivity.
- Gloves should provide increased friction between the hand and the material being handled.
- Use non-slip and waterproof footwear with well-cushioned insteps and insoles.
**Glossary**

*Carpal Tunnel Syndrome.* Compression of the median nerve as it passes through the carpal tunnel of the wrist, resulting in tingling, pain or numbness in the thumbs and first three fingers.

*Cumulative Trauma.* Injury or illness resulting from repeated and/or excessive demands over time on the musculoskeletal system.

*Cumulative Trauma Disorder.* A term used to identify a group of musculoskeletal disorders involving the tendons, tendon sheaths, muscles, bones and nerves of an extremity.

**Ergonomics.** The study of the relationship between an individual and his or her environment (such as a workstation). The attempt is to reduce unnecessary stress to the individual through modifications to the environment.

**Ganglion Cyst.** Lesions usually containing thick mucous fluid, normally appearing close to joints and tendon sheaths.

**Muscle Strain.** Overexertion of muscles, resulting in discomfort, pain or swelling.

**Personal Protective Equipment.** Equipment that workers wear to protect them from injury or illness. Personal protective equipment includes (but is not limited to) gloves, arm guards, safety shoes, rubber boots or aprons, hearing protection, respirators, and safety glasses.

**Repetitive Motion.** A single task, motion or posture that is continuously repeated.

**Tendinitis.** Inflammation of the tendon and/or tendon sheath at the point of attachment to the muscle, resulting in pain and swelling.

**Work Practices.** A set of procedures for accomplishing a specific task in a manner that reduces or eliminates worker exposure to hazards.
References/Notes


7. Bureau of Labor Statistics. Special report prepared by BLS for OSHA. Table 1. “Number, median days, and incidence rate of nonfatal occupational injuries and illnesses with days away from work involving musculoskeletal disorders by selected industries, 2002.” (OSHA Docket GE2003-2, Exhibit 4-9.)

8. Reports of OSHA site visits to poultry processing facilities. (OSHA Docket GE2003-2, Exhibit 4-5.)

9. *AFMA Voluntary Ergonomics Guideline for the Furniture Manufacturing Industry* (American Furniture Manufacturers Association, P.O. Box HP-7, High Point, NC 27261; (336) 884-5000; www.afma4u.org)

The following industry guides are available from the N.C. Department of Labor’s Division of Occupational Safety and Health:

1. A Guide to Safety in Confined Spaces
5. A Guide for Persons Employed in Cotton Dust Environments
6. A Guide to Lead Exposure in the Construction Industry
7. A Guide to Bloodborne Pathogens in the Workplace
8. A Guide to Voluntary Training and Training Requirements in OSHA Standards
10. A Guide to Farm Safety and Health
15. A Guide to Developing and Maintaining an Effective Hearing Conservation Program
17. A Guide to Asbestos for Industry
18. A Guide to Electrical Safety
19. A Guide to Occupational Exposure to Wood and Wood Dust
20. A Guide to Crane Safety
23. A Guide to Working With Electricity
25. A Guide to Personal Protective Equipment
27. A Guide to the Control of Hazardous Energy (Lockout/Tagout)
29. A Guide to Safety and Health in Feed and Grain Mills
31. A Guide to Formaldehyde
32. A Guide to Fall Prevention in Industry
33. A Guide to Office Safety and Health
34. A Guide to Safety and Health in the Poultry Industry
35. A Guide to Preventing Heat Stress
36. A Guide to the Safe Use of Escalators and Elevators
37. A Guide to Boilers and Pressure Vessels
38. A Guide to Safe Scaffolding
41. A Guide to OSHA for Small Businesses in North Carolina
Occupational Safety and Health (OSH)
Sources of Information
You may call 1-800-NC-LABOR (1-800-625-2267) to reach any division of the N.C. Department of Labor; or visit the NCDOL home page on the World Wide Web, Internet Web site address: http://www.nclabor.com.

N.C. Division of Occupational Safety and Health
Mailing Address: Physical Location:
1101 Mail Service Center 111 Hillsborough St.
Raleigh, NC 27699-1101 (Old Revenue Building, 3rd Floor)
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Bureau of Education, Training and Technical Assistance
Mailing Address: Physical Location:
1101 Mail Service Center 111 Hillsborough St.
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Raleigh, NC 27699-1101 (Old Revenue Building, 3rd Floor)
Telephone: (919) 807-2899 Fax: (919) 807-2902

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Agricultural Safety and Health Bureau
Mailing Address: Physical Location:
1101 Mail Service Center 111 Hillsborough St.
Raleigh, NC 27699-1101 (Old Revenue Building, 2nd Floor)
Telephone: (919) 807-2923 Fax: (919) 807-2924

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Safety and Health Compliance District Offices
Raleigh District Office (313 Chapanoke Road, Raleigh, NC 27603)
Telephone: Safety (919) 662-4597 Fax: (919) 662-4709
Health (919) 662-4711
Asheville District Office (204 Charlotte Highway, Suite B, Asheville, NC 28803-8681)
Telephone: (828) 299-8232 Fax: (828) 299-8266
Charlotte District Office (901 Blairhill Road, Suite 200, Charlotte, NC 28217-1578)
Telephone: (704) 342-6163 Fax: (704) 342-5919
Winston-Salem District Office (4964 University Parkway, Suite 202, Winston-Salem, NC 27106-2800)
Telephone: (336) 776-4420 Fax: (336) 776-4422
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