hard, squared edge, exemplify this situation. Contact stress generally causes musculoskeletal disorders when the compression occurs against tendons that are being used or against nerves or blood vessels in vulnerable locations. Contact stress can restrict the movement of the tendon (more resistance), which requires more force and leads to inflammation of the tendon and surrounding tissues. Contact stress that pushes sharply into deeper tissues may reduce blood flow and result in early muscle fatigue. Tissue that is compressed for prolonged periods of time may be damaged. Nerves that are exposed to contact stress in multiple locations are especially vulnerable. The problem becomes worse with extended or repeated exposure.

Examples:
- Extensive use of shears or scissors,
- Using a tool with a small, thin handle that digs into the palm,
- Using tools with grooved handles that press against the side of fingers,
- Leaning against a metal work bench with a square edge,
- Using a keyboard on a standard table or desk with unrounded edges, or
- Sitting in a bench or chair that does not have a padded seat.

Using hand as a hammer (*i.e.*, contact stress). When the hand is used to strike something, extreme contact stress may be created. This is sometimes done to avoid damage to the product, but the result of using the hand as a hammer is damage to the worker. Striking a hard object with the base of the palm to align, seat, release or move a part is the type of job where the hand is most likely to be used as a hammer. Even occasional hammering with the hand can cause problems, but repeated activity of this sort will result in serious damage to the tissues of the hand.

When the palm is used to deliver a blow to an object, the force from the blow passes into the soft tissues and then deeper into the tendons, nerves and muscles. The force from the hit can cause acute trauma to the palm, but over time the palm becomes calloused and acute trauma is no longer protective of the deep tissue, and consequently the tendons and muscles can be subjected to frequent disruption of blood supply, irritation, and trauma due to the reaction force from the hit. The more force that is required to hammer the part, the more residual force that will pass into the tendons, nerves and muscles. The forces from the hit may cause bruising of muscles and add to swelling and inflammation of tendons.

Examples:
- Pounding on a two part mold to get it to seat or come together properly,
- Hitting a palm button to activate a machine,
- Striking two parts to separate them, or
- Striking the handle of a vice to loosen it.

Using hands or body as a clamp to hold objects while performing tasks. Sometimes this is referred to as having the worker act as a ''human clamp'' or ''human vise.'' In these situations the worker usually holds the object being worked on with one hand (often in an awkward, forceful posture) while force is applied by the other hand. The hand being used as a clamp has to hold the object while resisting the forces being applied by the other hand. Using the hand as a clamp leads to muscle fatigue and inflammation of the muscles and tendons.

The strain on the muscles and tendons in the clamping hand is especially high when the task involves static postures or contact stress. Although the hand and arms are most often used as a clamp, some larger jobs require the feet, legs, hips or torso (lateral bending of the back) to support a part while work is performed.

Examples:
- Holding the head of a cow on a slippery surface while attempting to remove meat,
- Holding a small part while assembling it,
- Drilling a hole in a part that the worker has to hold, or
- Using the hips or thighs to hold a part in place while working on the part.

Force. Higher force requirements on the clamping hand results in more strain on the muscles and tendons. Sometimes the clamping hand is used in an inefficient pinch grip. When high forces are required throughout the shift day after day, the muscles and tendons may not have time to recover, leading to muscle fatigue and inflammation of the tendons. Higher clamp forces are required when the part is heavy or the forces applied to the part are high.

Examples:
- Holding an extrusion nozzle while checking each hole (50 holes) to ensure it is the appropriate size,
- Holding a jar in one hand while attempting to remove the lid with the other hand.

Static postures. Often when the body is used to position and hold an object, the clamping part of the body maintains the same posture (static posture). Static loading reduces blood flow because the muscles are not moving (*i.e.*, contracting and relaxing). The constant muscle tension can lead to swelling and pressure on nearby nerves. Static loading and high forces can lead to tears in the muscle tissue. Static loading of the tendons can also lead to inflammation and swelling to the point where motion is restricted and the swelling may put pressure on (*i.e.*, pinch) the nerves.

Examples:
- Holding a pipe overhead while preparing a fitting, or
- Holding an uncooperative animal on the exam table.

Awkward postures. More force is required when clamping the object requires maintaining an awkward posture, because the muscles do not operate efficiently in an awkward posture. Since the muscles must work harder, fatigue sets in sooner, leading to fatigue and inflammation. An awkward posture also puts additional strain on the tendons, which can cause inflammation, swelling, restricted movement and pressure on nearby nerves.

Examples:
- Using the hands to wring out a mop,
- Bending sideways using the shoulder to hold a door panel in place while fastening the hinges, or
- Holding a part in place overhead while inserting fasteners.

Contact stress. If the object being held has a sharp edge or knurls (that force the fingers into slots), then the object may dig into the skin and can restrict the motion of the tendons and bruise or reduce blood flow to the muscles.

Examples:
- Holding a pane of glass while attaching hardware,
- Using the knee to position a pump while making the electrical connection, or
- Holding onto a nut while turning the bolt.

Gloves are too large, too small or too bulky. For many jobs it is necessary or appropriate for workers to wear gloves while doing their jobs. Gloves can make grasping an object more difficult by changing the friction, decreasing dexterity, and interfering with sensory feedback. This often leads to

using more muscle force than would be required without gloves. Additionally, gloves can fold, wrinkle, and bunch so that pressure points are created that result in contact stress. Gloves that fit or are less bulky may help to relieve these problems. An even better solution is to eliminate the need to wear gloves.

Examples of glove use that may rise to the level of a hazard are providing inappropriate gloves for the work, or failing to consider the worker's needs when gloves are purchased, providing thick gloves for a task that requires dexterity beyond that allowed by the gloves, or providing vibration dampening gloves and expecting levels of dexterity or force exertion that are beyond the level possible with the gloves.

Force. Large, bulky, or loose gloves can interfere with tactile feedback so much that the worker must apply considerably more force than would be required to do the same task with more appropriate gloves or no gloves. Some gloves, such as those used for cut and puncture protection, are heavy and may cause additional fatigue.

Examples:
- Working on a hot pack used in extruding plastic with heat resistant gloves, or
- Holding a chicken leg while wearing cut resistant gloves.

Contact stress. Many bulky gloves bunch and cause pressure to small areas of the hands. Gloves that are supposed to provide protection from vibration and those with thick leather on the palm side are examples of gloves that may cause pressure points. When gloves are too small, they may impede the movement of the fingers and may reduce the blood supply.

Examples:
- Wearing latex gloves that are too tight, or
- Selecting cases in a frozen foods warehouse while wearing knit gloves under thermal gloves.

Manual handling (lifting/lowering, pushing/pulling and carrying). Forceful manual handling activities are a leading cause of workplace injury and illness. Lower back MSDs from lifting account for a large percentage of all workers' compensation cases. Studies discussed in the Health Effects section indicate that employees performing manual handling tasks have a significantly higher risk of back injury where they are exposed to force, repetition and/or awkward postures in the job.

The physical work activities and conditions included on the manual handling list in the proposal are ones that are likely to be a significant problem because they are ones in which the major ergonomic risk factors associated with manual handling tasks are present: force and awkward postures/static postures. This discussion about physical work activities and conditions in manual handling tasks is organized by task (*e.g.*, lifting, pulling). Manual handling tasks are discussed only where the physical work activities and conditions and ergonomic risk factors are likely to be a significant problem.

Objects or people are heavy (lifting, lowering, pushing, pulling, carrying). Workers lift, lower and move items every day. The heavier the weight that has to be lifted, lowered and/or moved, the more force the worker will have to exert. The heavier the weight, the closer the contraction required of the muscles will be to their maximum capability. When muscles contract at or near their maximum, they fatigue more rapidly and the likelihood of damage to the muscle and other tissues involved in the activity increases. In most situations involving lifting, lowering and moving heavy objects or people, the predominant risk factor is force. Manual handling of heavy objects exposes employees to high forces and will usually have the greatest impact on the back. Another aspect of weight that should be considered is a sudden shift in weight. Workers are more often able to accomplish a manual handling task without injury when they are prepared. When a patient's legs suddenly buckle while they are being transferred or a load within a package or container shifts, the worker may not be physically or mentally prepared for the weight.

Lifting and Lowering. In lifting and lowering, force is the risk factor that most often needs to be addressed. Although there may be a perception that lifting is more problematic than lowering, they both require the worker to exert the forces commensurate with the weight of the object. The actual forces exerted by the worker are determined by the weight of the object. It is obvious that lifting containers weighing 25 pounds is considerably easier than those weighing 50 pounds and that more people are capable of lifting the smaller amount. Posture can play a major role in the force required when moving an object. If that object can be held or lifted closer to the body, the muscle forces required in the back are less. Bulky containers present more of a problem when being lifted than do those with the same characteristics, including weight, that are compact. Finally, the frequency with which an object is lifted or lowered and the times it must be supported may be important in determining the risk presented by the job.

Examples:
- Lifting a resident, who has little ability to assist, from the toilet to a wheelchair,
- Lifting a 150 pound package from a loading dock into a van.

Pushing and Pulling. When pushing and pulling objects, the weight of the object or conveyance, including its contents, affects the force required of the worker. Often workers have to slide objects on a table or flat surface. In these cases the weight and the friction characteristics of the object and the surface are the prime determinants of the force required. Secondarily, the posture or reach may affect the degree of risk presented by the job. Where conveyances such as carts are used, the force required is generally determined by the characteristics and weight of the cart and contents. For very heavy carts, stopping and controlling the cart can sometimes be as difficult and important as pushing or pulling it to the desired location.

Examples:
- Pushing a 300 pound pump away from the paper machine, or
- Pushing a heavy cart up a sloped ramp.

Carrying. For carrying the weight, distance and object characteristics affect the forces required. Often the forces are exerted statically for some period of time when carrying. Additionally, the worker's body is in motion and the stability and biomechanics of the activity may be much worse than in a simple lifting or lowering situation. Examples might be carrying heavy parts from one work area to another, carrying containers from production to a pallet or storage area, or carrying packages when delivering them to a customer.

Examples:
- Carrying several 50-pound bags of feedstock material to the basement, or
- Carrying a resident of a nursing home to the bath tub.

Horizontal reach is long (Distance of hands from body to grasp object to be handled). Workers who are lifting/lowering, pushing/pulling or carrying are greatly affected by the distance that the hands are from the body during the

activity. The forces required to manually move an object by the muscles in the back and shoulder are increased significantly as the load is moved away from the body. The resulting compression on bone and cushioning tissues is also significantly increased. The impact on the musculoskeletal system increases dramatically as the object or weight (center of gravity for bulky objects) is farther from the body. When moving objects or people, the distance away from the worker's body affects the forces for a lift or carry. Two characteristics of a lift requiring a long horizontal reach make it harder on the worker. The first is that the worker's own body weight must be supported and lifted in addition to the weight of the object. The second is that the torque required puts the muscles at a greater mechanical disadvantage when the objects being lifted are at a greater distance from the body joint involved. Because of the mechanical disadvantage, the predominant risk factor in these situations is force, which is increased because of the risk factor of awkward posture (long reach) present. The awkward posture involved in long reaches requires higher muscle forces to lift or move the same weight as would be necessary if the reach were shorter. The problem becomes worse when either greater weight or greater distance is required. Lifting, lowering and/or carrying items when a long horizontal reach is required will usually have the greatest impact on the shoulders, arms and back.

Lifting and Lowering. For lifting and lowering where the horizontal reach is long, force is the factor that needs to be addressed. This is usually accomplished by reducing the reaches or the weight. Examples would include reaching for a product on the far side of a conveyor, reaching to a parts supply bin that is on the far edge of the work surface, lifting a large box with a center of gravity at some distance from the body, lifting or lowering something on the far side of a barrier, placing packages on the far side of a pallet, or assisting a patient in sitting.

Pushing and Pulling. For pushing and pulling tasks, there may be reaches that are long; however, these are not usually a problem unless there is simultaneous lifting or unless the pushing and pulling direction is side to side rather than in and out. Moving objects from side to side is much less efficient than toward and away from the body.

Examples:
- Pushing a heavy box on a non-powered conveyor

Carrying. There are times when workers carry an object that cannot be rested against the body, so the arms are in a position that is similar to that of a long reach. This also happens when carrying a large box or container. When this happens the force risk factor is probably the most important, followed by the awkward and static posture risk factors.

Examples:
- Carrying a hot pack used in extruding plastic to the repair cart, or
- Carrying a carboy of nitric acid.

Vertical reach is below knees or above the shoulders (Distance of hands above the ground when the object is grasped or released). Workers who are lifting/lowering, pushing/pulling or carrying must exert more effort if the vertical position of the hands (when the object is started in motion) is above or below 30″ (Snook 1978, Ex. 2–26; Ayoub *et al.* 1978, Ex. 26–1416; Snook and Ciriello 1991, Ex. 26–1008). The forces required by the muscles in the back and shoulder are increased significantly as the hands near the floor or move above the shoulders. The NIOSH lift equation reduces the recommended lift by 22.5% if the lift occurs at or above shoulder level.

In addition to the force, the resulting compression on bone and cushioning tissues increases the likelihood of an injury. Ideally the hands are at (or slightly below) waist level when manual handling begins. Manual handling tasks that require the hands to be lower than the knees or higher than mid-torso put the worker at a biomechanical disadvantage, which requires the muscles to exert more force than if the starting point is near waist height. Low starting points require bending or squatting, which adds stress to the back and knees, respectively, due to the awkward posture. When the lifted object is below the worker's knees, he or she must bend forward, thus stretching the muscles in the back into an awkward and less efficient lifting posture. In addition, from a stooped posture the worker must lift the weight of the torso up as the object is lifted.

When an object is lifted above mid-torso heights, the thrust of the lifting force shifts from the larger/stronger muscles of the back to the smaller muscles of the shoulder. As the load is raised higher, the muscles of the shoulder become the primary movers. When material is lifted overhead, control of the lift becomes important. If the weight of the load were to suddenly shift while being lifted overhead, the resulting awkward posture, combined with the weight and distance of the load from the lower spine, could tear tendons, ligaments and muscles.

Lifting and Lowering. In lifting and lowering from or to low or high positions, awkward posture is a risk factor that often needs to be addressed. The awkward posture makes the muscles less efficient, and results in higher muscle forces than would be required if the lifting or lowering took place with the load within 10 inches of the waist.

Examples:
- Picking up a 35 pound spool of yarn from a peg above shoulder height,
- Picking a 40 pound item from a 60″ high shelf in a grocery warehouse, or
- Lifting a 50 pound motor off a pallet

Pushing and Pulling. When pushing or pulling objects, the height of hands affects the amount of force needed. When the hands are slightly above waist height, the worker gets the most from the muscles. As the hands are moved lower or higher, the worker's posture becomes more awkward and requires more force from the muscles.

Examples:
- Pushing a cart with the hands above mid chest height, or
- Pulling a wooden pallet across the floor.

Carrying. Carrying an object combines the static loading of the muscles with the loading caused by the awkward vertical position of the load. The combination of static and awkward postures greatly increases the fatigue on the muscles. Maintaining a stooped posture to carry a load places strain on the muscles of the back and shoulder as well as the spinal discs. Not only is the back supporting the weight of the object, but also the weight of the upper body. Carrying loads above shoulder height cannot be maintained for prolonged periods of time because the shoulder muscles will fatigue. The exception is when the weight of the load is rested on the skeletal system and the arms merely balance the weight (*e.g.*, carrying objects on the head, carrying trays of food on the shoulder).

Examples:
- Carrying large, bulky boxes of machine parts where the worker is unable to carry the box with a horizontal hold, or

- Carrying a large piece of furniture down steps.

Objects or people are moved significant distance (*i.e.*, pushing, pulling, carrying). In producing products or even services it is often necessary to move objects or people. This may be done by a worker pushing, pulling or carrying the item. Almost invariably this involves forceful exertions. The method of movement, the force required, and the distance to be moved are the important aspects of the job that will determine the presence of MSD hazards. The higher the force required and the longer the distance to be moved, the more likely it is that the job will present a problem. Force is the predominant risk factor when objects are moved, and it can be mitigated by using carts or other conveyances. This type of job is most likely to have adverse effects on the back, shoulders and arms.

Lifting and Lowering. Lifting and lowering is usually involved in a job of this type when the object is to be carried. For the lifting and lowering part of the job, the discussion of ''objects or people moved are heavy,'' above, should be consulted. The carry part of the task involves force and static postures. The weight of the object and the distance affect the force required and the time spent in static and forceful postures, respectively. Carrying puts the body in a dynamic activity where the stability is less than when the body is stationary. Examples of movement distances that might rise to the level of a hazard are moving a patient from the bed to the bath, lifting a tire from the floor to above the head, or carrying a heavy part from a pallet to a workstation.

Pushing and Pulling. When pushing or pulling an object for a significant distance, the forces required and the distance moved are the important aspects of the job. If a cart or conveyance is used, the force to push or pull it is almost always the risk factor of concern. Sometimes large or heavy objects are moved by sliding them across the floor. This usually involves high forces and is better done in other ways such as using a cart or powered mover.

Examples:
- Pushing a cart of restaurant supplies from the delivery truck to the restaurant, or
- Pushing a patient on a gurney to physical therapy.

Carrying. Once again, the weight of the object and the distance it must be carried are the important factors. The effect of these on the worker can be reduced by providing some form of conveyance.

Examples:
- Carrying trash cans to the garbage truck, or
- Carrying water bottles to the cooler.

Bending or twisting during manual handling. Bending or twisting while manual handling creates an awkward posture and changes the way forces are distributed in the spine. When the spine is in its natural position, forces are directed along the bony structure and distributed into the tissue as the spine curves. However, bending and twisting redirects the forces, placing more compressive and shear forces on the discs. Psychophysical studies have reported that there is a decrease in the maximum acceptable weight of lift (MAWL) in the range of 8% to 22% where twisting of the torso is involved (Garg and Badger 1986, Ex. 26–121; Mital and Fard 1986, Ex. 26–182; Garg and Banaag 1988, Ex. 26–951). Experiments by Adams *et al.* (1980, Ex. 26–701) indicate that combined bending and twisting of the spine reduces the tissue tolerance of the intervertebral discs, predisposing them to rupture.

When an object to be lifted is below the worker's knees, he or she must bend forward, thus stretching the muscles in the back into an awkward and less efficient lifting posture. In addition, from a stooped posture the worker must lift the weight of the torso up as the object is lifted. Lifting from a stooped posture also creates a situation where the worker can accelerate the torso as they lift.

Marras and Granata (1995, Ex. 26–1383, and 1997b, Ex. 26–169) found that increased velocity and acceleration in trunk lateral bending and twisting result in measurable increases in both compressive and shear forces experienced by the intervertebral discs.

Lifting and Lowering. In lifting and lowering, awkward posture is the risk factor that most often needs to be addressed. The awkward posture makes the muscles less efficient and results in higher forces than would be required if the lift or lower were ±10 inches from the waist.

Examples:
- Moving 30 pound motors from a workstation to a conveyor perpendicular (90°) to the workstation,
- Moving a patient from the bed to a wheelchair, or
- Loading luggage into the cargo hold of an airplane.

Object is bulky, slippery or has no handles (lifting, lowering, carrying). Lack of good hand holds or good coupling between the hand and the object can result in higher grasp forces, higher other hand/arm forces, higher back forces, or the adoption of awkward postures to secure a stable relationship with the load. The predominant risk factors involved are force and awkward postures, which usually affect the back, hands, wrists and fingers.

Lifting and Lowering. When lifting and lowering an item in which the coupling is poor, the worker has to adapt. Sometimes this involves having the hands or center of gravity of the load at considerable distance from the body, which increases the forces required of the back in awkward postures. Sometimes the hands have to bend around the box corners, resulting in considerable force being exerted in an awkward posture. Bulky loads cause the worker to bend the back more. Open boxes with poor coupling may be picked up with pinch grips on the tops of the box sides, which results in high forces and an ineffective grip.

Examples:
- Lifting a 40 pound fuel pump out of a tank of mineral oil,
- Lifting wet watermelons out of a box (which requires the worker to use excessive grip force), or
- Lifting a patient with little ability to assist out of bed.

Pushing and Pulling. Hand forces will tend to be higher when pushing or pulling bulky items or those that have poor coupling.

Examples:
- Pushing a large box of potatoes in a produce warehouse.

Carrying. The problems of carrying an object with poor coupling or that is bulky are very similar to those involved in lifting and lowering. These problems are exacerbated by the static loading required when carrying any distance.

Examples:
- Carrying a keg of beer,
- Carrying machined parts to a degreaser, or
- Carrying a side of beef.

Floor surfaces are uneven, slippery, or sloped. Surfaces that are not level require the worker to compensate by placing the body in an awkward posture. When the spine is in its natural position, forces are directed along the bony

structure and distributed into the tissue as the spine curves. However, awkward postures both redirect the forces, placing more compressive and shear forces on the discs and placing the muscle in a less efficient position. In addition, to move an object manually, the forces exerted by the feet need to be resisted by the forces that push back from the floor. When the floor is slippery or sloped, the worker must expend more energy resisting the natural tendency for the feet to slip. If the load should shift while the worker is on an uneven, slippery or sloped surface, an injury becomes more likely. Poor floor conditions can affect the footing and the ease of movement of carts. Force is the risk factor that is usually exacerbated by poor floor surfaces and the back is the usual location of MSDs that are brought on by problems of floor surfaces. Lack of good footing will result in added stress on the postural muscles and other tissues.

Lifting and Lowering. In lifting and lowering, awkward posture is the risk factor that most often needs to be addressed. The awkward posture makes the muscles less efficient and results in higher forces. The higher forces lead to fatigue and inflammation.

Examples:
- Shoveling grain, or
- Lifting bags of laundry from a wet floor.

Pushing and Pulling. Pushing or pulling on an uneven, slippery, or sloped surface can result in a sudden increase in the force needed to move or stop an object. The increase in force alone can tear muscles or strain tendons enough to cause an injury. When the increase in force occurs when the body is in an awkward posture due to the surface, then a muscle or tendon strain is more likely, due to the inefficient position of the muscles.

Examples:
- Pushing a laundry hamper across a wet floor,
- Pushing a file cabinet on a carpeted floor,
- Pushing a wheelchair through gravel, or
- Pushing a cart on a cracked concrete floor.

Carrying. Carrying an object while walking on uneven, slippery or sloped surfaces causes the body to continually shift to accommodate the changing working surface.

Example:
- Carrying boxes of metal scraps down steps, or
- Carrying boxes of paper up a ramp into the computer room.

Section 1910.918 What must I do to analyze a problem job?

You must:

* * * * *

(b) Evaluate the ergonomic risk factors in the job to determine the MSD hazards associated with the covered MSD. As necessary, evaluate the duration, frequency and magnitude of employee exposure to the risk factors.

4. Paragraph (d)—''Evaluate''

Paragraph (d) of this section would require employers to evaluate the identified ergonomic risk factors to determine whether the employee exposure to them is such that a covered MSD would be reasonably likely to occur. To make this determination, employers need to look at the duration, frequency and magnitude (*i.e.*, modifying factors) of the employee's exposure to the ergonomic risk factors.

OSHA is proposing this evaluation provision because, although many jobs have ergonomic risk factors, these risk factors do not always rise to the level that poses a significant risk of injury. This may be because the exposure does not last long enough, is not repeated frequently enough, or is not intensive enough to pose a risk. For example, an employee bending to pick up a paper clip off the floor is exposed to awkward postures; however, this activity is not likely to result in a covered MSD because it is done infrequently. Also, an employee who picks up a box of copier paper is certainly exposed to high forces, but a covered MSD is not likely to occur where the employee does this only, for example, once a week. On the other hand, a job that requires bending from a neutral posture for most of the day would be likely to cause a covered MSD. The following is a brief description of the modifying factors:

a. Duration. Duration refers to the length of time an employee is continually exposed to risk factors. The duration of job tasks can have a substantial effect on the likelihood of both localized and general fatigue. In general, the longer the period of continuous work (*i.e.*, the longer the tasks require sustained muscle contraction), the longer the recovery or rest time required (Ex. 26–2). Duration can be mitigated by changing the sequence of activities or recovery time and pattern of exposure. Breaks or short pauses in the work routine help to reduce the effects of the duration of exposure.

b. Frequency. The response of the muscles and tendons to work is dependent on the number of times the tissue is required to respond and the recovery time between activity. The frequency can be viewed at the micro level, such as grasps per minute or lifts per hour. However, often a macro view will be sufficient, such as time in a job per shift, or days per week in a job.

2c. Magnitude. Magnitude (or intensity) is a measure of the strength of the risk factor, for example: how much force, how deviated the posture, how great the velocity or acceleration of motion, how much pressure due to compression. Magnitude can be measured either in absolute terms or relative to an individual's capabilities. There are studies on how much force should be required under some circumstances, but as an initial estimate, employees can be asked to classify the force requirements of the job on a scale (*e.g.*, low, moderate or high). Often this is all that is needed to focus the analysis on the part of the job that needs to be changed.

There are many qualitative and quantitative ways to determine the magnitude of exposure. Often all it takes is the employer asking employees to describe the most difficult part of the job, and the answer will indicate the magnitude of the risk factor. A common practice for assessing forceful exertion is to ask the employee to rate the force required to do the task. When magnitude is assessed qualitatively, the employer is making a relative rating, that is, the perceived magnitude of the risk factor relative to the capabilities of the worker. Relative ratings are very useful in understanding whether the job fits the employees currently doing the job.

There are a number of ways to quantitatively measure magnitude of exposure. For example, the NIOSH Lifting Equation is widely used to determine recommended weight limits for safe lifting and carrying (Ex. 26–521). The Snook Push-Pull Tables are used by many stakeholders to evaluate and design pushing, pulling and carrying tasks (Ex. 26–1008). For work-related upper extremity MSDs, the RULA survey method is often used to investigate and evaluate jobs (McAtamney, Lynn, Corlet, E. Nigel, 24(2) Applied Ergonomics 91–99, 1993, Ex. 26–1421).

The following is an example of an evaluation (qualitative and quantitative) of the duration, frequency and magnitude

of exposure to ergonomic risk factors in a computer-work job:

OBSERVATION	RISK FACTORS	FREQUENCY	DURATION	MAGNITUDE	CAUSE
Same posture maintained as the head bends down to look at the paper and screen	Repetition, awkward postures	Constant	6 hours per day	Head movement is about 45 degrees down from straight up	Monitor and sheet of paper are low.
High work surfaces causes the elbows to be above mid torso	Awkward postures, static postures	Constant	6 hours per day	Upper arm is about half way between resting at the side and straight out from the shoulder	Keyboard at mid-chest height.
Same posture maintained with the fingers on the keyboard	Awkward postures, static postures	Constant while typing	Typing time is about 6 hours per day	Hands do not move from the keyboard	Keyboard use.
Repetition of the same motion by the fingers	Repetition	900/min	Typing time is about 6 hours per day	Moderate level of typing	Keying.
Workstation objects press hard against the body	Contact stress	Constant while typing	Typing time is about 6 hours per day	Worker has red lines on the wrist	Edge of the desk pressing into the wrist.
Long reaches for the mouse	Awkward postures, static postures	Constant while using the mouse	Uses the mouse less than one hour per day	The arm is fully extended	The mouse is about 1.5 feet from the worker.
Prolonged sitting	Static posture	Constant	About 6 hours per day		Constant keying, sitting too long.
Workstation chair presses hard into the back of the thigh	Contact stress	Constant	About 6 hours per day		Chair seat pan too high, and the feet dangle above the floor or rest on the base of the chair.

As mentioned above, ergonomic risk factors are synergistic elements of MSD hazards. Simply put, the total effect of these risk factors is greater than the sum of their parts. As such, employers need to be especially watchful for situations where risk factors occur simultaneously. Levels of risk factors that may pose little risk when found alone are much more likely to cause MSDs when they occur with other risk factors.

Controls that reduce a risk factor focus on reductions in the risk modifiers (frequency, duration or magnitude). By limiting exposure to the modifiers, the risk of an injury is reduced. Thus in any job the combination of the task, environment and the worker create a continuum of opportunity to reduce the risk by reducing the modifying factors. The closer the control approach comes to eliminating the frequency, duration or magnitude, the more likely it is that the MSD hazard has been controlled. Conversely, if the control does little to change the frequency, duration or magnitude, it is unlikely that the MSD hazard has been controlled.

Section 1910.919 What hazard control steps must I follow?

You must:

(a) Ask employees in the problem job for recommendations about eliminating or materially reducing the MSD hazards;

(b) Identify, assess and implement feasible controls (interim and/or permanent) to eliminate or materially reduce the MSD hazards. This includes prioritizing the control of hazards, where necessary;

(c) Track your progress in eliminating or materially reducing the MSD hazards. This includes consulting with employees in problem jobs about whether the implemented controls have eliminated or materially reduced the hazards; and

(d) Identify and evaluate MSD hazards when you change, design or purchase equipment or processes in problem jobs.

Section § 1910.919 of the proposed rule outlines the basic process employers must use in controlling MSD hazards. These provisions are well-recognized as the basic problem-solving steps of hazard control (Ex. 26–2).

1. Paragraph (a) —''Ask employees for recommendations''

Proposed paragraph (a) requires that employers ask employees for recommendations on controls. Many stakeholders have said that employees who are doing a job are usually the best resource for finding both the problems or difficulties in that job and for identifying appropriate solutions that will control the hazards (Exs. 3–112, 3–164, 3–112, 26–5). In addition, employee input and participation in the problem solving process can minimize the resistance to change when job changes become necessary. Many stakeholders have testified to the value of employee participation in ergonomics:

> Employers and employees alike who work in the industry are in the best possible position to identify risk factors in their workplace and to develop prevention methods that concentrate on the significant problems unique to their particular industry's environment. America Health Care Association (Ex. 3–112).

> Job analysis should include input from the workers themselves. The employees can best tell what conditions have caused them pain, discomfort, and injuries. They often have easy and practical suggestions on how such problems can be alleviated. American Federation of State, County and Municipal Employees, AFL–CIO (Ex. 3–164).

2. Paragraph (b)—''Identify, assess and implement controls''

OSHA is proposing a requirement that employers identify, assess and implement feasible controls (interim and permanent) to eliminate or materially reduce the MSD hazards identified. Controls are considered feasible if they are presently in use for the application in question, can be adapted for such use from technologies that are being used in other applications, can be developed by improving existing technologies, or is on the horizon of technological development. For many MSD hazards, the identification and assessment of controls will be brief because the MSD hazards are obvious or not complex and can easily be implemented. Many MSD hazards can be addressed with off-the-shelf controls. Often controls can be identified during the job hazard analysis and even be put in as they are identified, such as these examples:

- Eliminating awkward postures (leaning over workstation) by putting blocks under a work bench to raise the work surface height.
- Eliminating awkward postures of the neck and reducing stress on the back by putting a telephone book under a VDT monitor.
- Reducing awkward postures of the neck by removing light bulbs that were causing glare on the VDT monitor screen.
- Reducing force by cleaning thread from the wheels of a cart that had been hard to push.

Where controls are not obvious or off-the-shelf, the identification and assessment of controls may require more effort.

Identify controls

There are many different methods employers can use and places employers can go to identify controls. Many employers rely on their internal resources to identify possible controls. These in-house experts may include:

- Employees who perform the job and their supervisors,
- Engineering personnel,
- Workplace safety and health personnel or committee,
- Maintenance personnel,
- On-site health care professionals,
- Procurement staff, and
- Human resource personnel.

A number of stakeholders said they bring their in-house experts together for brainstorming sessions to identify as many solutions as possible for the problem job (Ex. 26–1370). Some of those stakeholders have told OSHA that brainstorming is often a good technique for addressing complex problems (Ex. 26–1370). Looking at the original design and equipment specifications is another in-house method for identifying solutions. Reviewing the original design specifications or even operation manuals can help determine whether the job, equipment, tools or raw materials have changed substantially. If changes are identified, a return to the original condition via equipment maintenance and repair may be enough to correct the problem.

Another common method of identifying controls is to look at similar operations. Stakeholders have said that they review similar operations at sister worksites to identify changes that have worked there over time.

Possible controls can also be identified from sources outside the workplace, such as:

- Equipment Catalogs. Review of equipment catalogues, especially those dealing with the types of problems present. For example, if the problem deals with handling drummed materials, there are equipment catalogues that offer a number of pieces of equipment that aid with the handling of drums.
- Vendors. Talk to vendors who work within a particular industry. They may be able to share ideas from other operations. It may be useful to develop a partnership with a vendor and work collaboratively to resolve the problem.
- Trade Associations or Labor Unions. Discuss the problem with a trade association or a labor union. They may serve as a focal point for efforts to initiate changes within the industry.
- Conferences and Trade Shows.
- Insurance companies. Insurance companies can provide information about what other clients with similar operations are doing to solve problems.
- OSHA Consultation Services. OSHA provides free on-site assistance in identifying, analyzing and controlling problems. The first priority of OSHA's consultation services is small businesses in high hazard industries.
- Specialists. Specialists in materials handling, layout, work methods, occupational safety and health, or ergonomics may be able to provide solutions based on their experience. Many large organizations have such specialists on staff or at corporate headquarters.

Through in-house experts and other sources of expertise, employers need to generate solutions that eliminate or materially reduce ergonomic risk factors. To assist employers in identifying solutions, the following table provides a list of solutions and control measures that have been identified and used to eliminate or materially reduce ergonomic risk factors in the physical work activities and conditions identified in § 1910.918(c):

PHYSICAL WORK ACTIVITIES AND CONDITIONS	ERGONOMIC RISK FACTORS THAT MAY BE PRESENT	EXAMPLES OF CONTROLS
(1) Exerting considerable physical effort to complete a motion	(i) Force	Use powered tools Change pinch to power grip Use longer handle Use powered lift assist Use lift tables
	(ii) Awkward postures	Provide better mechanical advantage such as a longer handle Move the items closer to the worker Design task for smooth movements
	(iii) Contact stress	Attach a handle Wrap or coat the handle with cushioning and non slip material Wear gloves that improve the grip
(2) Doing same motion over and over again	(i) Repetition (ii) Force	Use power tools Use job enlargement Use job rotation Reallocate tasks
	(iii) Awkward postures	Provide wrist rest Allow short breaks
	(iv) Cold temperatures	Take break in a warm area Provide heat where the hands are located
(3) Performing motions constantly without short pauses or breaks in between	(i) Repetition (ii) Force (iii) Awkward postures (iv) Static postures (v) Contact stress (vi) Vibration	Use job enlargement Allow breaks as needed
(4) Performing tasks that involve long reaches	(i) Awkward postures	Redesign the workplace layout Reposition object Provide better access to machinery Rotate pallet or work surface Keep work in front of the worker Use a tool to extend the reach
	(ii) Static postures	Provide adjustability Allow short breaks Use job enlargement Allow tools and items to be set aside periodically
	(iii) Force	Use lift tables or pallet jacks
(5) Working surfaces are too high or too low	(i) Awkward postures	Provide adjustability Raise/lower the worker Use a tool to extend the reach
	(ii) Static postures (iii) Force	Use job enlargement Reorient work Allow short breaks Use lift tables
	(iv) Contact stress	Ensure round edges Pad surfaces
(6) Maintaining same position or posture while performing tasks	(i) Awkward postures	Use job enlargement Reposition object

PHYSICAL WORK ACTIVITIES AND CONDITIONS	ERGONOMIC RISK FACTORS THAT MAY BE PRESENT	EXAMPLES OF CONTROLS
	(ii) Static postures	Reduce weight of object Use job rotation Use job enlargement Allow short breaks Use sit/stand workstation Use anti-fatigue mats Provide foot rest Provide cushioned insoles
	(iii) Force	Use balanced powered hand tools Provide lift assist
	(iv) Cold temperatures	Wear thermal clothing Take break in a warm area Provide localized heating
(7) Sitting for a long time	(i) Awkward postures (ii) Static postures (iii) Contact stress	Stand occasionally Provide lumbar support Allow short breaks Provide chairs with padding on the seat Make seat height adjustment
(8) Using hand and power tools	(i) Force (ii) Awkward postures (iii) Static postures (iv) Contact stress	Support weight of the tool mechanically Ensure tool has good balance Use appropriate size handles Avoid sharp edges and finger slots on the handle
	(v) Vibration (vi) Cold temperatures	Use low vibration tools Isolate source of vibration from the worker Maintain tools Reduce vibration Insulate hands Eliminate of reduce draft or blow back on the hands
(9) Vibrating working surfaces, machinery or vehicles	(i) Vibration (ii) Force (iii) Cold temperatures	Isolate source of vibration Use job rotation Use adsorbing material to reduce the magnitude of the vibration Provide insulation from the cold Allow breaks in a warm area
(10) Workstation edges or objects press hard into muscles or tendons	(i) Contact stress	Provide round edges Enlarge handles Pad surfaces and handles
(11) Using the hand as a hammer	(i) Contact stress (ii) Force	Review design specifications Use soft mallet Provide frequent maintenance
(12) Using hands or body as a clamp to hold object while performing tasks	(i) Force (ii) Static posture (iii) Awkward posture (iv) Contact stress	Use a fixture, clamp or jig Use job rotation Provide round edges Pad surfaces
(13) Gloves are bulky, too large or too small	(i) Force (ii) Contact stress	Provide several sizes and weights of gloves

PHYSICAL WORK ACTIVITIES AND CONDITIONS	ERGONOMIC RISK FACTORS THAT MAY BE PRESENT	EXAMPLES OF CONTROLS
MANUAL HANDLING (Lifting/lowering, pushing/pulling, and carrying)		
(14) Objects or people moved are heavy	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static posture (v) Contact stress	Lighten load Use lift assist Use lift table Place package in larger containers that have to be mechanically handled Use two people lift team Rely on gravity to move the object Reduce friction
(15) Horizontal reach is long	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static posture (v) Contact stress	Redesign the workplace layout Reposition object closer to the employee Provide pallet, table that can be rotated Provide space so that the employee can walk around to the object Reduce the size of the object Slide the object closer before lifting Eliminate unnecessary barriers
(16) Vertical reach is below knees or above the shoulders	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static posture (v) Contact stress	Do not place objects to be lifted on the floor Use adjustable height tables Put employee on a platform Store heavy objects stored at waist height Put handles on the object Change the work place layout
(17) Objects or people are moved significant distances	(i) Force (ii) Repetition (iii) Awkward posture (iv) Static postures (v) Contact stress	Modify the process to eliminate or reduce moves over a significant distance Convey the object (*e.g.,* conveyor, ball casters, air) Use fork lifts, hand dollies, carts, or chairs (for people) Use appropriate wheels on carts (and maintain the wheels) Provide handles for pushing, pulling or carrying
(18) Bending or twisting during manual handling	(i) Force (ii) Repetition (ii) Awkward postures (iv) Static postures	Raise work to the appropriate height Lower the employee Arrange workstation so that work is done in front of the worker Use conveyors, chutes, slides, or turntables to change direction of the object
(19) Object is slippery or has no handles	(i) Force (ii) Repetition (iii) Awkward posture (iv) Static posture	Provide good handles Provide belt with handholds to assist in moving patients Provide gloves that assist in holding slippery objects
(20) Floor surfaces are uneven, slippery or sloped	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static posture	Redesign the handling job to avoid movement over poor surfaces Use surface with treatments or anti-skid strips Provide footwear that improves friction

Assess controls. The assessment of controls is an effort by employers, with input from employees, to select controls that are reasonably anticipated to eliminate or materially reduce the MSD hazards. The employer may find that there are several controls that would be reasonably likely to reduce the hazard. Multiple control alternatives are often available, especially when several risk factors contribute to the MSD hazard. The employer needs to assess which of the possible controls should be tried. Clearly, a control that significantly reduces several risk factors is preferred over a control that only reduces one of the risk factors.

Selection of the risk factor(s) to control and/or control measures to try can be based on numerous criteria. An example of one method involves ranking all of the ergonomic risk factors and/or possible controls according to how well they meet these four criteria:

- Effectiveness—Greatest reduction in exposure to the MSD hazards.
- Acceptability—Employees most likely to accept and use this control.
- Timeliness—Takes least amount of time to implement, train and achieve material reduction in exposure to MSD hazards.

• Cost—Elimination or material reduction of exposure to MSD hazards at the lowest cost.

Where there are several jobs that need to be controlled, the employer may need to consider prioritizing the implementation of controls as part of the assessment process. Although many employers tend to select the most severe problems to control first, the criteria above are another way to prioritize the control of jobs.

Implement Controls. Because of the multifactoral nature of MSD hazards, it is not always clear whether the selected controls will achieve the intended reduction in exposure to the hazards. As a result, the control of MSD hazards often requires testing selected controls and modifying them appropriately before implementing them throughout the job. Testing controls verifies that the proposed solution actually works and what additional changes or enhancements are needed.

There are a number of ways in which employers may test out controls. Many employers modify a single workstation first to ensure that all necessary revisions have been identified and completed. Only then are the modifications applied to other workstations. Some employers with manufacturing operations test out new work methods on training lines or training workstations, which typically have slower line speeds. In addition, employers may have employees test out several different models of new tools, furniture, and equipment to identify the best fit for each employee.

Stakeholders have told OSHA that sometimes it can take a long time to develop, purchase and/or install effective permanent controls (Ex. 26–1370). To ensure that employers have adequate time to identify, assess and test out possible control measures, OSHA is proposing that employers have up to 3 years to implement permanent controls (or 1 year after the compliance start-up times have passed). However, so that employees do not go unprotected for that period of time, OSHA is proposing to require that employers implement interim controls more quickly. Often simple engineering or administrative controls may be implemented quickly, while a better solution is being designed. A number of stakeholders have said that they used administrative controls to reduce exposures during the interim time it took them to design and implement new engineering controls (Ex. 26–1370).

3. Paragraph (c)—''Track progress''

Paragraph (c) would require employers to track their progress (*i.e.*, evaluate their progress and success) in eliminating or materially reducing the MSD hazards. OSHA believes this provision is important for several reasons. First, evaluating the effectiveness of controls is the *sine qua non* of an incremental abatement process. Unless they follow up on their control efforts, employers will not know whether the hazards have been adequately controlled or whether the abatement process needs to continue. Simply put, if the job is not controlled, the problem-solving is not complete.

Second, tracking progress is also essential in those cases where employers need to prioritize the control of hazards. It tells employers whether they are on schedule with their abatement plans. Third, tracking the progress of control efforts is a good way of determining whether the elements of the program are functioning properly. For example, evaluating controls, especially work practice controls, is one way to determine whether the ergonomics training has been effective.

Many employers evaluate controls within 30 to 60 days after implementation. This gives employees enough time to get accustomed to the controls and to see whether the controls have introduced other problems into the job (Ex. 26–2).

Once again, there are many ways that employers may track their progress in addressing MSD hazards, and OSHA does not intend to require employers to use one particular method. NIOSH says that the evaluation should use the same tool that was used to analyze the problem, or another method that allows employers to compare the before-and-after results (Ex. 26–2). One of the easiest approaches is to follow up with employees in the problem job and ask them whether the controls have reduced the physical difficulties of performing the job, whether the job is more comfortable, or whether the tools and equipment seem to fit them better. Many employers take baseline measurements before the ergonomics program is implemented so they have a way of quantifying their success. Some of the measures they use include:

• Reductions in severity rates, especially at the very start of the program,
• Reduction in incidence rates,
• Reduction in total lost-workdays and lost-workdays per case,
• Reduction in job turnover or absenteeism,
• Reduction in workers' compensation costs/medical costs,
• Increases in productivity or quality,
• Reduction in reject rates,
• Number of jobs analyzed and controlled,
• Number of problems solved.

OSHA is not proposing to require that employers use one of these methods listed to assess the effectiveness of controls. Employers are free to choose their own criteria. The proposed rule would require, however, that whatever measure employers do select, their evaluation of controls must include consulting employees in the problem job.

4. Paragraph (d)—Proactive ergonomics

Paragraph (d) would require employers to identify and evaluate MSD hazards when they make process and equipment changes. Sometimes this concept is referred to as ''proactive ergonomics'' or ''safety through design.'' The concept encompasses facilities, hardware, equipment, tooling, materials, layout and configuration, energy controls, environmental concerns and products. Designing or purchasing to eliminate or materially reduce MSD hazards in the design process helps to avoid costly retrofitting. It also results in easier and less costly implementation of occupational safety and health needs (Ex. 26–2, Ex. 26–1418).

OSHA is proposing this requirement, in part, because many stakeholders have said that the best and most cost-effective way to control MSD hazards is to prevent them from being introduced into the workplace in the first place (Ex. 26–1370):

> Ergonomic principles are most effectively applied to workstations and new designs on a preventive basis, before injuries or illnesses occur. Good design with ergonomics provides the greatest economic benefit for industry. American Industrial Hygiene Association (Ex. 3–197).

Design strategies should emphasize fitting job demands to the capabilities and limitations of employees. To achieve this, decision-makers must have appropriate information

and knowledge about ergonomic risk factors and ways to control them. They need to know about the problems in jobs and the causes. Designers of in-house equipment, machine and processes also need to have an understanding of ergonomic risk factors and how to control them. For example, they may need anthropometric data to be able to design to the range of capabilities and limitations of employees.

It is also important that persons involved in procurement have basic knowledge about the causes of problems and ergonomic solutions. For example, they need to know that adjustable chairs can reduce awkward postures and that narrow tool handles can considerably increase the amount of force required to perform a task. In addition, to prevent the introduction of new hazards into the workplace, procurement personnel need information about equipment needs.

Several employers in the meat processing industry have told OSHA that they were able to communicate their common concerns to equipment suppliers and that, as a result, several suppliers are now providing tools and equipment that reduce the likelihood of an MSD. OSHA encourages employers to contact individuals and other companies any time information about the cause of a workplace musculoskeletal disorder could be used to prevent similar incidents. Owens and Garg (Ex. 26–1415) found that manufacturers are often receptive and responsive to recommendations for design changes made by users of their products in the design phase.

Section 1910.920 What kinds of controls must I use?

(a) In this standard, you may use any combination of engineering, administrative and/or work practice controls to eliminate or materially reduce MSD hazards. Engineering controls, where feasible, are the preferred method for eliminating or materially reducing MSD hazards. However, administrative and work practice controls also may be important in addressing MSD hazards.

(b) Personal protective equipment (PPE) may be used to supplement engineering, work practice and administrative controls, but may only be used alone where other controls are not feasible. Where PPE is used, you must provide it at no cost to employees.

Note to § 1910.920: Back belts/braces and wrist braces/splints are not considered PPE for purposes of this standard.

Section 1910.920 permits the employer to use any combination of engineering, administrative, or work practice controls to address the MSD hazards identified in problem jobs. OSHA is proposing to allow employers this flexibility in choice of controls because OSHA's experience and reports from stakeholders both indicate that all of these control approaches have contributed to reductions in the number and severity of workplace MSDs. In addition, the broad range of jobs to which the standard will apply, and the great variation in workplace conditions covered, make compliance flexibility essential.

Paragraph (a) of § 1910.920 does, however, state that engineering controls are the preferred method of eliminating or substantially reducing MSD hazards in cases where these controls are feasible. The proposal defines engineering controls as controls that physically change the job in a way that eliminates or materially reduces the MSD hazard or hazards present. Examples of engineering controls that are used to address ergonomic hazards are workstation modifications, changes to the tools or equipment used to do the job, facility redesigns, altering production processes, and/or changing or modifying the materials used.

Engineering controls range from very simple to complex: from putting blocks under a desk to raise the work surface for a taller-than-average worker to providing a lumbar support pillow or rolled-up towel to a video display unit (VDU) operator to redesigning an entire facility to enhance productivity, reduce product defects, and reduce workplace MSDs.

When choosing an engineering control to address a particular ergonomic problem, employers often have many choices, depending on how much they wish to spend, how permanent a solution they seek, how extensive a production process change they need, and employee acceptance and preference. For example, as MacLeod (Ex. 26–1425) points out, an employer whose VDU operators are experiencing neck and shoulder problems has many options available, including the following:

- Raising the height of the monitor by putting it on phone books, building a monitor stand, buying an adjustable monitor stand, buying an adjustable wall-mounted monitor stand, or buying an adjustable desk-mounted monitor stand;
- Putting the desk on blocks; or
- Providing an adjustable-height desk or workstation.

The ergonomics proposal reflects the preference of ergonomists and safety and health professionals for engineering controls, which is based on the ability of engineering controls to eliminate the MSD hazards posed by the job. The standard ergonomics textbooks and guidance documents emphasize the superiority of engineering controls over other classes of controls, *i.e.*, administrative controls, work practices, or personal protective equipment (PPE) (see, for example, Ex. 26–1487, Ex. 26–1428, Ex. 26–1424, Ex. 26–2; Ex. 26–1426, Ex. 26–1425, Ex. 26–1408; and Ex. 26–3). According to NIOSH's recent publication, ''Elements of Ergonomics Programs'':

A three tier hierarchy of controls is widely accepted as an intervention strategy for controlling workplace hazards, including ergonomic hazards. (Ex. 26–2)

A recent ergonomics text states, ''Ergonomic hazards can be effectively eliminated by introducing engineering controls and applying ergonomic principles when developing workstations, tools, or jobs * * * only engineering controls eliminate the workplace hazards. Other strategies [work practices, administrative controls] only minimize the risk of injury'' (Ex. 26–1408).

Ergonomists endorse the hierarchy of controls, which accords first place to engineering controls, because they believe that control technologies should be selected based on their reliability and efficacy in eliminating or reducing the workplace hazard (risk factors) giving rise to the MSD. Engineering controls are preferred because these controls and their effectiveness are:

- Reliable;
- Consistent;
- Effective;
- Measurable;
- Not dependent on human behavior (that of managers, supervisors, or workers) for their effectiveness;
- Do not introduce new hazards into the process.

In contrast to administrative and work practice controls or personal protective equipment, which occupy the second and third tiers of the hierarchy, respectively, engineering controls fix the problem once and for all. However, because

there is such variability in the workplace conditions covered by the proposed standard, OSHA is permitting employers to use any combination of engineering, work practice, or administrative controls as methods of control for MSD hazards.

Work practice controls involve changes in the way an employee does the job. They are defined by the standard as changes in the way an employee performs the physical work activities of a job that reduce exposure to MSD hazards. Work practice controls involve procedures and methods for performing work safely. Examples of work practices that reduce the potential for exposure to ergonomic risk factors are training workers to use a new or modified tool properly, training workers to vary the tasks they perform throughout the day to minimize muscle fatigue, and training workers to work in positions that reduce risk factors as much as possible (*e.g.*, to hold a tool with their wrists straight, to avoid awkward postures, etc.). In the context of ergonomic programs, work practice controls are essential, both because they reduce ergonomic stressors in their own right and because they are critical if engineering controls are to work effectively. For example, workers need to be trained to use a power grip rather than a trigger grip if a new tool is to be successful, and they need to be trained to adjust an ergonomically designed chair properly if it is to substantially reduce the risk of neck disorders, shoulder tendinitis, or another type of MSD. Work practices, like learning to vary job activities during the day (*e.g.*, moving from filing to sorting mail to using the computer and back again) can often reduce the magnitude and duration of exposure to the risk factor sufficiently to make MSDs unlikely. To be effective, the culture at the workplace and supervisory support and reinforcement are necessary to ensure that safe work practices are routinely observed.

Administrative controls are management-controlled work practices and policies designed to reduce exposures to MSD hazards by changing the way work is assigned or scheduled. Administrative controls reduce the frequency, magnitude, and/or duration of exposure and thus reduce the cumulative dose to any one worker. Examples of administrative controls that are used in the ergonomics context are employee rotation, job enlargement, and employer-authorized changes in the pace of work.

Administrative controls have been effective in addressing MSD hazards in some cases. For example, one case study cited in the Benefits chapter (Chapter IV of the Preliminary Economic Analysis) describes a lift team approach that has been quite effective in reducing work-related back injuries among nursing personnel in a long-term care facility for the elderly (Ex. 26–1091). However, many ergonomists note that these controls should be used with caution. For example, a recent book (Ex. 26–1408) states ''* * * the biggest disadvantage with administrative controls is that they treat the symptoms and not the cause of biomechanical stress.''

Another well-known ergonomics book, MacLeod's ''The Ergonomic Edge,'' cautions:

> * * * job rotation is only beneficial if the tasks involve different muscle-tendon groups or if the workers are rotated to a rest cycle * * * Poorly structured job rotation programs, may, in fact, *increase* the risk of CTDs. If employees are not properly trained or accustomed to the tasks they are to do, they can increase their exposure to risk factors * * * Furthermore, job rotation alone does not change the risk factors present in a facility. It only distributes the risk factors more evenly across a larger group of people. Thus, the risk for some individuals can be reduced, while the risk for others is increased. * * * When employees rotate between two jobs the risk of exposure can be thought of as being ''averaged.'' Job rotation may drop the average to within a safe level, or raise the whole group in excess of safe limits * * * Finally, although job rotation may have beneficial effects, engineering changes should remain the goal of the ergonomics program.'' [Ex. 26–1425]

The proposed standard permits employers to use personal protective equipment (PPE) to supplement engineering, work practice, and administrative controls. However, personal protective equipment may not be used alone, *i.e.*, as the sole means of employee protection unless no other controls are feasible. Any PPE that is provided must be made available to employees at no cost.

PPE is equipment that is worn by the employee and provides an effective barrier between the employee and the MSD hazards in the job. Examples are palm pads and knee pads to reduce contact stress, vibration-attenuation gloves, and gloves worn to protect against cold temperatures.

The hierarchy of controls, which is widely endorsed by ergonomists, occupational safety and health specialists, and health care professionals, accords last place to PPE because:

- Its efficacy in practice depends on human behavior (the manager's, supervisor's and worker's),
- Studies have shown that the effectiveness of PPE is highly variable and inconsistent from one worker to the next,
- The protection provided cannot be measured reliably,
- PPE must be maintained and replaced frequently to maintain its effectiveness,
- It is burdensome for employees to wear, because it decreases mobility and is often uncomfortable,
- It may pose hazards of its own (*e.g.*, the use of vibration-reduction gloves may also force workers to increase their grip strength).

One author (Ex. 26–1408) notes that: ''* * * in most cases, the use of PPE focuses attention upon worker responses and not the causes of ergonomic hazards * * * PPE does not eliminate ergonomic hazards * * * [and] must be considered as the last line of defense against ergonomic hazard exposure.'' Thus, although the proposed standard permits PPE to be used as a supplemental control, it cannot be relied on as a permanent solution to the presence of MSD hazards unless other feasible controls are not available.

A note to proposed section 1910.920 states:

> Back belts/braces and wrist braces/splints are not considered PPE.

The proposal includes this note to alert employers to the fact that back belts and wrist braces, which are widely used in U.S. workplaces, are not considered a control to reduce ergonomic hazards under the standard. These devices are being marketed as equipment that can prevent MSDs, although the evidence to support these claims is not available.

The AIHA ''White Book'' (Ex. 26–1424) cautions: ''Back belts have become ubiquitous in the American workplaces. Some employers now require their use by employees. But there is little scientific evaluation available regarding their use in primary prevention.'' Recently, a NIOSH working group reviewed the available scientific literature on the use of back belts and published a 1994 report evaluating them. NIOSH expressed concern that wearing a belt may alter workers' perceptions of their capacity to lift heavy workloads (*i.e.*, belt wearing may foster an increased sense of security, which may not be warranted or substantiated (Ex. 15–16). NIOSH does not recommend the use of back belts as PPE, and neither do a number of professional

societies (Ex. 15–15, Ex. 15–17, Ex. 15–33). NIOSH is currently studying the effect of back belt use on employees engaged in manual handling jobs in WalMart stores.

Wrist splints and braces present even more serious problems:

''Wrist splints or braces used to keep the wrist straight during work are not recommended, unless prescribed by a physician for rehabilitation. * * * using a splint to achieve the same end may cause more harm than good since the work orientation may require workers to bend their wrists. If workers are wearing wrist splints, they may have to use more force to work against the brace. This is not only inefficient, it may actually increase the pressure in the carpal tunnel area, causing more damage to the hand and wrist'' (Ex. 26–1424).

OSHA thus believe that the proposed Note to section 1910.920 will alert employers and employees to the lack of evidence demonstrating the effectiveness of these devices.

Section 1910.921 How far must I go in eliminating or materially reducing MSD hazards when a covered MSD occurs?

The occurrence of a covered MSD in a problem job is not itself a violation of this standard. You must comply with one of the following:

(a) You implement controls that materially reduce the MSD hazards using the incremental abatement process in § 1910.922; or

Note to § 1910.921(a): ''Materially reduce MSD hazards'' means to reduce the duration, frequency and/or magnitude of exposure to one or more ergonomic risk factors in a way that is reasonably anticipated to significantly reduce the likelihood that covered MSDs will occur.

(b) You implement controls that reduce the MSD hazards to the extent feasible. Then, you periodically look to see whether additional controls are now feasible and, if so, you implement them promptly; or

(c) You implement controls that eliminate the MSD hazards in the problem job.

Note to § 1910.921(c): ''Eliminate MSD hazards'' means that you eliminate employee exposure to ergonomic risk factors associated with the covered MSD, or you reduce employee exposure to the risk factors to such degree that a covered MSD is no longer reasonably likely to occur.

Section 1910.921 of the proposed rule tells employers how far they must go to reduce exposure to MSD hazards to be in compliance with the Ergonomics Program Standard. This section sets forth the control endpoint that employers must achieve. Proposed § 1910.921 includes three control endpoints. Employers are in compliance with this section when they have implemented controls that satisfy one of the following:

- The controls eliminate MSD hazards;
- The controls reduce MSD hazards to the extent feasible; or
- The controls materially reduce MSD hazards.

Many case studies demonstrate that employers have successfully either eliminated the risk factors in problem jobs or materially reduced the risk factors to a level where an MSD is reasonably unlikely to occur. (See Applied Ergonomics Case Studies Volume 2, Alexander, D.C., ed., 1999; Preliminary Risk Assessment (Chapter V); Preliminary Economic Analysis (Section VIII).)

Section 1910.921 of the proposed rule would not require employers to eliminate the occurrence of all MSDs. OSHA recognizes that, in a number of jobs, workplaces, and physical work activities it may not be possible to eliminate MSDs. OSHA is also aware that employers who have an effective ergonomics program may still receive reports of MSDs. The goal of the proposed rule is to have employers put a good working system into place so that they can take quick and effective action when MSDs do occur. And section 1910.921 tells employers how far they must go in implementing controls after that MSD does occur.

1. Materially Reduce (Paragraph (a))

Paragraph (a) of the proposed rule provides that employers are in compliance if they implement controls that materially reduce MSD hazards in the job using the incremental abatement process in § 1910.922. Materially reduce MSD hazards should not be interpreted to mean that the employer may simply make any change, even one for which there is only a nominal expectation that the control will reduce the likelihood that an MSD will occur. The note to paragraph (a) emphasizes that materially reduce requires more. Materially reduce means that the overall effect anticipated to result from implementing controls to reduce risk factor exposure is a significant reduction in the probability that another MSD will occur in that job. For example, if the likely cause of an MSD hazard is regular unassisted manual lifting of 100-pound rolls of roofing material, reducing the weight of the roll to 90 pounds would not significantly change the likelihood that an MSD will occur and would not be considered a material reduction.

To further illustrate, a covered MSD of the lower back occurs in a manual handling job that requires employees to fill and seal a 50-pound bag of lead chromate pigment every 2 minutes, lift the bag and twist to put it on a pallet, and pile the bags as high as 4-feet off the ground. When the pallet is fully loaded, employees push it to the loading area at the far end of the facility. Reducing the risk factors by moving the loading area next to the fill lines cuts out more than 75% of the distance pallets had been moved. This change does materially reduce exposure to pushing and pulling the pallet. However, the hazards caused by pushing and pulling the pallets are not nearly as likely to cause or contribute to the type of MSD reported as the force and repetition risk factors in the job, and therefore the change has done little to address the ergonomic risk factors. Thus, there does not appear to be a reasonable likelihood that the implemented change will achieve a material reduction in the likelihood of injury. On the other hand, changes such as halving the fill weight of the job and/or adding additional employees to the fill line would be reasonably anticipated to materially reduce the probability of injury, because they address the primary risk factors in the manual handling job.

At the same time OSHA recognizes that a number of MSD hazards are complex and it may not always be clear what control(s) will achieve a material reduction in the probability that MSDs will occur. OSHA is aware that it may be necessary in many situations for employers to test a solution to know if it will work. As a result, OSHA is proposing that employers be considered in compliance with the requirement to materially reduce MSD hazards if they select and implement the controls that a reasonable person would anticipate would achieve a material reduction in the likelihood of injury.

The fact that an employer hired a qualified ergonomics consultant to analyze a problem job and then implemented the controls that the consultant said should significantly reduce MSD hazards is good evidence that the employer has taken action reasonably anticipated to materially reduce the likelihood of injury. Examples of other evidence that employers have taken action that could reasonably be

expected to significantly reduce the MSD hazards are that the implemented controls have been shown to reduce MSD hazards in other workplaces in the industry; that the controls were identified, evaluated and implemented by a trained ergonomics committee; or that both the MSD hazard and solution were obvious. There are also many other ways of demonstrating that the controls selected could reasonably be anticipated to achieve a material reduction in risk factors.

Employers may materially reduce MSD hazards by reducing the frequency (*i.e.,* how often), duration (*i.e.,* how long) and/or magnitude (*i.e.,* quantity) of exposure to the risk factors. For example, a manufacturing employer may be able to achieve a significant reduction in MSD hazards in an assembly line job by reducing or eliminating awkward postures, even without changing the frequency with which tasks are performed. The employer may also achieve the equivalent level of protection by reducing the length of time employees must perform repetitive tasks without a break, or by adding more workers to the assembly line so that task cycles are not repeated as often. Employers are free to proceed as they wish (*e.g.,* eliminating one risk factor, reducing the frequency and duration but not the magnitude of exposure, or trying a combination of eliminating and reducing risk factors) so long as the overall effect of their actions is to achieve a material reduction in the hazard.

OSHA is also proposing in paragraph (a) that employers use the incremental abatement process in § 1910.922 to materially reduce MSD hazards. As the term indicates, an incremental hazard abatement process relieves employers from having to implement, all at once, the combination of controls that may ultimately prove necessary to control the hazard. Instead, this process allows employers to implement controls in smaller increments, *e.g.,* one at a time, and then to observe whether the control(s) have been successful in materially reducing the hazard before moving on to other controls. If the control(s) is successful, as measured by the resolution of the injured employee's MSD, reports from employees that the job is no longer physically stressful, or by the absence of additional MSDs, the employer would be allowed to stop adding controls and to wait and see whether additional controls will be needed. The proposed rule provides that as long as no MSDs occur (*i.e.,* the injured employee's condition improves and no other MSDs are reported), employers may continue in the wait and see mode. If covered MSDs occur, employers would be required to identify and try out additional controls.

OSHA believes that it is appropriate and reasonable to allow employers to reduce MSD hazards using an incremental process. First, as mentioned above, MSD hazards are complex and there may be a number of situations where employers may not know what will fix the job. Because of this, OSHA believes that employers should be allowed to try out controls in smaller increments so they are more clear about what solutions will work before they have to move on to put in all the necessary controls.

Second, OSHA believes that the incremental abatement process is a cost effective approach for materially reducing MSD hazards. The proposed rule would not require employers to implement more controls than are necessary to achieve a substantial reduction in the MSD hazards. OSHA believes that an incremental test and evaluate approach will help assure that employers will not have to spend $1,000 in controls if $100 will fix the problem. In fact, a number of stakeholders who have ergonomics programs have said that many controls cost less than $100 (Ex. 26–1370) (see OSHA Web). Given this, OSHA believes it is reasonable to allow employers to test the less-costly solutions that other employers may have identified to see whether those solutions will adequately address the hazards in their workplaces.

Third, OSHA is proposing an incremental abatement process because it is the process that employers with good ergonomics program are using. Many stakeholders have told OSHA that their programs use an incremental abatement process (Ex. 26–1370). In addition, there is strong support for this approach among stakeholders representing a broad range of industries, employers and employees.

Fourth, the Occupational Safety and Health Review Commission has upheld OSHA's authority under a section 5(a)(1) ergonomics enforcement action to require employers:

> [T]o engage in an abatement process, the goal of which is to determine what action or combination of actions will eliminate or materially reduce the hazard. *Secretary of Labor* v. *Pepperidge Farm*, 17 OSHC 1993, 2034 (April 26, 1997).

Finally, OSHA believes that an incremental abatement process provides the best fit with the rapidly changing area of ergonomics control technology. New controls and ergonomics equipment come onto the market almost daily. By allowing employers to implement controls incrementally rather than requiring them to implement all feasible controls immediately, employers will have an opportunity and incentive to select the newest and best solutions. As a result, many more MSD hazards are likely to be identified and addressed in the design phase and eliminated before they enter the workplace. It is a well-accepted principle that the best way to address ergonomic hazards is in the design phase. For example, one stakeholder commented that ''With ergonomics programs you are never done. The workplace is constantly changing.'' (Hank Lick, Ford Motor Company, at February 1998 ergonomics stakeholder meeting, Ex. 26–1370)

The concept of incremental hazard abatement may suggest to some that ergonomics is a never-ending process or continuous loop. However, OSHA is proposing a stopping point. In § 1910.944, OSHA is proposing that employers be permitted to suspend large parts of their ergonomics program, including the incremental abatement process, if they have materially reduced the MSD hazards and no covered MSD has been reported for 3 years. Where a 3-year wait and see period has passed without the occurrence of any covered MSDs, the incremental control(s) the employer anticipated would significantly reduce the likelihood that covered MSDs would occur will have been proven in fact to do so. Therefore, there is no need to continue all the elements of the ergonomics program at that time.

2. Reduce to the Extent Feasible (Paragraph (b))

Paragraph (b) of the proposed standard states that employers have implemented all necessary controls, if they have implemented all the controls that are feasible. This control endpoint is statutorily driven. OSHA has no authority to require employers to do what is not feasible or ''capable of being done.'' *American Textile Mfrs. Institute* v. *Donovan (Cotton Dust)*, 452 U.S. 490, 509, 513 n. 31, 540 (1981). When employers have reached this level, they are not required to be involved in the incremental abatement process since they have already implemented the existing feasible control technology. (As discussed above, controls are considered feasible if they are presently in use for the application in question, can be adapted for such use from technologies that are being used in other applications, can be developed by improving existing technologies, or are on the horizon of technological development.)

However, OSHA is proposing that these employers periodically check to see whether new technology has been developed and is available if they continue to have MSDs in their covered jobs. In addition, these employers must periodically review whether controls that previously may not have been feasible are now capable of being implemented in the problem job. OSHA is not proposing to impose a time period for the periodic review. Rather, as periodically is defined in the proposed rule, employers must establish a regular time period for checking out whether the control situation has changed. The time basis for review must be appropriate for the conditions in the workplace, such as the nature and extent of the MSD hazards. A review of conditions may be necessary where there are significant changes in the workplace that may result in increased exposure to MSD hazards.

When additional feasible controls are identified, the proposed rule requires that employers must implement them promptly. The compliance timetable in § 1910.943 is not applicable to paragraph (b). That schedule incorporates time for identifying and analyzing controls before control implementation deadlines come due. In paragraph (b), on the other hand, the hazards are known and the analysis has been completed. Given this, OSHA does not believe it is necessary or appropriate to give employers a year to implement additional controls after they become available.

3. Eliminate MSD Hazards (Paragraph (c))

Of course, employers are also finished implementing controls when they have eliminated MSD hazards. This control endpoint is also statutorily based. Cotton Dust, 452 U.S. at 505–06; *Industrial Union Dep't, AFL–CIO* v. *American Petroleum Inst. et al.* (Benzene), 448 U.S. 607, 642 (1980) .

The phrase ''eliminate MSD hazards'' incorporates two concepts. First, employers are finished when they have eliminated exposure to the hazard. For example, use of a mechanical lift eliminates forceful exertions, and a voice-activated computer eliminates highly repetitive motions. Second, it means that controls have been implemented that have reduced exposure to ergonomic risk factors to the extent that employees in the job are no longer exposed to a reasonable likelihood of developing a covered MSD. MSDs are no longer reasonably likely to occur in a parts assembly job where the awkward reaches behind the back for parts has been eliminated and parts are now delivered on a conveyor to employees.

Where employers have eliminated the reasonable likelihood of the occurrence of a covered MSD, they are in compliance with the proposed control endpoint. And even if MSDs are reported in the job, employers who have eliminated MSD hazards have no obligation to take control action because the physical work activities and conditions of the job are no longer reasonably likely to cause or contribute to an MSD. In addition, if no covered MSD is reported for a period of at least 3 years after the employer has eliminated MSD hazards, the employer may stop parts of the ergonomics program in accordance with § 1910.944.

Section 1910.922 What is the ''incremental abatement process'' for materially reducing MSD hazards?

You may materially reduce MSD hazards using the following incremental abatement process:

(a) When a covered MSD occurs, you implement one or more controls that materially reduce the MSD hazards; and

(b) If continued exposure to MSD hazards in the job prevents the injured employee's condition from improving or another covered MSD occurs in that job, you implement additional feasible controls to materially reduce the hazard further; and

(c) You do not have to put in further controls if the injured employee's condition improves and no additional covered MSD occurs in the job. However, if the employee's condition does not improve or another covered MSD occurs, you must continue this incremental abatement process if other feasible controls are available.

Section 1910.922 of the proposed rule explains the steps of the incremental abatement process that employers are to use if they want to materially reduce hazards incrementally. The proposed incremental abatement process allows employers to test solutions in a problem job, and wait and see whether the action does significantly reduce the hazards before trying out additional controls. In Pepperidge Farm, the Commission discussed the meaning of an incremental abatement process in upholding OSHA's authority under section 5(a)(1) of the OSH Act to require that an employer engage in this process to control ergonomic hazards:

> Incrementalism implies a premium on evaluation of the consequences of initial actions which have been undertaken. Incrementalism also suggests (but does not require) that some steps may await the completion of others, and admits that actions may not have the desired results. Pepperidge Farm, 17 OSHC at 2034 n. 114.

Many stakeholders as well as professionals in the field of workplace safety and health refer to the incremental abatement process as a continuous improvement process (Ex. 26–1370). A comment by the Electronic Industries Association (Ex. 3–230) best sums up the goal of the proposed incremental abatement process:

> Ergonomics is a continuous improvement process. If an employer can show that they have made an organized effort to identify ergonomic stressors, to educate their affected employees on ergonomic principles, to implement solutions, and to have a system to identify when a solution is not working and needs to be readdressed, they have met the intent of the law.

1. Paragraph (a)

Paragraph (a) provides that employers may go about addressing MSD hazards by trying out a control(s) to see whether this will take care of the problem. But it also specifies that whatever control(s) the employer wants to start with must be one(s) that a reasonable person would anticipate to be likely to achieve a material reduction in the hazard, or where the efficacy of individual control measures is unclear, it has the potential to significantly reduce the likelihood that covered MSDs would occur in the job.

Under this process, employers have great flexibility to choose the control or controls that would be reasonably likely to materially reduce the hazard. Employers may start where they wish in addressing the hazard so long as their initial action is reasonably anticipated to reduce the hazard. Thus, employers may start with the ergonomic risk factor they prefer to look into first and with the modifying factor (*i.e.,* duration, frequency, magnitude) they wish to address first.

For example, in a manual handling job that requires the worker to quickly lift heavy containers off a low flatbed cart all day and then to turn to put them on a conveyor, an employer is likely to have several options about which risk factor(s) to start with: size or weight of load, vertical height of the lift, turning/twisting motion, or the container design. The employer is also likely to have several ways to modify (or reduce) any of the risk factors: reduce the percentage of the work day spent doing this task, reduce how quickly each

load must be moved, reduce the weight of load, reduce the vertical height (*e.g.*, raise height of flatbed), reduce the amount of twisting, add handles to containers, or install mechanical lift or lifting assist devices.

Paragraph (a) provides that if reducing the vertical height that the employee must lift the container does materially reduce the likelihood of injury, the employer is not required at the outset, for example, to purchase and install mechanical lifts. However, if the load weighs more than 100 pounds, for example, it is not reasonable to expect that changing the vertical distance alone would significantly reduce the likelihood that employees performing these physical work activities would develop a back injury (unless the vertical travel distance was reduced to 0 because the requirement to lift was eliminated).

2. Paragraph (b)

Paragraph (b) specifies that if the problem does not resolve or gets worse, employers must try additional feasible controls to achieve a material reduction in the hazard. A problem is not considered resolved if the injured employee's condition does not improve because the employee continues to be exposed to ergonomic risk factors that are reasonably likely to cause, contribute to, or aggravate an MSD of this type. Employers need to install additional controls if another employee in the job reports a covered MSD. The fact that another employee in the job has been injured is a good indication that additional controls are needed to reduce the hazard.

3. Paragraph (c)

Paragraph (c) proposes that, if after the employer implements the initial control(s) designed to materially reduce the hazard, the injured employee's condition gets better, then the employer would not be required to take further control action, provided that no one else in the job develops a covered MSD. This provision would allow the employer, at this point, to wait and see whether the initial action has been adequate. As long as no one in the problem job reports a covered MSD, the employer need not put in any additional controls.

When a covered MSD is reported in that job, however, the waiting process is over. The occurrence of another covered MSD indicates that the initial controls were not adequate. This means that employers must try other feasible controls to materially reduce the MSD hazards in the job. As long as covered MSDs continue to occur and feasible controls exist, employers must be following the steps of the incremental abatement process.

As with the control endpoints discussed in § 1910.921, there also are endpoints to the incremental abatement process. Obviously, employers may stop the incremental abatement process when they have eliminated the MSD hazards because there is nothing remaining in the physical work activities and conditions of the job that would be reasonably likely to cause or contribute to a covered MSD. Likewise, the obligation to continue the process would cease if employers have tried controls and have reduced the hazard to the extent feasible, *i.e.*, they have done everything at this time. The only remaining hazard analysis and control obligation required by the standard in such a situation is to periodically check to see whether a new control that is capable of materially reducing the hazard has become available.

Training (§§ 1910.923–1910.928)

Training is a critical component of an ergonomics program. Training is needed to equip employees in problem jobs, their supervisors, and persons involved in administering the ergonomics program with the knowledge and skills necessary to recognize and control MSDs and MSD hazards. Effectively addressing workplace MSD hazards requires that these individuals possess the ability to identify the physical work activities and job conditions that may increase a worker's risk of developing MSDs, recognize the signs and symptoms of these disorders, and participate in the development and execution of effective strategies to eliminate or materially reduce them.

As has already been discussed, the proposed standard requires that information regarding common MSD hazards, signs and symptoms of MSDs, reporting methods, and the requirements of the standard be provided to at-risk employees. Providing information serves to heighten awareness of employees with regard to MSDs that may occur and the workplace risk factors that can cause them, as well as indicating the means of communicating any relevant observations to the employer. The provision of information alone, however, does not constitute training, because it may not ensure the level of comprehension that is necessary for employees to take an active role in the ergonomics program. The requirements of the proposed standard for training are also broader in scope than the requirements for providing information, extending to methods of control as well as the recognition of MSD hazards.

Section 1910.923 What is my basic obligation?

You must provide training to employees so they know about MSD hazards and your ergonomics program and measures for eliminating or materially reducing the hazards. You must provide training initially, periodically, and at least every 3 years at no cost to employees.

Section 1910.923 proposes to require employers to provide training to employees about MSD hazards, the ergonomics program, and control measures in the workplace. Training would be required to be provided initially, periodically as needed, and at least every three years. Training would be required to be provided at no cost to employees.

Initial training is necessary to ensure that employees in problem jobs, their supervisors, and the individuals who set up and manage the ergonomics program are provided with the knowledge and skills necessary to recognize MSD hazards in their workplace and to effectively participate in the ergonomics program. Periodic training is necessary to address new developments in the workplace and to reinforce and retain the knowledge acquired in initial training. The length and frequency of training would be determined by the needs of the workplace. Individuals would need to be trained sufficiently to understand the subjects specified in § 1910.925. An interval of three years between training sessions is proposed as the minimum necessary to preserve the knowledge and understanding acquired in initial training. Employee participation in the ergonomics program, job hazard analysis, and program evaluation all depend on adequate employee training.

The proposed requirement that training be provided at no cost to employees means that the employer would bear any costs associated with training. For example, any training materials given to employees would have to be provided free of charge. Employees would have to be compensated at their regular rate of pay for time spent receiving training, and could not be required to forfeit regularly scheduled lunch or rest periods to attend training sessions. In addition, where training requires employees to travel, the employer would have to pay for the cost of travel, including travel time when

the activities are not scheduled during the employee's normal work hours.

The proposed requirement that training be provided at no cost to employees reflects OSHA's strong belief and past regulatory policy that the costs of complying with safety and health requirements be borne by the employer. The Agency considers training to be essential to the effectiveness of other provisions of the proposed standard: work practice controls, for example, will not be effective if employees are not aware of their proper application, and MSD management cannot be effective if employees do not know when it is appropriate or how to obtain access to it. OSHA believes it is reasonable for employers to bear the cost of training, because, under the Occupational Safety and Health Act of 1970, employers bear the responsibility for providing a safe and healthful workplace. Having the costs borne by the employee would discourage participation in training activities, and would thus limit the effectiveness of the rule's training requirements.

Section 1910.924 Who must I train?

You must train:

(a) Employees in problem jobs;

(b) Supervisors of employees in problem jobs; and

(c) Persons involved in setting up and managing the ergonomics program, except for any outside consultant you may use.

Employees in problem jobs play a key role in the success of an ergonomics program. They are the individuals who have developed or are at risk of developing MSDs. By reporting MSDs and MSD hazards early, making recommendations, and following established control procedures, these workers can assist in protecting themselves.

Early reporting of the development of MSDs would allow the employer to provide appropriate MSD management to the affected employees. Notification of the existence of MSD hazards would alert the employer to the necessity of evaluating and implementing measures to eliminate or control the hazards. The effective control of MSD hazards also often requires the active participation of employees. For example, a work station that can be easily adjusted to accommodate the demands of different tasks or the height and reach limitations of different workers will not be constructively used if the workers are not aware of how to make the adjustments. If employees are not aware of MSD signs and symptoms, or cannot properly use control measures, the ergonomic protection process will not succeed. It is critical that employees have the training they need to perform these functions. The proposed standard therefore would require in § 1910.924(a) that training be provided to all employees in problem jobs.

Supervisors of employees in problem jobs are often in a position to observe MSD hazards and to recognize when MSDs develop in the workers they supervise. As supervisors, they are also in a position to ensure that employees in problem jobs understand and conform with procedures established to control MSD hazards. A supervisor, for example, may observe an employee operating a hand-held vibrating power tool without wearing appropriate vibration-resistant gloves. The supervisor, when prepared by training to understand the significance of this oversight, could take corrective action by ensuring that gloves are provided and used when necessary. If the supervisor was aware that this employee was experiencing numbness, tingling, and loss of sensation in the fingers, training would provide the knowledge necessary to recognize these symptoms as potential indications of an MSD. Training of supervisors would thus provide an additional avenue for the protection of employees who develop MSDs. MSDs and MSD hazards that may be overlooked by the employees who are directly affected may be recognized by their supervisors. Training is necessary for these supervisors to acquire the knowledge necessary for these tasks. For this reason, the proposed standard would require in § 1910.924 (b) that supervisors of employees in problem jobs be provided training.

The effectiveness of the ergonomics program is also dependent on the abilities of those individuals who establish and administer the program. These individuals must be able to identify MSDs and MSD hazards, undertake appropriate interventions to control the hazards, and evaluate the effectiveness of the ergonomics program and controls that have been adopted. The individuals who establish and administer the ergonomics program may be provided by the employer with the authority and resources necessary to accomplish these objectives, but without effective training it is unlikely that they would have sufficient knowledge to accomplish them successfully. For example, a program administrator assigned the task of evaluating the effectiveness of measures instituted to materially reduce MSD hazards in problem jobs would likely need training in order to understand how to assess effectiveness. Section 1910.924 (c) of the proposed standard would therefore require that training be provided to individuals who set up and manage the ergonomics program. Outside consultants do not need to be trained by the employer, because these individuals are responsible to preparing themselves to perform their professional duties.

Section 1910.925 What subjects must training cover?

This table specifies the subjects training must cover:

YOU MUST PROVIDE TRAINING FOR . . .	SO THAT THEY KNOW . . .
(a) Employees in problem jobs and their supervisors.	(1) How to recognize MSD signs and symptoms; (2) How to report MSD signs and symptoms, and the importance of early reporting; (3) MSD hazards in their jobs and the measures they must follow to protect themselves from exposure to MSD hazards; (4) Job-specific controls implemented in their jobs; (5) The ergonomics program and their role in it; and (6) The requirements of this standard.
(b) Persons involved in setting up and managing the ergonomics program.	(1) The subjects above; (2) How to set up and manage an ergonomics program; (3) How to identify and analyze MSD hazards and measures to eliminate or materially reduce the hazards; and

YOU MUST PROVIDE TRAINING FOR . . .	SO THAT THEY KNOW . . .
	(4) How to evaluate the effectiveness of ergonomics programs and controls.

Training must encompass certain elements in order to provide affected individuals with sufficient knowledge to recognize and control MSDs and MSD hazards in their workplace. The proposed standard presents a number of elements on which training would be required for all employees in problem jobs, their supervisors, and persons involved in setting up and managing the ergonomics program. For persons involved in setting up and managing the ergonomics program, several additional elements would be required to be covered.

Training would address recognition of MSD signs and symptoms, and the method and importance of early reporting when these signs and symptoms develop. This is an elaboration of the information provided to at-risk employees, and an opportunity for the employer to relate the general information provided to the operations at a specific workplace and to site-specific conditions. Training is not intended to prepare workers, supervisors, or managers to medically diagnose or treat MSDs. Rather, the purpose is to instill an understanding of what type of health problems may be work related so that these individuals will be able to recognize when MSD management is necessary.

Since the employees who would be trained are in problem jobs, they are exposed to factors that are associated with a risk of developing MSDs, and may already suffer from MSDs. It is thus particularly important that they be aware of the MSD signs and symptoms that are reasonably likely to occur. The supervisors of employees in problem jobs will often be in position to observe MSD hazards and the development of MSD signs and symptoms among the workers they supervise. In many instances, supervisors may perform the same job tasks as the workers they supervise. Early reporting would help the employer ensure that intervention in the disease process occurs before functional incapacity or permanent disability results, and would assist in identifying MSD hazards so that measures could be taken to eliminate or materially reduce those hazards. In many instances, the workers who perform tasks that involve MSD hazards and their supervisors are also the persons most familiar with the options for controlling those hazards. The recommendations of these individuals are thus an important means of identifying actions that would alleviate MSD hazards.

Employees in problem jobs, their supervisors, and persons involved in setting up and managing the ergonomics program would also be trained to recognize the MSD hazards in jobs and the measures that must be taken to control exposure to these hazards. This would include both general measures and those specific to the job. This training would provide these individuals with the knowledge and skills necessary to take actions to reduce the potential for developing MSDs. Proper understanding of control measures is particularly important because the effectiveness of these measures is dependent on their proper use by employees. All affected parties also need to know what their role in the ergonomics program is, in order to best facilitate the program's successful implementation. Employees, for example, must understand the provisions for MSD management in order to participate appropriately in this process.

The proposed standard includes a requirement that employees in problem jobs, their supervisors, and persons involved in setting up and managing the ergonomics program know the requirements of the standard. This would ensure that workers are aware that specific requirements have been established to protect them from MSDs. Program administrators would be able to ensure that the program meets its legal obligations.

Additionally, program administrators must know how to set up and manage an ergonomics program, recognize and appraise MSD hazards, and select and apply appropriate measures to eliminate or materially reduce MSD hazards in order for the ergonomics program to be effective. The proposed standard would require that training be provided to equip these individuals to perform these assigned functions. The administrators would further be trained to evaluate the effectiveness of ergonomics programs and controls, in order that they be able to identify and rectify any deficiencies that may occur in their workplace's program.

While employees in problem jobs may be able to take some limited actions individually to protect themselves from MSD hazards, the primary responsibility for providing a safe work environment rests with the employer. The individuals who set up and administer the ergonomics program act on behalf of the employer in controlling MSD hazards. Employees cannot be protected from MSD hazards unless these hazards are identified and effective measures are then taken to control them. Accordingly, the individuals who administer the ergonomics program must be properly trained to discern when interventions are needed, decide what intervention methods are appropriate, and examine the results of interventions to determine if further actions are necessary.

Section 1910.926 What must I do to ensure that employees understand the training?

You must provide training and information in language that employees understand. You also must give employees an opportunity to ask questions and receive answers.

The proposed standard would allow employers to use whatever training methodology they consider most useful or appropriate for that particular workplace, provided that the specified elements are addressed. Hands-on training, videotapes, slide presentations, classroom instruction, informal discussions during safety meetings, written materials, or any combination of these methods may be appropriate. The primary concern is that the training be effective.

In order for the training to be effective, the employer must ensure that the training is provided in a manner that the employee is able to understand. Employees have varying educational levels, literacy, and language skills, and training must be presented in a language and at a level of understanding that accounts for these differences in order to meet the proposed requirement that individuals being trained understand the specified training elements. This may mean, for example, providing materials, instruction, or assistance in Spanish rather than English if the workers being trained are Spanish-speaking and do not understand English. The employer would not be required to provide training in the employee's preferred language if the employee understood both languages; as long as the employee is able to understand the language used, the intent of the proposed standard would be met.

In order to ensure that employees comprehend the actions that they must take to protect themselves from exposure to MSD hazards, it is critical that trainees have the opportunity to ask questions and receive answers if they do not fully understand the material that is presented to them. When videotape presentations or computer-based programs are used, this requirement may be met by having a qualified trainer available to address questions after the presentation, or providing a telephone hotline so that trainees will have direct access to a qualified trainer.

Section 1910.927 When must I train employees?

This table specifies when you must train employees:

IF YOU HAVE . . .	THEN YOU MUST PROVIDE TRAINING AT THESE TIMES . . .
(a) Employees in problem jobs and their supervisors	(1) When a problem job is identified; (2) When initially assigned to a problem job; (3) Periodically as needed (*e.g.,* when new hazards are identified in a problem job or changes are made to a problem job that may increase exposure to MSD hazards); and (4) At least every 3 years.
(b) Persons involved in setting up and managing the ergonomics program	(1) When they are initially assigned to setting up and managing the ergonomics program; (2) Periodically as needed (*e.g.,* when evaluation reveals significant deficiencies in the program, when significant changes are made in the ergonomics program); and (3) At least every 3 years.

Section 1910.927 proposes establishing time frames for the provision of training. Employees in problem jobs and their supervisors would be required to be provided training when a problem job is identified, when they are initially assigned to a problem job, and periodically thereafter as needed, but at least every three years.

The need for initial training is self-evident: employees and their supervisors must be trained prior to the occurrence of covered MSDs in order to recognize the hazards, help to reduce them, and effectively participate in the ergonomics program. If an employee is assigned to a problem job prior to receiving proper training, that employee is not likely to be able to take advantage of protective measures that are available to alleviate MSD hazards.

Periodic training under the proposed standard would be required to be conducted on an as-needed basis. The frequency of routine training would be performance oriented; individuals would need to be trained sufficiently to understand the elements specified in § 1910.925. Periodic training is needed to refresh and reinforce the memories of individuals who have previously been trained, and to ensure that these individuals are informed of new developments in the ergonomics program. For example, training after new control measures are implemented would generally be necessary in order to ensure that employees are able to properly use the new controls as they are introduced. Employees would likely be unfamiliar with new work practices undertaken, with the operation of new engineering controls, or the use of new personal protective equipment; training would rectify this lack of understanding. This would ensure that employees are able to actively participate in protecting themselves under the conditions found in the workplace, even if those conditions change.

At a minimum, the periodic training would be required to take place every three years. This interval is considered by the Agency to represent the maximum reasonable interval for affected individuals to retain the knowledge and understanding initially acquired without some form of reinforcement. More frequent periodic training, such as annual training, has not been proposed because regular communication between employees and management would be ongoing as a result of the proposed requirements for management leadership and employee involvement in the ergonomics program. Employee involvement in developing, implementing, and evaluating each element of the ergonomics program, including training, is included in the requirements of the proposed standard in § 1910.912. Prompt reporting by employees of MSD signs and symptoms and MSD hazards, effective job hazard analysis, and evaluation of the ergonomics program will make employers aware of additional training needs. Periodic training more frequently than every three years is likely to be appropriate in many work situations, for example in a workplace with many problem jobs. A requirement for annual training has not been included in this proposal in order to avoid encumbering those employers whose operations involve more limited exposure to MSD hazards.

Persons involved in setting up and managing the ergonomics program would be required under the proposed standard to be trained upon initial assignment to these duties. Knowledge and understanding of the identification of MSDs and analysis of MSD hazards, measures to eliminate or materially reduce MSD hazards, and the ergonomics program and its evaluation are all needed for the development and operation of the program. Periodic training is needed to provide program administrators with the skills and abilities to adjust the program to account for changes in the workplace, and to correct any significant deficiencies that may be identified in the program. This would assure that the ergonomics program is applicable to current conditions in the workplace, and is optimally effective in protecting workers from MSD hazards. Periodic training would also allow those individuals setting up and managing the program to keep abreast of new developments in the evolving field of ergonomics.

In comments received in response to the ANPR, some concern was expressed by industry regarding the frequency of training. For example, the American Meat Institute wrote (Ex. 3–147):

> OSHA should not dictate specific training requirements. Specifically, training frequencies should not be included in a standard.

OSHA intends for the performance oriented approach adopted in the proposal to provide sufficient flexibility so that employees in problem jobs, their supervisors, and individuals involved in establishing and managing the ergonomics program receive sufficient training to effectively

participate in the program, without compelling employers to provide training more often than the circumstances of the workplace dictate.

Section 1910.928 Must I retrain employees who have received training already?

No. You do not have to provide initial training to current employees, new employees and persons involved in setting up and managing the ergonomics program if they have received training in the subjects this standard requires within the last 3 years. However, you must provide initial training in the subjects in which they have not been trained.

Proposed § 1910.928 would allow training received within the previous three years to fulfill the requirements for initial training. Subsequent periodic training would still be required at least every three years, and more frequently if warranted by the circumstances of the workplace. For example, a baggage handler who has received training from one employer and then moves to another employer six months later to perform the same job may not need to receive initial training in all of the subjects prescribed in § 1910.925. Prior training in general topics, such as the recognition of MSD signs and symptoms, may remain relevant in the new workplace. However, site-specific training, for example training in how to perform work safely using the equipment at the new workplace, would generally be required. Allowing prior training in covered topics to be ''portable'' would apply to both current and newly hired employees, including those who set up and manage the ergonomics program.

The employer must be able to demonstrate that the employee has retained sufficient knowledge to meet the requirements for initial training in order for prior training to be considered sufficient to meet the requirements of § 1910.928. This could be determined through discussion of the required training subjects with the employee. Merely having received training during the previous three years would not be sufficient for an exemption from the initial training requirement. If the employer cannot demonstrate that the new employee has been trained and knows the required elements, the new employer would be obligated to train the employee in these elements. In cases where understanding of some elements is lacking or inadequate, the employer would be required to provide training only in those elements. This allowance for prior training is intended to ensure that employees receive sufficient training, without requiring unnecessary repetition of that training.

Evidence in the record clearly shows that training is an essential component of an effective ergonomics program and can help to reduce MSDs. In some instances, training in appropriate work practice controls may serve to reduce the incidence of MSDs. For example, the effectiveness of training in reducing the incidence of MSDs has been reported by Parenmark *et al.* (Ex. 26–6). Sixteen newly hired assembly workers at a Swedish chain saw plant were trained to perform their jobs using work practices that maintained the muscular load on the upper extremities at 10% or less of maximum voluntary contraction. The same training was also given to a group of assembly workers who had been on the job for one year. Training was not provided to a control group of new hires. After 48 weeks on the job, sick leave due to arm/neck/shoulder complaints was reduced by more than 50% among the new hires provided ergonomic work practice training when compared to the control group of new hires; the difference was statistically significant. For the assembly workers who had been on the job for one year, sick leave due to arm/neck/shoulder complaints was reduced by over 40% after training, although this result was not statistically significant.

Further evidence of the success of training in proper work practices in controlling MSD hazards in some instances is provided by Dortch and Trombly (Ex. 26–7), who examined the effectiveness of training in reducing the frequency of movements identified as traumatizing to the musculature and connective tissue of the hand, wrist, and forearm and known to be associated with MSDs. Eighteen electronic assembly workers were observed performing their jobs, and the number of MSD-associated movements was recorded for each individual. The workers were then divided into two groups. The first group received awareness training and a printed handout describing job-specific work practice controls. In addition to awareness training and the printed handout, members of the second group discussed the concepts in the handout individually with an instructor and received hands-on training. Each of the groups exhibited statistically significant reductions in the frequency of those movements associated with MSD development during observation one week after the training was administered. The group receiving more extensive training showed the greater reduction, although the difference between the two groups after training was not statistically significant.

Engels *et al.* (Ex. 26–8) studied the effectiveness of ergonomic work practice training for nurses. Twelve nurses attending an ergonomic education course were compared to a control group of twelve nurses. Participants were videotaped and their performance was assessed by scoring ergonomic errors on a checklist. Included among the activities monitored under standardized conditions were such tasks as transferring a patient from a bed to a wheelchair, washing a patient, and raising a patient from a lying position to sitting up. The nurses who had received training were found to be less likely to make ergonomic errors than the control group; this result was statistically significant. When the ergonomic work practice training was accompanied by other elements of an ergonomics program, the likelihood of making ergonomic errors was found to continue to decrease a year after the training had ended; this result was also statistically significant.

Training in work practices, however, represents only one of the subjects that would be covered in the proposed requirements for ergonomic training. Training in the recognition of MSD signs and symptoms, and methods of reporting development of these signs and symptoms, would allow appropriate medical management to take place. Ergonomics training can also provide employees in problem jobs, their supervisors, and ergonomics program managers with the knowledge necessary to actively participate in the development of appropriate methods of controlling MSD hazards in their workplace, providing a number of benefits for employers. The Joyce Institute, a provider of ergonomic training and consultation services, reported the results obtained by a number of companies when ergonomic improvements were made as a result of training (Ex. 3–122E–3). Among the outcomes:

- Textron-Davidson Interior Trim experienced a 42% reduction in OSHA recordable injuries, a savings of $440,000 in labor and materials, and a reduction in employee turnover;
- Spectra-Physics reduced CTDs from 558 to 150 in three years;
- A food processing company found 50% fewer CTDs in the plant where training had been performed and changes

made when compared to other plants doing similar work; and

- Milton Bradley experienced a 90% improvement in quality as measured by customer returns due to damaged packaging.

Responses to the ANPR indicate that the need for ergonomic safety and health training is widely recognized. For example, the National Solid Wastes Management Association (Ex. 3–248) stated:

> The Association feels that the training and education of workers is the single most important element of any general industry standard, and is the element most within the resources of the majority of employers within our industry to provide an effective reduction in exposure to ergonomic hazards * * *
>
> If employees are sufficiently educated to avoid or minimize ergonomic hazards within their personal control, to report symptoms early enough to avoid serious medical complications and to understand the need to communicate to their employer regarding a work station, equipment or job duty that presents an ergonomic hazard, then the employer should be in the best possible position to identify and rectify an inappropriate situation.

The Mount Sinai-Irving J. Selikoff Occupational Health Clinical Center (Ex. 3–162) also advocated training for employees:

> We believe that training and education of workers about ergonomic hazards should be required under the standard. The training should emphasize the identification of potential ergonomic hazards as well as recognition of symptoms of common ergonomic disorders. Prevention should be strongly emphasized in such programs as part of an aggressive company-wide commitment to work to eliminate these problems as soon as possible.

The Telesector Resources Group (Ex. 3–215) expressed support for training all employees exposed to significant workplace risk factors, and indicated what should be included in this training, particularly job-specific training regarding work practices:

> Employees exposed to significant occupationally-related CTD risk factors should be trained in the broad scope of applicable ergonomics principles and in the specific operations of their work tasks and workstations where such training is required to ensure that the task can be performed, and equipment operated as intended. These employees should understand the significant CTD risk factors to which they may be exposed and how to prevent or minimize exposure to them. Education and training in applicable ergonomics principles is especially important for new employees and those employees who are assuming new job tasks where significant CTD risk factors are known to exist.

Similarly, the AFL–CIO also endorsed training as part of an appropriate approach to addressing ergonomics in the workplace (Ex. 3–184):

> In order for the standard to be most effective in preventing CTDs, workers must be trained in early identification of CTDs and risk factors for CTDs, proper ways to perform the job, and other information related to the standard.

However, not all stakeholders supported a training requirement. For example, the Society of American Florists (Ex. 3–55) commented:

> Additional training and recordkeeping requirements would place yet another burden and layer of bureaucracy upon small businesses and compromise their ability to compete.

Some respondents to the ANPR expressed a desire that training requirements be adaptable to the specific circumstances of the affected employers. US WEST Business Resources, Inc. (Ex. 3–91), while endorsing training as part of the approach to ergonomics, stated that the requirements must be flexible:

> US WEST recognizes that employee training is an essential cornerstone of any occupational health and safety program. As with other aspects of an ergonomics program, training needs are highly variable and OSHA must allow employers a high degree of flexibility in establishing training programs that best fit the needs of their employees and operations.

The Synthetic Organic Chemical Manufacturers Association, Inc. (Ex. 3–185) made the same point:

> We agree that individuals participating in the CTD program should be trained. However, the level, frequency, and sophistication of the training effort should be performance-based so that the employer can best determine what is appropriate for its workplace.

In the proposed standard, OSHA seeks to provide employees, their supervisors, and those involved in administration of the ergonomics program sufficient training to actively participate in the protective process in their workplace, without creating any unnecessary or undue burden on employers. The Agency recognizes that workplaces vary greatly in the scope and magnitude of MSD hazards present, the number and complexity of control measures implemented, and the extent to which affected individuals must be involved in the control process. The standard, therefore, does not propose a specified format or length of time for training, allowing employers to adjust training to the needs of their workplace. It is anticipated that the training would vary in duration from facility to facility, depending on the extent of the MSD hazards, the type of operation, the controls required, and the involvement necessary on the part of the employee for the control measures to be effective.

MSD Management (§§ 1910.929 through 1910.935)

This discussion of MSD management is divided into three parts. Part A explains the proposed requirements in sections 1910.929 through 1910.935, all of which address aspects of the proposed MSD management process. Part B discusses OSHA's legal authority to require work restriction protection and the Agency's reasons for doing so. Part C deals with alternatives to the proposed work restriction protection requirements that OSHA has considered in developing the proposed rule's work protection provisions.

Part A—Proposed Requirements for Sections 1910.929 through 1910.935

This section of the proposed rule establishes the requirements for setting up a process to manage MSDs when they occur. MSD management is the employer's process for ensuring that injured employees are provided with:

- Prompt access to health care professionals (HCPs) or other safety and health professionals as appropriate;
- Effective evaluation, management, and follow-up; and
- Appropriate temporary work restrictions where needed during the recovery period.

MSD management emphasizes prevention of impairment and disability through early detection, prompt management and timely recovery from covered MSDs (Ex. 26–1264, Ex. 26–921). This early intervention process is important in helping to achieve the goals of the proposed standard—reducing the severity as well as the number of work-related MSDs.

The MSD management provisions in the proposed standard are built upon the processes that employers with ergonomics programs already are using to help employees who have work-related MSDs. Evidence in the record shows that these companies, through early intervention and management of MSDs, have achieved substantial reductions in areas such as lost-work time, lost-workdays, costs per case, and workers' compensation claims and costs (see, *e.g.*, Ex. 3–147, Ex. 26–1367, Ex. 26–1405).

The proposed MSD management provisions are consistent with and based on OSHA's other ergonomics efforts. MSD management provisions are included in OSHA's Ergonomics Program Management Guidelines for Meatpacking Plants (Ex. 26–3). The Guidelines emphasize that ''proper medical management is necessary both to eliminate or materially reduce the risk of development of CTD signs and symptoms through early identification and treatment and to prevent future problems'' (Ex. 26–3). In addition, MSD management provisions have been included in all of OSHA's corporate settlement agreements addressing MSD hazards. Finally, to become a member of OSHA's Voluntary Protection Program, employers must include an ''Occupational Heath Care Program'' in their safety and health programs. This would address MSDs, along with other health hazards.

1. Need for MSD Management

MSD management is recognized by, among others, employers, HCPs, and occupational safety and health professionals as an essential element of an effective ergonomics program (Ex. 26–1, Ex. 26–5, Ex. 26–1264). Among employers who told OSHA they have an ergonomics program, most reported that their programs include MSD management as a key element (Exs. 3–56; 3–59; 3–73; 3–95; 3–113; 3–118; 3–147; 3–175; 3–217; and 26–23 through 26–26). The draft American Standards Committee (ASC) consensus standard on the control of work-related MSDs states that a program to control MSDs ''shall'' include provisions for the evaluation and management of MSD cases (*i.e.*, MSD management), because such elements ''are either recognized and fundamental to injury prevention, or considered minimally essential to the control of [MSDs]'' (Ex. 26–1264). The draft ASC consensus standard was developed by a committee comprised of representatives from the medical, scientific, and academic communities, as well as those representing employers and employees.

There are many reasons why MSD management is essential to the success of an ergonomics program. MSD management helps to reduce the severity of MSDs that occur. As mentioned above, MSD management emphasizes the early detection of MSDs, followed by prompt and effective evaluation and management. Identifying and addressing MSD signs and symptoms at an early stage helps to slow or halt the progression of the disorder. When MSDs are caught early they are more likely to be reversible, to resolve quickly, and not to result in disability or permanent damage. The American Meat Institute is on record as saying that MSD management programs that promote early intervention result in a reduction in the number of serious MSDs, fewer surgeries, reduced lost-time from work, and a quicker return to full duty (Ex. 3–147). Two studies by Maurice Oxenburgh also support this. In one study, Oxenburgh found that for employees suffering from upper-extremity MSDs (UEMSDs), the earlier they reported signs and/or symptoms of the UEMSDs, the quicker they were able to return fully to work (Ex. 26–1367). Specifically, Oxenburgh found that UEMSDs resulted in 49 days away from work (or on restricted work) for employees who reported within 20 days of the onset of pain, 66 days for employees who reported within 21–50 days of the onset of pain, and 84 days for employees who reported after 51 days of the onset of pain. In another study, Oxenburgh observed two groups of video display unit (VDU) workers who were exposed to the same ergonomics risk factors. One group (''the MSD management group'') received medical screening, training, workstation redesign, treatment, and rehabilitation; the other group (''the control group'') received none of these interventions. Oxenburgh compared the two groups and found:

> 1. Twenty-two percent of the control group cases had second or third stage injuries, compared with 8% for the MSD management group;
>
> 2. The mean period of absence from work for the control group workers was 33.9 days, compared with 3.4 days for the MSD management group; and
>
> 3. The total amount of time the average worker in the control group lost, either to days away or alternate duty, was 124.9 days, compared to 34.9 days for the MSD management group (Ex. 26–1405).

These studies demonstrate the importance of early reporting and intervention as part of MSD management in reducing the severity of MSDs, as well as accelerating the recovery process for injured employees. In so doing, MSD management also reduces the costs of MSDs to employees and employers alike.

An MSD management process is also important to reduce the use of and need for surgery to repair MSDs (Ex. 26–5). Uniformly, stakeholders have told OSHA that intervention should be made at the earliest possible stage when conservative treatment, rather than surgery, is most likely to resolve MSDs (see Exs. 26–23 through 26–26). For example, the Denton Hand Rehabilitation Clinic stated:

> [E]arly intervention and nonsurgical intervention is the more appropriate approach to carpal tunnel syndrome. It is imperative that the high cost of health care be reduced and a program which offers early intervention and nonsurgical intervention with full employer participation, employee understanding, and the medical referral would certainly offer this (Ex. 3–33).

If MSD management is delayed or not provided at all, it may be more difficult to avoid surgery because conservative treatment may not be able to resolve the MSD.

MSD management also helps to reduce the number of MSDs by alerting employers early enough that they can take action before additional problems occur. To illustrate, many employers with ergonomics programs use the report of a single MSD as a trigger for conducting a job hazard analysis (Ex. 26–5). The purpose of analyzing and fixing the job at this stage is to prevent injury to other employees in the same job. An MSD management process that encourages early reporting and evaluation of that first MSD thus helps to ensure that the analysis and control of the job is done before a second employee develops an MSD.

MSD management also reduces MSDs through prevention. Specifically, MSD management helps to prevent future problems through development and communication of information about the occurrence of MSDs. For example, where engineering, design and procurement personnel are alerted to the occurrence of MSDs, they can help to implement the best kind of ergonomic controls: controlling MSD hazards in the design and purchase phase to prevent their introduction into the workplace.

OSHA is using the term ''MSD management'' in the proposed rule rather than ''medical management.'' ''Medical

management'' is a term that OSHA has used in earlier ergonomics publications (*e.g.*, Ergonomics Program Management Guidelines for Meatpacking Plants (1990)) and stakeholders have become familiar with it. However, OSHA believes that ''MSD management'' is a more accurate term because it emphasizes that the successful resolution of MSDs may involve professionals from many disciplines. These individuals may include physicians, occupational health nurses, nurse practitioners, physician assistants, occupational therapists, physical therapists, industrial hygienists, ergonomists, safety engineers, or members of workplace safety and health committees. OSHA believes that all of these individuals, along with the employer and employees, may have a role to play in MSD management, depending on the size, organizational structure, or culture of the particular workplace.

In addition, OSHA believes that the term MSD management indicates that many approaches can be successful in resolving MSDs. For example, some employers have developed successful MSD management programs that are built on immediately providing restricted work activity at the first report of MSD signs or symptoms. These employers have said that quick intervention has resulted in dramatic reductions in lost workday injuries as well as reductions in medical treatment costs. Other companies utilize on-site HCPs to provide quick front-line health interventions. Although these approaches are quite different, they have both been shown to be successful. Still other organizations rely on the training and skill of ergonomics committee members to address problems. The MSD management provisions of the proposed rule have been written to recognize that many individuals may be trained and knowledgeable about MSDs and MSD hazards. The choice of approach to MSD management is left to the employer.

Section 1910.929 What is my basic obligation?

You must make MSD management available promptly whenever a covered MSD occurs. You must provide MSD management at no cost to employees. You must provide employees with the temporary ''work restrictions'' and ''work restriction protection (WRP)'' this standard requires.

The employer's basic obligation, as stated in section 1910.929, is to make MSD management available promptly to employees with covered MSDs. MSD management is a process that addresses MSDs promptly and appropriately. In other words, MSD management means that an employer has established a process for assuring that employees with covered MSDs receive timely attention for the reported MSD, including, if appropriate, work restrictions or job accommodation and follow-up. Where there is no on-site HCP, the employer may designate an individual to receive and respond promptly to reports of MSD signs, symptoms, and hazards. Where there is an on-site HCP, he or she would be the likely person to have responsibility for MSD management, including referral as appropriate.

An effective MSD management program has:

1. A method for identifying available appropriate work restrictions and promptly providing them when necessary;

2. A method for ensuring that an injured employee has received appropriate evaluation, management, and follow-up in the workplace;

3. A process for input from persons contributing to the successful resolution of an employee's covered MSD; and

4. A method for communicating with the safety and health professionals and HCPs involved in the process.

Many stakeholders stated that early reporting and intervention is absolutely essential for MSD management to be successful. To this end, the MSD management provisions are crafted to encourage employees to report MSDs early and to receive appropriate treatment promptly. In particular, OSHA's work restriction protection requirements (discussed in detail below) are included as part of the MSD management process to encourage employees to report MSDs early.

In its 1997 primer, Elements of Ergonomics Programs, NIOSH stated that, in general, the earlier symptoms are identified and treatment initiated, the less likely a more serious MSD is to develop (Ex. 26–2). Thus, employees need to receive prompt, appropriate help after reporting the signs or symptoms of MSDs that may be work-related. The importance of early reporting and intervention has also been documented in a number of studies (see Exs. 26–912, 26–913, 26–917, 26–914, 26–915, 26–910, 26–916, 26–911, 26–1367, 26–1405).

Commenters to OSHA's ANPR also stressed the importance of early reporting. Martin Marietta attributed a drop in the incidence rate of cumulative trauma disorders to early reporting and the education of their workers (Ex. 3–151). Perdue Farms noted a 15% decrease in cumulative trauma disorders, which they attributed to early reporting and intervention (Ex. 3–56). The Mount Sinai-Irving J. Selikoff Occupational Health Center stated: ''We cannot overemphasize the importance of the early reporting of symptoms. Based on evaluations of patients from a wide variety of work places, we believe it is essential to intervene medically, and by appropriate modification of the work station or job task, as soon as possible in order to reduce the potential for genesis of permanent impairment '' (Ex. 3–162). (See also Exs. 3–33; 3–147).

For MSD management to be effective, it must be provided ''promptly,'' as the proposed rule requires. By ''promptly,'' OSHA means that employers whose employees come forward with reports of MSDs or their signs or symptoms must as soon as possible assess the situation, determine whether temporary work restrictions or other measures are necessary, and/or refer the employee to the ergonomics committee, an ergonomics consultant, other qualified safety and health consultant or an HCP, as appropriate. These actions must be taken promptly to enable the MSD to resolve quickly, to prevent worsening due to further exposure to MSD hazards. For further guidance on what constitutes prompt MSD management, OSHA refers employers to § 1910.943. In that section, OSHA includes start-up deadlines for those employers who may not be covered by the ergonomics rule initially but whose employees subsequently, after the compliance deadlines for the rule have passed, develop MSDs that are covered by this standard. For those employers, OSHA requires that when an employee reports an MSD, MSD management must be provided within 5 days. OSHA believes that this time requirement is also appropriate for all cases of covered MSDs. This is not meant to imply, however, that employers should wait several calendar days after an employee reports experiencing symptoms before assessing the case, providing appropriate work restrictions, or referring the employee to the ergonomics committee, a safety and health professional, ergonomist, or an HCP. OSHA reiterates that prompt MSD management involves responding to employee reports of MSDs as soon as possible to prevent the MSDs from worsening.

MSD management must be provided at no cost to employees. The term ''at no cost to employees'' includes

making MSD management available at a reasonable time and place, *i.e.*, during working hours. In order to increase the likelihood that employees will receive the full benefits provided by the standard, MSD evaluations must be provided in a manner that is reasonably convenient for employees. OSHA has defined ''at no cost'' the same way in its other health standards.

Employers must also provide employees with temporary work restrictions and work restriction protection as required by this proposed rule. Temporary work restrictions and work restriction protection are discussed in detail below.

The term MSD management in the proposed standard does not cover particular diagnostic tests, treatment protocols, or specific treatments but instead refers to the employer's process of ensuring that injured employees have access to appropriate help when they need it. It is not the purpose of this standard to dictate professional practice for HCPs. An employer is free to establish such protocols in consultation with an HCP, but this is not required by the standard. Many stakeholders urged OSHA to leave the establishment of treatment protocols and procedures for covered MSDs to the HCPs (see, *e.g.*, Ex. 3–154). Where HCP evaluation, treatment, and follow-up is necessary, OSHA believes that HCPs will prescribe treatment and specific therapeutics on the basis of the best available knowledge at the time that care is provided. In addition, OSHA believes HCPs will closely monitor the employee's progress to evaluate the effectiveness of the prescribed treatment. It has also generally not been OSHA's practice, in other health standards, to dictate specific diagnostic procedures or treatment protocols.

Section 1910.930 How must I make MSD management available?

You must:

(a) Respond promptly to employees with covered MSDs to prevent their condition from getting worse;

(b) Promptly determine whether temporary work restrictions or other measures are necessary;

(c) When necessary, provide employees with prompt access to a ''health care professional'' (HCP) for evaluation, management and ''follow-up'';

(d) Provide the HCP with the information necessary for conducting MSD management; and

(e) Obtain a written opinion from the HCP and ensure that the employee is also promptly provided with it.

Paragraph (a) requires employers to respond promptly to employees with covered MSDs. Whenever an employee reports an MSD, the key is to take action quickly to help ensure that the MSD does not worsen. As discussed above, stakeholders are in agreement that early reporting and response are the key to resolving MSD problems quickly and without permanent damage or disability. The term ''promptly,'' as used in this section, has the same meaning as in § 1910.929, discussed above. Employers must respond to employees with covered MSDs as soon as possible to determine what action is appropriate to prevent the employee's condition from becoming more severe.

Many employers with ergonomics programs respond to reports of MSDs by immediately placing the employee on restricted work activity, either in the same job or in an alternative assignment. Limiting further exposure to the MSD hazard or hazards associated with the employee's job ensures that the employee's condition does not worsen while the employer analyzes the problem job and, if necessary, makes arrangements for the employee to be evaluated by a safety and health professional, ergonomist, member of the ergonomics committee, or an HCP. Employers using this approach have discovered that the employee's condition will often resolve within a few days without further intervention. This is especially true if the symptom is associated with work hardening or conditioning for a new job, new tool, or new equipment. It could also be the case if a company has instituted a Quick Fix that completely eliminates the MSD hazard or hazards in the job, which ensures that the employee will experience no further exposure or aggravation of the condition.

For other employers, the first response may be to have the affected employee evaluated by an HCP. Where the employer has an on-site HCP, for example, the employee can usually be seen immediately. Immediate attention is particularly important where the employer does not have a policy of immediately limiting the work activities of employees who report MSDs. However, even when employers have on-site HCPs, the HCP may not be available when the employee reports an MSD.

In most cases, however, employers will not have an on-site HCP. In such cases, OSHA is aware that it may take a few days to arrange an appointment with an HCP. In order to assure a prompt response in these cases, employers must ensure that employees have access to the HCP as soon as possible. There are circumstances where immediate evaluation by an HCP is warranted. For example, an employee experiencing severe shoulder pain with numbness down her arm, an inability to sleep due to pain, and decreased range of motion of the arm and shoulder should immediately be referred to an HCP. An employee who describes symptoms that have been present continuously for three weeks should also be referred at the time of initial reporting.

Paragraph (b) requires employers to make an initial determination promptly of whether temporary work restrictions or other measures are necessary. In many workplaces, work restrictions are the first line of defense against progression of the disorder. Work restrictions include any limitation placed on the manner in which an injured employee performs a job during the recovery period, up to and including complete removal from work. Work restrictions are important to resolving most MSDs. The purpose of work restrictions is to facilitate recovery of the affected area by not exposing the injured tissues to the same risk factors. The employer, who must provide temporary work restrictions, where necessary, to employees with covered MSDs, and the employee whose work has been restricted need to understand (1) What jobs or tasks the employee can perform during the recovery period, (2) whether the employee can perform these jobs or tasks for the entire workshift, and/or (3) whether the employee needs to be removed from work entirely. Employees for whom restrictions have been assigned because of a covered MSD must be properly matched with those jobs that involve task and work activities that accommodate the requirements of the restriction and thus facilitate healing.

The employer must also determine whether other measures are necessary to protect the employee with a covered MSD. A company could institute a Quick Fix that completely eliminates the MSD hazard or hazards in the job, ensuring that the employee will experience no further exposure or aggravation of the condition. There are also circumstances where immediate evaluation by an HCP is warranted. In addition, an employer who was not able to provide immediate temporary work restrictions may be able to have an injured employee attend on-site training classes

for a few days. The person(s) assigned responsibility for MSD management needs the relevant information to make the decision about what is appropriate for the affected employee.

Section 1910.930 gives employers flexibility to develop an appropriate process for responding to employees with covered MSDs. The proposed rule allows varied approaches because many factors can influence the process and procedures employers establish to deal with MSDs covered by this standard. Such factors may include the severity of the employee's condition and the interventions readily available. For example, some employers immediately place an employee on restricted duty. They take a ''wait and see approach'' and, if the MSD does not clear up in a few days, the employer moves on to the next level of intervention. Other employers have on-site HCPs. Some employers with on-site HCPs place employees who report signs or symptoms immediately on work restrictions while the HCP does the evaluation. Where necessary, the HCP then develops a treatment and/or return-to-work plan. Whatever the employer's response, it needs to be made promptly.

In paragraph (c) of the proposed rule, employers must provide injured employees with prompt access to an HCP, when necessary, for evaluation, management and follow-up. OSHA used the language ''when necessary'' in the proposed rule because the Agency recognizes that it is not always necessary for an employer to send the injured employee to an HCP. OSHA recognizes that there are situations in which providing work restrictions immediately and/or taking other measures immediately, such as fixing the job, may be an adequate response to the report. This is particularly true if the MSD is reported very early, that is, before the condition becomes severe. In other situations, however, it will be necessary to send the injured employee to an HCP. For example, employers who do not provide work restrictions and/or other measures at the time the MSD is reported will need to send injured employees to the HCP. In addition, there will be some cases where the reported MSD is so severe that it is essential the employee be evaluated by an HCP at the earliest possible time.

The proposed rule defines health care professional (HCP) as a physician or other licensed health care professional whose legally permitted scope of practice (*e.g.*, license, registration, or certification) allows them to independently provide or be delegated the responsibility to provide some or all of the MSD management requirements of this standard. The proposed rule is flexible enough to allow employers to use a broad range of HCPs, provided the HCP is capable and authorized to provide evaluation, management, and follow-up of MSDs. As defined by this proposal, HCPs are not limited to physicians or nurses. Different HCPs may be involved in the process at different points.

OSHA is proposing a flexible definition of HCP, for several reasons. First, this approach is responsive to the requests of stakeholders, particularly those with establishments in rural locations, who strongly urged that the rule provide maximum flexibility in the selection of HCPs. Specifically, these employers urged OSHA not to limit employers' choice of HCPs to specialists, who are often not available in reasonable proximity, which would delay prompt evaluation, management, and follow-up and make it much more costly. In general, most of the commenters made broad, generic statements on the qualifications of HCPs that were needed to perform MSD management. For example, the American College of Occupational and Environmental Medicine stated, ''[a] health care provider is considered to be a licensed/registered health care provider practicing within the scope of their license/registration'' (Ex. 3–105). Other commenters, such as Carol Stuart-Buttle, a well-known ergonomics consultant, concur with this opinion (Ex. 3–59). The American Feed Industry Association expressed concern that the medical profession in a rural area may not have the expertise to deal with work-related MSDs, and pointed out that compliance may be a problem if OSHA stipulates that the HCP have a specific background (Ex. 3–73).

Second, OSHA does not want to limit employers' options where the State has determined that an individual is authorized to provide care. The scope of practice for a particular HCP may vary from State to State. OSHA believes that issues of HCP qualifications and scope of practice are adequately addressed by State law and professional organizations, and thus it is appropriate to allow employers to rely on the system developed by the States. OSHA requests comments on these issues and specifically seeks information on the experience of employers in using HCPs with various qualifications in their ergonomics programs.

Some commenters said that the employer should be allowed to determine what HCPs would best be able to direct their occupational health services (Exs. 3–99; 3–104). For example, physician assistants, occupational therapists, and physical therapists said that the proposed ergonomics program rule should not limit the HCPs that are allowed to provide medical management and emphasized the role these professionals play in the management of work-related MSDs (Exs. 3–57; 3–47; 3–64).

Others, however, have urged OSHA to require employers to use only HCPs who have training in and experience with work-related MSDs and MSD hazards. These commenters stressed the need for knowledgeable HCPs. They said that HCPs should be required to have training and experience in occupational medicine, MSD hazards, and the disorders associated with these hazards (Exs. 3–181; 3–106). For example, one commenter stated that HCPs need a background in occupational health and in ergonomics (Ex. 3–59). Another pointed out that the skills of the HCP need to be updated periodically (Ex. 3–137).

To the extent possible, employers should use HCPs who are knowledgeable in the assessment and treatment of work-related MSDs to ensure appropriate evaluation, management, and follow-up of employees' MSDs. In any event, paragraph (d) of the proposed rule requires the employer to provide information to the HCPs conducting the assessment. If these individuals are already on site, they are likely to be familiar with the jobs in the workplace, the hazards identified in the hazard analysis, and what jobs or temporary alternative duty may be available. It is essential that HCPs charged with the responsibility for MSD management know or be provided this information if they are to successfully manage the cases of the injured workers.

OSHA rules state where an individual other than an HCP is responsible for determining whether temporary work restrictions or other measures are necessary under § 1910.930(b), that individual too must be provided the information necessary to discharge his or her responsibility. This is implicit in § 1910.930(b) and is in any event required by § 1910.912(b). With these materials, the safety and health professional or HCP will be better able to ensure that the employee is properly assessed and is placed in a job that will allow healing to occur during the recovery period.

Paragraph (e) requires the employer who has referred the employee to an HCP to obtain a written opinion from the HCP so it is clear to all parties what needs to be done to

resolve the employee's MSD. This opinion must be written because oral communication is more susceptible of misinterpretation. Employers must keep a record, and the easiest way to do this is if the opinion is in writing. In addition, the HCP's opinion is valuable information for employers to have when identifying MSD hazards in jobs and evaluating the ergonomics program and controls.

This paragraph also requires an employer to ensure that the employee promptly receives a copy of the opinion, which is essential if the employee is to participate in his or her own protection. It is particularly important for the employee to be knowledgeable about what work restrictions, if any, he or she has been assigned and for how long they will apply.

Section 1910.931 What information must I provide to the health care professional?

You must provide:

(a) A description of the employee's job and information about the MSD hazards in it;

(b) A description of available work restrictions that are reasonably likely to fit the employee's capabilities during the recovery period;

(c) A copy of this MSD management section and a summary of the requirements of this standard; and

(d) Opportunities to conduct workplace walkthroughs.

Section 1910.931 requires that HCPs receive necessary information so the evaluation, management and follow-up of the injured employee is effective. It is important that employers provide information to HCPs, regardless of whether the HCP has special training or knowledge in dealing with occupational injuries and illnesses or in managing MSD cases. Requirements to provide information to HCPs are not new; they have been included in every medical surveillance provision in other OSHA health standards. In addition, a number of commenters recommended that OSHA's ergonomics rule ensure that HCPs receive the information they need to be familiar with the jobs in the employers' workplaces (Exs. 3–23–A; 3–56; 3–89). OSHA also notes that if employers provide the HCP with the information required in this section, they will have satisfied the requirement in § 1910.930(d) that they provide ''the HCP with the information necessary for conducting MSD management.''

Paragraph (a) requires employers to provide a description of the employee's job and information about the hazards in it. This information is needed to assist HCPs in providing both accurate assessment and effective management of MSDs. Without such information the HCP may not be able to make an accurate evaluation about the causes of the MSD or may not be able to prescribe appropriate restricted work activity. OSHA believes that providing HCPs with information about the results of any job hazard analysis that has been done in that job ensures that the HCP has the most complete and relevant information for evaluating and managing the recovery of the injured employee. Many stakeholders have told OSHA that they already provide this type of information to the treating HCP in order to familiarize the provider with the employee's job and associated workplace risk factors and ultimately to facilitate resolution of the MSD (Exs. 26–23 through 26–26).

Paragraph (b) requires employers to provide information on work restrictions that are available during the recovery period and that are reasonably likely to fit the employee's capabilities during the recovery period. Providing this information to HCPs helps to facilitate the appropriate matching of the employee's physical capabilities and limitations with a job that allows an employee to adequately rest the injured area while still remaining productive in other capacities. Employers with ergonomics programs have discovered that the more detailed information and communication provided to the HCP about available alternative duty jobs, the better the HCP understands the causes of the problem and knows what work capabilities remain. As a result, these employers have found that the HCP is more likely to recommend restricted work activity rather than removal from work during the recovery period. In addition, it is more likely that HCPs are able to recommend much shorter removal periods when removal is combined with restricted work activity as a means of facilitating recovery.

To achieve these kinds of MSD management results, the employer must establish a good communication process with the injured employee and the responsible HCPs, as well as with any other safety and health professionals involved in the MSD management process. In addition, for communication to be effective and helpful to the MSD management process, it needs to be clear, timely, and on-going. The person(s) the employer assigned to be responsible for working with the injured employee and communicating information to the HCP needs to have authority to coordinate appropriate placement of the affected employee in the workplace during the recovery period (Ex. 26–923, Ex. 26–924).

Paragraph (c) requires employers to give the HCP a copy of the MSD management section and a summary of the requirements of the standard. This summary must highlight how MSD management fits into the ergonomics program this standard requires. For example, it is especially important that the HCP understand that early reporting of MSD signs and symptoms is key to the success of the ergonomics program and that employers must encourage it. HCPs also need to know how quickly employers must provide employees with access to the HCP and that employers must analyze any job in which a covered MSD is reported. Moreover, HCPs need to understand that the effective resolution of MSDs may require the input of different persons, including those like safety and health professionals, ergonomists, and ergonomics committee members, who are in charge of analyzing and implementing measures that will eliminate or control the hazards that caused the MSD.

OSHA intends, in paragraph (d), that employers provide HCPs with opportunities to look at the problem job and the available alternative duty jobs. Not only is it important that the HCP become familiar with the physical work activities the injured employee performs, but also it is important that the HCP see the available alternative duty jobs to ensure that such jobs will allow the employee to rest the injured area during the recovery period. OSHA does not intend to require employers to provide HCPs walkthroughs throughout the entire facility.

Many stakeholders support this provision and have told OSHA that workplace walkthroughs are one of the best ways to obtain knowledge regarding the physical work activities and workplace conditions in the employee's job (Exs. 3–52; 3–107). They are also the best way for the HCP to understand whether the available alternative duty jobs will allow the injured employee to rest the affected area and not be exposed to other conditions that could aggravate rather than resolve the MSD.

Workplace walkthroughs can be either informal or formal. Several stakeholders said that they often invite community

HCPs for a tour of the facility. Others conduct the tours one on one. To remain knowledgeable about the specific workplace, jobs, job tasks, and any changes, employers should encourage HCPs to tour the workplace periodically. Finally, where workplace walkthroughs are not possible (*e.g.*, HCP located too far from the workplace), there are other ways HCPs can acquire more in-depth information about the employee's job and the MSD hazards in it. For example, employers can provide HCPs with the results of the job hazard analysis, photographs of the job, or videotapes of the job being performed.

Where possible, employers should use HCPs who have a basic knowledge of the importance of the early recognition, evaluation, treatment, and prevention of work-related MSDs. Since standards of care change over time, it is the responsibility of the treating health care professional to select treatments in accordance with current acceptable standards of practice (Kuorinka and Forcier, Eds. 1995, Ex. 26–638).

Section 1910.932 What must the HCP's written opinion contain?

The written opinion must contain:

(a) The HCP's opinion about the employee's medical conditions related to the MSD hazards in the employee's job.

(1) You must instruct the HCP that any other findings, diagnoses or information not related to workplace exposure to MSD hazards must remain confidential and must not be put in the written opinion or communicated to you.

(2) To the extent permitted and required by law, you must ensure employee privacy and confidentiality regarding medical conditions related to workplace exposure to MSD hazards that are identified during the MSD management process.

(b) Any recommended temporary work restrictions and follow-up;

(c) A statement that the HCP informed the employee about the results of the evaluation and any medical conditions resulting from exposure to MSD hazards that require further evaluation or treatment; and

(d) A statement that the HCP informed the employee about other physical activities that could aggravate the work-related MSD during the recovery period.

As mentioned above, the HCP must provide a copy of the written opinion to the employer and injured employee. The written opinion must contain the HCP's opinion about the employee's medical condition related to MSD hazards in the employee's job. The written opinion must explain what actions the HCP recommends to resolve an MSD. These recommendations may include temporary work restrictions or the work the employee may do during the recovery period as well as the medical treatment and follow-up necessary to ensure that the MSD resolves.

It is important that the HCP's opinion be provided in writing to the employer or the person(s) at the workplace who are responsible for carrying out the MSD management requirements of the standard. Employers need to know about the employee's medical condition to ensure that the restricted work activity they provide satisfies the HCP's recommendations. Employers also need to know whether the employee requires medical treatment that may necessitate his or her absence from work. The HCP's written opinion is especially important for the on-site person who is responsible for follow-up. That person needs to understand the HCP's plan for follow-up and how to assist in ensuring that follow-up is effective.

Paragraph (a) would require that the HCP's written opinion include information on any medical condition the employee has that is related to the MSD hazards in the employee's job. The HCP's opinion addresses issues such as whether the employee has a work-related MSD, whether work restrictions are needed and for how long, and what kind of follow-up is needed.

Note: Some HCPs may classify a medical condition under an International Disease Classification (ICD) code, while other HCPs may provide a more general diagnosis of the condition. The proposed rule is not limited to providing MSD management only for those MSDs that have an ICD–9 classification.

The HCP's opinion must be limited to medical conditions related to MSD hazards in the employee's job. This does not mean that the HCP must determine whether the MSD is work-related (recordable). Rather, this provision means that the written opinion must not contain medical information about the employee that is not related to work or to MSD hazards in the employee's job. This provision has been included to protect the privacy of the employee, who may not, for example, want the employer to know that he or she has been in treatment for a psychological condition.

As stated, the written opinion the HCP provides to the employer must not include medical information (*e.g.*, diagnoses, test results, medical history) that is not related to MSD hazards in the job. Paragraph (a) requires employers to instruct the HCP that any findings, diagnoses, recommendations on treatment or medical follow up, or information not related to workplace exposure to MSD hazards must remain confidential and must not be included in the written opinion or communicated in any way to the employer. This kind of prohibition is important in protecting the employee's privacy, and has been a routine feature of OSHA health standards. Moreover, HCPs have their own independent duty to protect the privacy of patients, even patients who work for the same employer as the HCP does. *Cf. Wilson* v. *IBP*, 558 N.W.2d 132, 138–39 (Iowa 1996). This confidentiality provision is necessary to ensure that employees will be willing to provide complete information about their medical condition and medical history. Employees will not divulge this type of personal information if they fear that employers will see it or use it to the employee's disadvantage. For example, employees may fear that their employment status could be jeopardized if employers know that they have certain kinds of medical conditions, which may be completely unrelated to work or exposure to MSD hazards, or if they are taking certain kinds of medication (*e.g.*, seizure medication, an anti-depressant). In this sense, the ergonomics rule is consistent with and is intended to be consistent with the confidentiality requirements of the Americans with Disabilities Act. Paragraph (a), however, recognizes that there may be times where information regarding medical conditions related to workplace exposure to MSD hazards are required to be revealed by some other State or Federal law. The proposed rule does not prohibit release of this confidential information where expressly required by those laws.

In paragraph (b), OSHA is proposing that the written opinion must contain any temporary work restrictions and follow-up that the employee needs during the recovery period. Work restrictions, defined in § 1910.945 of this proposed standard, are limitations placed on the manner in which an employee with a covered MSD performs a job during the recovery period. The proposed rule defines work restrictions to include modifications and restrictions to the employee's current job, such as limiting the intensity or

duration of exposure, reassignment to temporary alternative duty jobs, and/or complete removal from the workplace.

The written opinion should specifically spell out recommended temporary work restrictions, what kind of follow-up is required, and the specific time frame for the follow-up. For example, restrictions on lifting during the recovery period should be as specific as possible: ''No lifting of more than 10 pounds above shoulder level.'' The more specific the temporary restrictions are, the more likely that the employer will be able to identify an alternative duty job that fits the employee's capabilities while still ensuring that the injured area is rested. Specific recommendations give employers needed information about whether employees can remain in their current job, with restrictions on certain of their regular job duties, during the recovery period. Finally, specific recommendations make it possible for on-site safety and health personnel to identify alternative jobs or job changes that will satisfy the temporary work restriction recommendations.

Paragraph (c) would require that injured employees be informed by the HCP about the results of the evaluation and medical conditions resulting from exposure to MSD hazards that may necessitate further evaluation or treatment. This provision ensures that employees know the information that is the basis for the written opinion the HCP provides to the employer. For example, it may include the test results, or physical examination results, that support the recommendations regarding treatment and/or work restrictions.

This provision would also ensure that there is full disclosure to the employee about medical conditions that require the employee's further attention. The written opinion must include a statement that the employee has been informed about the results of the evaluation.

Paragraph (d) is similar to the previous provision. It requires that employees be informed about other activities, including non-work activities, that could aggravate the covered MSD and could delay or prevent recovery. OSHA is proposing this provision because it is important for employees to know how they can facilitate and participate in their own recovery. Although the employer is responsible for ensuring that the employee is not exposed during the recovery period to workplace conditions and physical work activities that are reasonably likely to cause MSDs, the employee should be aware of the actions he or she should take away from work to reduce exposure to ergonomic risk factors. This may include reducing or stopping certain personal work or recreational activities that might be associated with MSDs. It also might include recommendations to wear immobilization devices, such as a wrist brace, during rest periods or while asleep. As discussed above, paragraph 1910.932(a) would require that employers ensure HCPs not include any of these recommendations in the written opinion.

This provision is intended for informational purposes only and does not require employees to refrain from non-work activities that could aggravate the MSD or delay recovery. OSHA's authority is ''limited to ameliorating conditions that exist in the workplace.'' *Forging Indus. Ass'n* v. *Secretary of Labor,* 773 F.2d 1436, 1442 (4th Cir. 1985).

Section 1910.933 What must I do if temporary work restrictions are needed?

You must:

(a) *Work Restrictions.* Provide temporary work restrictions, where necessary, to employees with covered MSDs. Where you have referred the employee to a HCP, you must follow the temporary work restriction recommendations in the HCP's written opinion;

(b) *Follow-up.* Ensure that appropriate follow-up is provided during the recovery period; and

(c) *Work Restriction Protection (WRP).* Maintain the employee's WRP while temporary work restrictions are provided. You may condition the provision of WRP on the employee's participation in the MSD management this standard requires.

Section 1910.933 outlines the requirements employers must follow when it is determined that an employee has a covered MSD that is serious enough to require some kind of work restriction.

Paragraph (a) would require that employers provide temporary work restrictions, where necessary, to employees with covered MSDs. As discussed above, work restrictions are restrictions on the way in which a job is performed or on the activities that the injured employee performs during the recovery period. Work restrictions include changes to the employee's existing job, such as limiting the tasks the employee may perform. Restrictions also include temporary transfer to a restricted duty job or removal from the workplace during the recovery period or a portion of it.

If a HCP has recommended restricted work, employers should consider such restrictions necessary to prevent the employee's condition from worsening and to allow the employee's injured tissues to recover. In those instances where the employer has referred the employee to a HCP, the employer must follow the temporary work restriction recommendations, if any, included in the HCP's written opinion.

The provision of work restrictions to injured employees is a vital component of MSD management. Work restrictions provide the necessary time for the injured tissues to recover. They are often considered the single most effective means of resolving MSDs, especially if they are provided at the earliest possible stage. If work restrictions are not provided, it may not be possible for the employee to recover, and permanent damage or disability may result.

For work restrictions to be effective, employers must ensure that they fit the physiologic needs of the injured employee. For example, work restrictions will only be effective if they reduce or prevent the employee's exposure to workplace risk factors that caused or contributed to the MSD or aggravated a pre-existing MSD. To find the right fit, employers may need to examine potential alternative duty jobs to ensure that the employee will still be able to rest the affected area while performing the alternative job. Identifying appropriate work restrictions may require the collaboration of different persons such as HCPs, safety and health personnel, persons involved in managing the ergonomics program, and the injured employee.

Although some covered MSDs are at such an advanced stage that complete removal from the work environment is the appropriate treatment, it usually should be the recommendation of last resort. Where appropriate, work restrictions that allow the employee to continue working (*e.g.,* in an alternative job, or by modifying certain tasks in the employee's job to enable the employee to remain in that job) are preferable during the recovery period. These types of restrictions allow employees to remain within the work environment. Studies indicate that the longer employees are off work, the less likely they are to return (Exs. 26–685, Ex. 26–919, 26–923, 26–924). If employers provide accurate and detailed information about the job and alternative jobs, it is more likely that the safety and health professional, ergonomist, or HCP will recommend restricted activity at

work rather than complete removal. Employers should communicate with safety and health professionals, HCPs, and others to coordinate the provision of work restrictions.

Under this provision, employers are not required to provide particular alternative jobs or work restrictions that an employee requests. Therefore, if a safety and health professional, ergonomist, or HCP recommends that the employee not perform lifting tasks or engage in repetitive motions during the recovery period, the employer is free to provide any form of work restriction that effectuates that work restriction recommendation. For example, if the recommended work restriction requires fewer repetitive motions, the employer may move the employee to an alternative duty job as a way of achieving this restriction. Or the employer could reduce the number of repetitions expected to be performed in the employee's current job in a number of ways: by reducing the amount of time the employee performs repetitive motions, by reducing the speed at which the employer performs the tasks, or by eliminating certain repetitive tasks during recovery. In the case of lifting jobs, the work restriction may be as simple as limiting the types or weights of objects the employee must move or lift.

Paragraph (b) requires that the employee receive appropriate follow-up during the recovery period. Follow-up is the process or protocol the employer, safety and health professional, and/or HCP uses to check up on the condition of employees with covered MSDs when they are given temporary work restrictions during the recovery period. Follow-up of injured employees is essential to ensure that MSDs are resolving and, if they are not, that other actions are taken promptly. This process helps to ensure that injured employees do not ''slip through the cracks,'' for example, by being left in alternative duty jobs long after they have recovered, or by being given work restrictions without finding out if the restrictions are helping. If follow-up is not provided, neither the employer nor the safety and health professional or HCP will know that an employee's MSD symptoms are not abating or are becoming worse. Where follow-up is not provided or the healing process is not properly monitored, injured employees, in the end, may never be able to return to their jobs.

To be effective, follow-up may require the efforts of both an HCP and on-site personnel, such as the person(s) responsible for receiving and responding to employee reports. Some employers may use HCPs who already have a follow-up process in place. For example, some occupational medicine clinics have employees contact the clinic almost daily, or, alternatively, the clinic may contact the employee. In many situations, effective follow-up involves a team approach. This is especially true where the ergonomist, HCP or safety and health professional is not on-site and cannot see the employee on a daily basis. In these cases an on-site person (*e.g.,* nurse, person(s) designated to receive and respond to reports, human resources person) regularly checks on the employee and reports the results back to the HCP, ergonomist, or safety and health professional. This approach may be very effective because the HCP can be provided with almost daily reports on the injured employee's condition and respond quickly if the condition becomes worse.

Many stakeholders also recognize the need for effective follow-up and have made the process a standard company practice. Coors Brewing Company, for example, stated that it provides follow-up for injured employees as often as is necessary until the employee is released from care (Ex. 3–95).

Paragraph (c) requires employers to provide work restriction protection (WRP) to employees on temporary work restrictions. WRP is defined in § 1910.945 of the proposed rule as the maintenance of earnings and other employment rights and benefits of employees who are on temporary work restrictions as though the employees had not been placed on temporary work restrictions. For employees placed on temporary work restrictions short of complete removal from work (*e.g.,* an alternative duty job), WRP includes maintaining 100% of the after-tax earnings the employees were receiving at the time they were placed on work restrictions. For employees removed entirely from the workplace, WRP includes maintaining 90% of their after-tax earnings; the value of 90 percent is considered by OSHA to be a reasonable estimate of the percentage of take-home pay received by workers when awarded a worker's compensation claim. Thus, if an employee needs to be removed from work entirely, either because the employer, an ergonomist, a safety and health professional or the ergonomics committee has initiated it or the employer referred the employee to an HCP who recommended it, the employer must pay the removed employee 90% of the employee's after-tax earnings and maintain the employee's full benefits. If an employee is placed into an alternative duty job, however, that pays less than the employee was earning at the time the MSD occurred, the employer must maintain 100% of the employee's after-tax earnings, with full benefits. The benefits referred to in § 1910.945 include, for example, accrual of vacation time; employer contributions to health insurance; employer contributions to other workplace programs such as profit-sharing, life insurance, and pension; and seniority or ''bidding'' rights. Paragraph (c) also permits employers to condition the provision of WRP benefits upon an employee's participation in the MSD management required by the proposed standard.

By requiring employers to provide WRP, OSHA intends that employees have some economic protection when they are placed on temporary work restrictions. OSHA believes that this economic protection will encourage employees to come forward to report MSDs early; such reporting helps to ensure that the injured employees, as well as employees in the same ''problem'' job, are provided with protection from MSD hazards. Because early reporting is so critical to the proposed rule, OSHA has crafted WRP to encourage employees to report as early as possible. By requiring employers to maintain 100% of an employees' after-tax earnings when they are placed on temporary work restrictions short of complete removal from work, OSHA believes employees will have an incentive to report the onset of MSDs early, before their MSDs become so severe that complete removal from work is necessary. OSHA predicts that very few employees with covered MSDs will need to be removed entirely from the workplace during their recovery period. OSHA anticipates that restricted work activity will be sufficient for a large percentage of employees, particularly because the proposed standard requires employers to establish systems for the early reporting of MSDs and to provide prompt MSD management.

In the proposed standard OSHA is referring to this economic protection during temporary work restrictions as ''work restriction protection (WRP).'' In other OSHA health standards, similar provisions have been called ''medical removal protection.'' OSHA is using the term ''work restriction protection (WRP)'' because it more accurately describes the typical recovery process for most employees with MSDs and the practical effect this provision will have on employers and employees. Moreover, the term ''medical removal protection'' implies that removal is necessitated by

a diagnosis or recommendation by an HCP. In the proposed rule, some restricted work activity (*i.e.*, immediate placement in alternative duty when an employee reports an MSD) need not be triggered by an HCP's opinion. OSHA does not believe it is appropriate to imply that restricted work activity can only be triggered by an HCP's opinion. OSHA intends that employees who are given restricted work activity even before seeing an HCP have WRP.

Note: When ''medical removal protection'' provisions in other health standards are discussed in this section, the term ''WRP'' is also used.

Section 1910.934 How long must I maintain the employee's work restriction protection when an employee is on temporary work restrictions?

You must maintain the employee's WRP until the FIRST of these occurs:

(a) The employee is determined to be able to return to the job,

(b) You implement measures that eliminate the MSD hazards or materially reduce them to the extent that the job does not pose a risk of harm to the injured employee during the recovery period; or

(c) 6 months have passed.

As mentioned above, the proposed rule would only require employers to provide work restrictions that are temporary, meaning that the work restrictions are for MSDs that are temporary and reversible. In this section, OSHA is proposing a time frame for the length of time employers would be required to maintain WRP, and identifies the points at which the employer's obligation to do so would end.

To ensure that WRP is provided only for temporary medical conditions, OSHA is proposing three cutoffs that limit the employer's obligation to provide WRP. The employer's obligation to provide WRP would cease when the first of the cutoffs occurs:

- The employee is able to return fully to the regular job,
- The job is fixed so the employee will not continue to get hurt, and
- WRP has been provided for 6 months

Although the proposed rule would require the employer to maintain WRP for as long as 6 months, evidence shows that the need to provide protection for 6 months is relatively rare. Although the median number of lost workdays for certain MSDs is quite high, as discussed in Chapter IV of the Preliminary Economic Analysis (Ex. 28–1) and Section VII of this preamble, data show that many MSD cases involve only a few days of work restriction before employees are able to return fully to work. In fact, according to the BLS, 50% of all MSD cases that involve days away from work result in less than 7 days away from work (Ex. 26–1413). Assuming no change in these lost workday trends, this evidence indicates that the first WRP cutoff that is likely to occur is that the employee is able to return fully to the regular job.

The second cutoff would occur when the employer fixes the job, either by eliminating or materially reducing the MSD hazards to the extent that the job does not pose a risk of harm to the injured employee during the recovery period. The second cutoff would occur even if the injured employee's MSD has not completely recovered. This cutoff is also likely to occur early in the process because so many ergonomic controls are quick and inexpensive. According to David Alexander, an ergonomist who has provided consultative services for employers in a broad range of industries, most jobs can be fixed for less than $500 (Alexander, D. and Orr, G. 1999, Ex. 26–1407). In addition, a number of controls involve making simple, low-cost changes in how the job is performed. For example, if a person is not tall enough to perform the task without reaching excessively, the employer could change the height at which the employee stands to perform the task. Or, if the reach for the product is too great, the employer can extend the length of the handle of the tool used to grab the product. If an employee's arm, leg or hand has contact with a hard work surface, the employer can wrap the surface with foam. In a warehousing area, employees can stack smaller amounts of product on each pallet, instead of stacking a large amount of product on one pallet. If an employer installs a fixture or device (a ''jig'') so that it maintains the correct relationship between a piece of work and the tool used during assembly, the employee does not have to use force or awkward posture to hold the part. Because controls for many jobs are inexpensive and cost less than WRP, this cutoff should create an incentive for employers to implement controls quickly.

The proposed rule itself facilitates the implementation of effective controls. Where a covered MSD occurs, the employer may either set up an ergonomics program for the employee in that job or do a Quick Fix. The Quick Fix provision of the proposed rule (see § 1910.909) essentially allows employers to bypass most of the requirements of the program if they can quickly implement controls that eliminate the hazard.

The final cutoff for WRP is 6 months. OSHA believes that few employers will be required to provide WRP for this length of time, because the overwhelming majority of MSDs resolve well before 6 months have passed. As mentioned above, the median number of days away from work for lost workday MSDs is 7. The 1998 Liberty Mutual data are consistent with the BLS data: only 11% of all UEMSD claims were associated with a length of disability of more than 6 months (Ex. 26–54). With implementation of the early reporting requirements in the proposed rule, that percentage should decrease.

Even though most MSDs involve substantially less than 6 months of recovery time, OSHA is proposing a maximum WRP duration of 6 months for several reasons. First, OSHA believes this is a ''fallback'' cutoff. Some employees with reversible MSDs may require longer recovery time. This is especially true where employees require surgery or where the employer has not established an aggressive early reporting policy and the MSD was not caught until signs or symptoms were more serious (see Oxenburgh 1984, Ex. 26–1367). Longer recovery time may also be necessary for employees who already have had an MSD or surgery, have a disability, or have other susceptibilities. OSHA wants to cover those cases that may require more time but nonetheless may still have good expectation of recovery.

At the end of the 6 month WRP period, employers should evaluate the employee's condition to determine whether work restrictions are still necessary and/or whether the employee can return to the job. OSHA seeks comment from interested parties on what protections should be provided to employees if their MSDs have not resolved at the end of the 6 month WRP period and they are not physically able to return to the job.

Section 1910.935 May I offset an employee's WRP if the employee receives workers' compensation or other income?

Yes. You may reduce the employee's WRP by the amount the employee receives during the work restriction period from:

(a) Workers' compensation payments for lost earnings;

(b) Payments for lost earnings from a compensation or insurance program that is publicly funded or funded by you; and

(c) Income from a job taken with another employer that was made possible because of the work restrictions.

Section 1910.935 specifies the offsets employers may make if an injured employee receives workers' compensation. This section serves two purposes. First, the provision helps to strike a balance by providing economic protection for employees who are placed on temporary work restrictions, while ensuring that employers need not provide WRP benefits that would result in the injured employee receiving more than current earnings. OSHA believes that an employer should not have to provide WRP benefits that duplicate the compensation the injured employee receives from other sources for earnings lost during the work restriction period. Although the most likely ''other'' source would most often be workers' compensation payments for lost earnings, the proposed rule also permits the employer to offset other earnings that would not have been possible but for the work restrictions, for example a job baby-sitting during the day because the injured worker is at home. (The employer would not be entitled to offset earnings the injured employee received from a second job held prior to the injury, except that the employer may offset any additional earnings from a previously held second job if such additional earnings were made possible by the work restrictions (*e.g.*, as a result of the work restrictions, the employee is able to work more hours at the previously held second job).)

Second, this section stresses that OSHA's intention in proposing WRP is not to supersede workers' compensation. If WRP were structured without regard to workers' compensation eligibility, it could be viewed as superseding workers' compensation. The offsets allowed in this paragraph are consistent with those in other OSHA health standards. The offsets for workers' compensation payments for lost earnings are permitted regardless of whether workers' compensation is publicly funded or employer-funded.

Part B—Work Restriction Protection

1. Legal Authority for WRP

The OSH Act authorizes WRP. WRP is authorized by the OSH Act as necessary to protect the health of employees suffering from MSDs. Section 6(b)(5) of the OSH Act directs OSHA to adopt the health standard that ''most adequately assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity'' if exposed to a hazard over a working lifetime. 29 U.S.C. 655(b)(5). Section 3(8) of the OSH Act explains that an ''occupational health and safety standard [requires] the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment.'' 29 U.S.C. 652(8). The statutory provisions give OSHA broad authority to require employers to implement practices that are reasonably necessary and appropriate to provide safe and healthful work environments. See *United Steelworkers of America* v. *Marshall (Lead),* 647 F.2d 1189, 1230 (D.C. Cir. 1980), *cert. denied,* 453 U.S. 913 (1981) (''A number of terms of the statute give OSHA almost unlimited discretion to devise means to achieve the congressionally mandated goal.''). As discussed in greater detail below, WRP furthers OSHA's statutory mandate to protect the health of workers. By providing employees with economic protection if they are placed on temporary work restrictions, WRP encourages employee participation in MSD management and increases early reporting of MSDs. This prevents injured employees from suffering more severe injury, including permanent disability. This also helps to protect other employees in the same jobs by ensuring that MSD hazards are identified and controlled before other employees become injured.

WRP also furthers the broad purposes of the OSH Act. In the OSH Act Congress sought ''to assure so far as possible every working man and woman in the Nation safe and healthful working conditions.'' 29 U.S.C. 651(b). To achieve this goal, Congress authorized OSHA to:

- ''[Develop] innovative methods, techniques, and approaches for dealing with occupational safety and health problems.'' 29 U.S.C. § 651(b)(5). WRP is such an innovative technique. WRP is designed to encourage early reporting of MSDs, and employee participation in MSD management and an employer's ergonomics program, thereby protecting the health of all employees.

- ''[Build] upon advances already made through employer and employee initiative for providing safe and healthful working conditions.'' 29 U.S.C. § 651(b)(4). WRP builds upon advances currently found in workplaces. Many employers with existing ergonomics programs provide for economic protection for employees when they are on restricted work activity. In addition, many collective bargaining agreements that already contain ergonomics programs include WRP provisions.

- ''[Provide] medical criteria which will assure insofar as practicable that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work experience.'' 29 U.S.C. § 651(b)(7). WRP is a critical component of MSD management which helps prevent workers from suffering from diminished health and functional capacity due to MSDs.

Courts uphold OSHA's authority to require WRP. Judicial decisions have upheld OSHA's authority under the OSH Act to require WRP. In *Lead,* the D.C. Circuit directly examined OSHA's authority to include WRP in the Lead standard and held (1) that the OSH Act gave OSHA broad authority to issue WRP, and (2) OSHA's inclusion of WRP in the Lead standard was necessary and appropriate to protect the health of workers. *Lead,* 647 F.2d at 1228–40.

In the *Lead* decision, the D.C. Circuit first held that OSHA's inclusion of WRP was within its statutory authority. The court found that the OSH Act and its legislative history ''demonstrate unmistakably that OSHA's statutory mandate is, as a general matter, broad enough to include such a regulation as [WRP].'' *Id.* at 1230. The court relied upon a number of provisions in the OSH Act in support of this finding, including 29 U.S.C. 651(b)(5) and the definition of an ''occupational safety and health standard'' discussed above. In short, the court held that OSHA has broad authority to fashion regulatory policies that further the goals of the OSH Act—enhancing worker safety and health and providing for safe and healthful working environments. See *Id.* at 1230 n. 64 (''[T]he breadth of agency discretion is, if anything, at [its] zenith when the action assailed related primarily * * * to the fashioning of policies * * * in order to arrive at maximum effectuation of Congressional objectives.'' (citation omitted)).

The court also concluded that the legislative history of the OSH Act supported reading the statute to authorize WRP. *Id.* at 1230–31. The court highlighted a statement by Senator Saxbe explaining how both the House and Senate versions of the OSH Act did not contain a ''list of specific 'do's and don'ts' for keeping workplaces safe and healthful''; rather, both versions tasked OSHA with developing regulations to

address the various complexities of America's workplaces. *Id.* at 1230.

After concluding that OSHA had the statutory authority to promulgate WRP in general, the court held that OSHA's inclusion of WRP in the Lead standard was a reasonable exercise of that statutory authority. OSHA established that WRP was a preventive device necessary for the effectiveness of the standard. *Id.* at 1237. OSHA demonstrated that lead disease is highly reversible if caught in its early stages; however, OSHA provided evidence that employees ''would resist cooperating with the medical surveillance program'' absent assurances that they would have some economic protection if they were removed from their jobs due to high blood-lead levels. *Id.* at 1237. For example, employees fearing removal from their normal work without pay if they showed high blood-lead levels would tend to try to evade or cheat the blood test. The court held that WRP in the Lead standard was reasonably necessary and appropriate to protect the safety and health of workers.

Further supporting OSHA's authorization to include WRP in its standards, the D.C. Circuit in *International Union* v. *Pendergrass (Formaldehyde),* 878 F.2d 389, 400 (D.C. Cir. 1989)) criticized OSHA for not including any WRP in its Formaldehyde standard and remanded the standard to OSHA for reconsideration of the necessity of including WRP. OSHA had claimed that WRP was not appropriate in part because the ''nonspecificity of signs and symptoms [made] an accurate diagnosis of formaldehyde-induced irritation difficult,'' and the health effects from formaldehyde exposure for these employees quickly resolved. *Id.*

The court rejected OSHA's justifications and remanded the issue to OSHA for further examination. OSHA's failure to include WRP in the formaldehyde standard represented a dramatic ''swerve'' from prior health standards that required extensive explanation; OSHA's ''allusions to 'non-specificity' of symptoms [were] too vague and obscure either to show consistency with OSHA's prior stance or to justify a reversal of position.'' *Id.* at 400. The court also stated that WRP was particularly appropriate in situations where employees recover quickly from the signs and symptoms of disease. *Id.*

On remand, OSHA included a WRP provision in the formaldehyde standard, explaining:

> On reconsideration, the Agency has concluded that [WRP] provisions can contribute to the success of the medical surveillance programs prescribed in the formaldehyde standard. Unlike some other substance-specific standards, the formaldehyde standard does not provide for periodic medical examination for employees exposed at or above the action level. Instead, medical surveillance is accomplished in the final rule through the completion of annual medical questionnaires, coupled with affected employees' reports of signs and symptoms and medical examinations where necessary. This alternative depends on a high degree of employee participation and cooperation to determine if employee health is being impaired by formaldehyde exposure. OSHA believes these new [WRP] provisions will encourage employee participation in the standard's medical surveillance program and avoid the problems associated with nonspecificity and quick resolution of signs and symptoms that originally concerned the agency. 57 FR 22290, 22293, May 27, 1992.

Formaldehyde makes clear that OSHA may not decline to include WRP in a health standard absent specific findings justifying such a change in Agency practice.

Other health standards support OSHA's inclusion of WRP. OSHA has included some form of WRP in many other health standards based upon findings that WRP is necessary to encourage employee participation in medical surveillance. See 29 CFR 1910.1025 (Lead); 29 CFR 1910.1027 (Cadmium); 29 CFR 1910.1028 (Benzene); 29 CFR 1910.1048 (Formaldehyde); 29 CFR 1910.1050 (Methylenedianiline); 29 CFR 1910.1052 (Methylene Chloride). OSHA has tailored the WRP provisions in these health standards to address the particular hazards involved, as well as to effectuate the purposes of the standards. In some of these standards, for example, WRP is triggered by a specific finding. In the Lead standard, WRP must be provided when blood-lead levels exceed certain limits. In other standards, however, WRP is provided even though no medical ''triggering'' test is available. In these instances, WRP must be provided (1) when an employee exhibits signs or symptoms of disease (see, *e.g.,* 29 CFR 1910.1048 (l)(8)(I) (Formaldehyde) ''[WRP applies] when an employee reports significant irritation of the mucosa of the eyes or the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization attributed to workplace formaldehyde exposure.''), or (2) there is a finding by a physician that an employee must be removed to avoid material impairment of health or functional capacity. Providing WRP based upon a finding by a physician (or HCP) is included in all other OSHA health standards with WRP. OSHA believes that this provision serves as a ''backstop'': it protects those employees who exhibit signs and/or symptoms of disease at particularly low exposures.

OSHA's inclusion of some form of WRP in other health standards based on findings that WRP is necessary to ensure employee participation in medical surveillance programs demonstrates an established policy that OSHA may not depart from without substantial justification. OSHA is aware of no such justification. To the contrary, OSHA's preliminary view is that WRP is necessary to encourage early and full employee reporting, which is critical if the standard is to reduce the number and severity of MSDs.

2. Necessity Of WRP

As discussed in more detail in the Risk Assessment and Significance of Risk sections of this preamble, many employees currently suffer from MSDs. OSHA believes that WRP is a critical component of the proposed rule for the following reasons:

1. WRP encourages employee participation in MSD management and the ergonomics program;

2. WRP encourages early reporting of MSDs, and/or signs and symptoms of MSDs;

3. The actions required of employers by the proposed rule are determined by reported MSDs; and

4. There is no justification to deviate from past OSHA practice and exclude WRP.

WRP encourages employee participation in MSD management and the ergonomics program.—There is evidence that many employees at present do not report MSDs, and/or signs and symptoms of MSDs, because they fear any or all of the following will happen to them if they report signs and/or symptoms of MSDs, and/or are diagnosed with an MSD:

1. They will be transferred to alternative ''light'' duty at reduced pay (see Exs. 3–184; 3–186);

2. They will be fired or suffer a great financial loss and lose their benefits (see Exs. 3–151; 3–183; 3–184; 3–186); or

3. They will suffer other forms of job discrimination or retaliation (see Ex. 3–121).

These comments are consistent with those comments OSHA received during other health standards rulemakings where similar WRP provisions were proposed. See, *e.g.*, 43 FR 54354, 54442, November 21, 1978. These fears are particularly acute for the many low-wage employees who live ''pay check-to-pay check.'' Evidence and data show that many of the jobs where ergonomic problems are severe are jobs that pay minimum wage or only slightly above minimum wage. For example, as detailed in the Preliminary Risk Assessment, some of the jobs with the highest incidence of MSDs are those held by nursing aides, orderlies, and attendants; laborers (not construction); stock handlers and baggers; and maids and housemen.

OSHA's concern about the pressure on workers not to come forward to report their MSD signs and symptoms early is heightened by two factors: the large number of employees who do not receive sick leave, and the difficulty employees have in receiving State workers' compensation benefits for work-related MSDs. The BLS reports that only 50% of workers are covered by sick leave benefits, *i.e.*, were paid for work absences due to illness or injury; 64% of blue collar workers are not provided this basic benefit (BLS 1995, Ex. 26–1406).

Each State has a statutory workers' compensation system that controls eligibility for and payment of benefits for State, municipal, and private sector employees. The Federal government operates a workers' compensation system covering Federal workers, and there are Federal statutes that create special compensation schemes for longshore and harbor workers and coal miners. The workers' compensation laws in each State are the result of legislative enactments and interpretations of courts and administrative tribunals, and the laws among States often vary sharply as to what injuries are covered and what benefits are paid.

All States compensate injured or ill workers with MSDs, at least to some degree. However, obtaining workers' compensation for MSDs is complicated by the difficulty of fitting an MSD into the State's definition of an injury caused by accident (an acute, traumatic injury traceable to a particular occurrence at a particular time and place) or an illness meeting the State's definition of occupational illness (often a specific list of diseases or a definition that includes only diseases associated with particular occupations); by the State-imposed statute of limitations on occupational illnesses; and by the high level of litigation associated with these claims.

State statutes have increasingly limited the compensability of MSD claims. In Virginia, for example, the only MSD that is covered is carpal tunnel syndrome (CTS); all other MSD claims are not accepted. Idaho requires the employee to have worked for a single employer for 60 days before a claim for a non-acute injury is considered. In Louisiana, if a claimant was on the job for less than 12 months, he or she needs an ''overwhelming preponderance of the evidence'' to receive compensation. In Texas, the claimant must prove the disease is inherent in that particular type of employment. The result of this trend can clearly be seen in the substantial underreporting of MSDs reported in a number of peer-reviewed articles (Cannon, *et al.* 1981, Ex. 26–1212; Mazlish, *et al.* 1995, Ex. 26–1186; Silverstein, *et al.* 1997, Ex. 26–28).

Those claims that are filed are often litigated and may drag on for years. For example, the California Workers Compensation Institute reported that 94% of the State's cumulative trauma claims were litigated and that employers in California pay $0.33 in litigation costs for every $1 paid in benefits for these cases. For other claims, this figure is $0.15 per $1 of benefits paid (Kohn 1997, Ex. 26–1408).

OSHA believes that both factors—the low level of sick leave benefits available to workers and the difficulty employees have in receiving workers' compensation benefits for work-related MSDs—underscore the importance of the proposed standard's WRP provisions. OSHA believes that by providing employees who must be placed on temporary work restrictions with some guaranteed economic protection, WRP will reduce employee anxiety about reporting signs and/or symptoms of MSDs. Thus, OSHA believes that employees will be more willing to participate actively in MSD management and the ergonomics program.

WRP encourages early reporting of MSDs, and/or signs and symptoms of MSDs. WRP also encourages employees to report MSDs, and/or signs and symptoms of MSDs, as early as possible, so that employers can determine whether the MSD is covered and/or whether temporary work restrictions are appropriate. Early reporting of MSDs leads to early detection and successful treatment of MSDs.OSHA has substantial evidence that most MSDs are reversible if treatment is provided early, before the disease becomes debilitating (see Exs. 3–56; 3–59; 3–179; 3–184). In addition, early detection and intervention reduces the severity of MSDs, as well as the treatment required to address the MSDs. An added benefit is that early detection, intervention, and treatment reduce the costs of MSDs for both employers and employees (see Exs. 3–23; 3–33; 3–50; 3–56; 3–59; 3–121; 3–124; 3–151; 3–162; 3–179; 3–184). Conversely, when employees do not report MSDs, and/or the signs or symptoms of MSDs early, they will likely continue working until their MSDs become (1) compensable under workers' compensation statutes, or (2) more severe and/or disabling. This results in more damage to the affected employee, higher costs for the employer, and reduced productivity.

Because early reporting is so important, the proposed WRP requirements are designed to maximize the incentives employees have to report signs and/or symptoms of MSDs early. As stated above, OSHA is requiring employers to maintain 100% of an employee's after-tax earnings if the employee is placed on work restrictions short of complete removal from work. OSHA believes that this will encourage employees to report signs and/or symptoms of MSDs at the earliest possible point, before their conditions become so severe that complete removal from work is necessary.

The early reporting that will result from WRP will not only provide protection for injured employees, it will provide protection to other employees as well. Early reporting allows employers to identify problem jobs early and to take the necessary steps to correct the identified hazards before other employees become hurt. In addition, early reporting may ensure that job fixes are provided more quickly. Since employers bear the costs of providing MSD management and WRP, they will have an incentive to reduce or avoid those costs by implementing effective and appropriate ergonomics programs in their workplaces. See 43 FR 54354, 54449, November 21, 1978 (''One beneficial side effect of [WRP] will be its role as an economic incentive for employers to comply with the inorganic lead standard.'').

OSHA has evidence that in current ergonomics programs where employees report signs and/or symptoms of MSDs early, the number of MSDs and the number of lost-time/lost-day injuries decreases (see Ranney 1993, Ex. 26–913; Day 1987, Ex. 26–914; see also Oxenburgh 1984, Ex. 26–1367). This evidence demonstrates that where employees report MSDs early: (1) the severity of the MSDs decreases, and (2)

greater protection is provided to other employees in the workplace, so that they do not develop MSDs.

During OSHA's public outreach process, every stakeholder who commented on this subject agreed that early reporting of MSDs is critical to preventing disease and to protecting workers. They confirmed that early reporting also reduces the costs to the employee and employer (see Exs. 3–197; 3–118; 3–124; 3–151; 3–56; 3–68; 3–107). Moreover, many stakeholders that currently have ergonomics programs said that they achieved dramatic reductions in the number and severity of MSDs once they implemented an effective early reporting process (Exs. 26–23 through 26–26). This experience is consistent with the literature and studies conducted on ergonomics programs (see NIOSH 1997, Ex. 26–2; Oxenburgh 1985, Ex. 26–1405).

WRP is necessary where employer action is triggered by reports of MSDs. Whether the proposed rule covers certain jobs is determined, in part, by the reporting of an OSHA recordable MSD. This incident-based ''trigger'' is unique to OSHA health standards. In other OSHA health standards, employers are required to monitor their workplaces for hazards and control those hazards. In this proposed standard, however, employers will not have to implement certain aspects of an ergonomics program until a covered MSD is reported.

In order for an incident-based rule to be as effective as possible in providing protection for employees, employees must be willing to report MSDs, and/or signs and symptoms of MSDs. If employees are not willing to come forward and report MSDs, serious MSD hazards in that job will go uncontrolled, thus potentially placing every employee in that job at increased risk of harm. Moreover, some stakeholders fear that an incident-based ''trigger'' will create an incentive for employers to discourage employees from reporting MSDs. There is strong evidence that there currently is significant underreporting of MSDs (see Exs. 2–2; 2–4; 2–22; 3–159; 3–160; Fine *et al.* 1986, Ex. 26–920; Liss 1992, 26–918; Silverstein, *et al.* 1997, Ex. 26–28). OSHA believes that WRP in this proposed rule is thus particularly necessary to ensure that employees come forward and report MSDs early. OSHA believes the proposed WRP provision provides the necessary economic protection to ensure such employee reporting and participation.

No justification to deviate from past OSHA practice and exclude WRP. As mentioned above, many OSHA health standards include WRP. These standards are based on findings that workers are less likely to participate in needed medical management programs if they may suffer severe economic loss as a result. The court in Formaldehyde held that this principle evinced a clear policy that is to be followed unless OSHA gives a persuasive justification for deviating from it. Cf. Formaldehyde, 878 F.2d at 400. OSHA believes that it does not have justification for deviating from its past practice of including WRP in health standards where necessary and appropriate to encourage the participation of employees in programs designed to protect the safety and health of workers.

In particular, the fact that there are no unambiguous biological monitoring tests for diagnosing some MSDs is not a sufficient justification for such exclusion. Formaldehyde, 878 F.2d at 400. In addition, the fact that some MSDs resolve quickly is not sufficient to exclude WRP. *Id.* The court in Formaldehyde stated that if affected employees have quick recovery periods, they ''surely could benefit from receiving [WRP] during the recovery period.'' *Id.*

3. Stakeholder Comments on WRP

The issue of WRP has engendered much discussion. OSHA discussed different forms of WRP with its stakeholders, and OSHA has received many comments from industry, labor, and others on WRP generally, as well as on the specific elements of WRP. Many stakeholders, particularly those in the health care profession, support the inclusion of some WRP provision in the proposed rule (see, *e.g.*, Ex. 3–124). These professionals recognize the importance of encouraging employee participation in MSD management. Employees and their representatives also support some form of WRP as being necessary to the effectiveness of the proposed standard generally, and the effectiveness of MSD management specifically (see Exs. 3–184; 3–164). A large number of stakeholders, however, object to the inclusion of any form of WRP in the proposed standard. These stakeholders contend that WRP:

1. Is not necessary for the effective functioning of the standard;

2. Violates section 4(b)(4) of the OSH Act;

3. Poses a significant economic hardship for employers, especially small employers; and

4. Will be abused by employees.

Is WRP necessary? Some stakeholders argue that WRP is not necessary to get employees to report MSDs. They point to the fact that more than 600,000 MSDs are reported each year. MSDs, they state, account for approximately one of every three dollars paid out in workers' compensation claims. Given these numbers, these stakeholders state that the proposed rule does not need WRP to encourage employees to report MSDs and participate in MSD management. They say that the proposed requirements that employers encourage reporting, train employees in reporting, and refrain from retaliating against employees who do report, are sufficient measures to achieve the objective of early reporting of MSDs.

While OSHA agrees with stakeholders that many MSDs are reported each year, there is also strong evidence that MSDs are significantly underreported (see Exs. 2–2; 2–4; 2–22; 3–159; 3–160, 26–920, 26–918, 26–28). In the last 18 years, many peer-reviewed studies that document underreporting of MSDs in OSHA logs have been published in the scientific literature (Exs. 2–2, 26–1212, 26–1186, 26–28, 26–1258, 26–920, 26–922, 26–1259, 26–1261, 26–1260). These studies document extensive and widespread underreporting on the OSHA logs of occupational injuries and illnesses (Ex. 2–2) and of MSDs (Exs. 26–28, 26–1258, 26–920, 26–922, 26–1259, 26–1261, 26–1260). The studies also show that a large percentage of workers with MSDs that were identified as work-related by health care providers do not file workers' compensation claims (Exs. 26–1258, 26–1212, 26–920). In one early study, only 47 percent of workers with medically diagnosed cases of CTS filed claims (Ex. 26–1212). Fine and his co-authors found that, in two large automobile manufacturing plants, workers' compensation claims were filed in less than 1 percent of medically confirmed cumulative trauma cases in one plant and in only 14 percent of such cases in another (Ex. 26–920). A recent study of 30,000 Michigan workers who were identified by a health care provider as having a work-related injury showed that only 9 to 45 percent of workers filed a workers' compensation claim for their injuries (Ex. 26–1258). (For a more detailed discussion of these studies and a table summarizing them, please refer to Section VII of this preamble.) OSHA is including WRP in the standard to cure underreporting and to secure early reporting.

OSHA believes that existing State workers' compensation systems are not sufficient to encourage employees to report MSDs early and to cure this underreporting. As stated earlier, every State has a different workers' compensation system. In many States, obtaining workers' compensation for MSDs is difficult due to the different definitions of ''injuries'' or ''illnesses'' in the various States, the different State statutes of limitation, and the contentious litigation that is often associated with claims for compensation for MSDs. In addition, some States provide no compensation for some MSDs (see, *e.g.*, Virginia for rotator cuff tendinitis, epicondylitis, etc.). There is also another reason workers' compensation payments may not be adequate to ensure early employee reporting of MSDs. All States have waiting periods ranging from 1 to 7 days before an injury or illness is compensable under workers' compensation. Many employees cannot go even a few days without any pay. This is particularly true for many low-wage employees who live pay check-to-pay check. OSHA believes that existing workers' compensation systems are not adequate to ensure the effectiveness of MSD management.

Some stakeholders contend that WRP is not necessary because many employers do not currently reduce the pay or benefits of employees when they are placed on restricted work duty. OSHA agrees with these stakeholders that many employers with good ergonomics programs and generous benefits policies do not reduce injured employees' pay and benefits when they are given, for example, alternative duty jobs. Other stakeholders, however, have told OSHA that many employers do reduce pay in such cases. Some stakeholders have also said that to create an incentive to return to work quickly, employers may not allow employees to use sick leave if they develop a workplace injury or illness (see Ex. 23). Also, OSHA estimates that approximately 50% of businesses do not even have a sick leave policy (Ex. 26–1406). OSHA believes that these kinds of practices would significantly deter employee reporting and would persist if the ergonomics rule did not include WRP.

Does WRP violate section 4(b)(4) of the OSH Act? Several stakeholders contend that the WRP provision in the proposed rule violates section 4(b)(4) of the OSH Act because it would preempt, replace, and/or overwhelm State workers' compensation laws and systems.

Section 4(b)(4) of the OSH Act provides:

> Nothing in this Act shall be construed to supersede or in any manner affect any workmen's compensation law or to enlarge or diminish or affect in any other manner the common law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, diseases, or death of employees arising out of, or in the course of, employment. 29 U.S.C. § 653(b)(4).

Congress included section 4(b)(4) in the OSH Act for a number of reasons. First, the section is intended to bar ''workers from asserting a private cause of action against employers under OSHA standards.'' *Lead*, 647 F.2d at 1235. See also *Ben Robinson Co.* v. *Texas Workers' Compensation Comm'n.*, 934 S.W.2d 149, 156 (Tex. App. 1996) (''*Ben Robinson*'') (Section 4(b)(4) of the OSH Act sought ''to prevent injured workers from circumventing workers' compensation by claiming a private cause of action based on the OSH Act'' (citing *Pratico* v. *Portland Terminal Co.*, 783 F.2d 255, 265 (1st Cir. 1985))). Second, this section of the Act is intended to prevent any party in an employee's claim under workmen's compensation law or other State law from asserting that an OSHA regulation or the OSH Act itself preempts any element of State law. *Lead*, 647 F.2d at 1236. An employee thus cannot obtain relief under State law for a disablement that is not compensable under that law simply because an OSHA standard provides protection against that disablement. Similarly, when an employee is injured, the employer cannot escape liability under State law simply because OSHA has not regulated the hazard that caused the injury.

The D.C. Circuit has held that WRP does not violate the language or intended purposes of section 4(b)(4). See *Lead*, 647 F.2d at 1236; cf. Formaldehyde, 878 F.2d 400. In the *Lead* decision, the court squarely addressed the issue of whether a similar WRP provision violated section 4(b)(4). The WRP provision at issue in *Lead* required employers to maintain an employee's ''earnings and seniority rights during removal for a period of 18 months.'' *Lead*, 647 F.2d at 1230. In *Lead*, the opponents of WRP argued that WRP violated section 4(b)(4) because, in practical terms, WRP would ''wholly replac[e]'' workers' compensation (*i.e.*, federalize workers' compensation). *Id.* at 1234. Opponents claimed that WRP violated workers' compensation because it provided compensation before the point at which workers' compensation recognized the disability. *Id.* They also argued that WRP would render workers' compensation meaningless because disabled employees receiving full earnings under WRP would never seek workers' compensation. *Id.*

The court in *Lead* found these arguments unpersuasive. First, the court held that the section's prohibition against ''affecting'' or ''superseding'' workers'' compensation could not be read too broadly because all OSHA standards are meant in some way to ''affect'' workers'' compensation and ultimately to ''supersede'' it in the sense that they seek to ensure that employees are protected from injury and never have the need to seek such compensation. *Lead*, 647 F.2d at 1235. *Cf. Ben Robinson*, 934 S.W.2d at 156. The goal of this proposed rule is the same as the goal for the Lead standard: to ensure that employees are protected from developing MSDs and therefore have no need to seek workers' compensation.

Next, the court found that even if WRP were available, injured employees would have incentives to seek workers' compensation because: (1) Workers' compensation would reimburse them for the medical treatment expenses that WRP would not cover; and (2) WRP would only last for several months (*e.g.*, 18 months in the Lead standard; 6 months in the proposed rule), while workers' compensation would compensate them for longer periods of disability, and in certain cases indefinitely. *Lead*, 647 F.2d at 1235. The court's finding is particularly applicable to the proposed rule. Employees with MSDs would still have several incentives to seek workers' compensation. The only way employees with severe disorders could get reimbursement for medical expenses such as prescription medicines, physical therapy, and surgery, would be by filing a workers' compensation claim. (The proposed rule does not require that employers pay for the medical treatment costs, such as those for surgery or physical therapy, of employees who have covered MSDs.) In fact, employees with MSDs have an even greater incentive to file claims than employees covered by the Lead standard because the proposed rule limits WRP to 6 months (compared to 18 months for the Lead standard).

The court in *Lead* held that even if WRP has a ''great practical effect'' on workers'' compensation, it does not violate section 4(b)(4) as long as it ''leaves the state scheme wholly intact, as a legal matter.'' *Lead*, 647 F.2d at 1236. The proposed WRP provision does not touch the legal scheme of existing State workers' compensation laws, even though it may result in a reduction in workers' compensation claims and payments. The proposed WRP provision would not

require States to cover MSDs that they have excluded from coverage. The proposed WRP provision would not require States to change the percentage of lost wages it will replace. The proposed WRP provision also would not change the legal tests for compensability; that is, it would not require that compensation be awarded when work ''contributed'' to the MSD if State workers'' compensation laws only allow it when work is the ''primary cause'' of the MSD.

The stakeholders who oppose WRP state that the *Lead* decision's reference to ''great practical effect'' is not applicable to the proposed WRP provision. They contend that the ''practical effect'' this provision would have is much greater than that anticipated by the *Lead* court. They argue that this standard, and thus the WRP provision, will cover a significantly greater number of employers and employees than previous OSHA standards. This means, they state, that a significantly larger number of employees will receive WRP. This degree of ''practical effect,'' they state, would either overwhelm workers'' compensation or render it meaningless or insignificant.

Although stakeholders are correct that the proposed rule is likely to cover more establishments than many other health standards, OSHA believes that these stakeholders overstate the ''practical effect'' that the proposed WRP provision would have on workers'' compensation as well as individual employers. While the median number of lost workdays for certain MSDs is quite high, as discussed in Sections IV and VII, the median number of lost workdays for all MSDs is 7 (Ex. 26–1413). Thus, in many cases the impact of WRP will be limited because a large percentage of MSDs resolve in a matter of days and many employers allow workers who must stay away from work or be on restricted work to use their sick leave for this purpose. By contrast, in other health standards, such as lead, it usually takes longer, for example, for blood lead levels to decline to acceptable levels. Once the ergonomics standard is final, the percentage of MSDs involving less than 6 days away from work should increase as employees are informed about the importance of early reporting, and employers implement better controls to reduce MSD hazards.

Second, as mentioned above, most MSDs resolve if employees are simply placed in alternative work duty during the recovery period. Where employers provide such work duty, only a very small number of cases ever require complete removal from work for any significant period of time. This suggests that the impact on workers' compensation will be much more limited than the stakeholders contend. Furthermore, as employers identify and fix problem jobs and employees are trained to report MSDs as early as possible, the numbers of injured employees requiring complete removal from work during the recovery period should decrease significantly. Companies that have implemented effective ergonomic programs report that lost-time/day injuries have decreased significantly or have been eliminated (Ex. 26–5; Ex. 3–147). In addition, the WRP provision itself is crafted to encourage employees to report signs and/or symptoms of MSDs as early as possible, thereby decreasing the number of employees with MSDs that will require complete removal from work.

Third, for many employers, WRP should have little impact. Many employers who have told OSHA that they already have an alternative duty program for employees with MSDs also said that they do not reduce employee pay when employees are placed on restricted work duty during the recovery period.

Finally, the type of ''practical effect'' many employers believe WRP will have on workers'' compensation systems is precisely the effect that the courts have said OSHA standards are intended to have. *Lead*, 647 F.2d at 1234–35. *Cf. Ben Robinson*, 934 S.W.2d at 156. The goal of WRP, as well as other provisions of the proposed rule, is to protect employees from suffering material impairment of health or functional capacity. Achieving that goal will result in reducing or eliminating the need to seek workers' compensation. This effect, however, does not violate section 4(b)(4) of the OSH Act. *Lead*, 647 F.2d at 1234–35.

Will WRP impose substantial economic hardship on employers? Some stakeholders argue that WRP will impose a substantial economic hardship on employers, especially small employers, because it will be so expensive to implement. Stakeholders argue that small employers will not be able to remain in business if they must provide employees with WRP.

OSHA is aware of the stakeholders' concerns, but the Preliminary Economic Analysis and Initial Regulatory Flexibility Analysis show that the proposed rule, which includes the WRP provision, is economically feasible for all of the industries that OSHA is proposing to cover, including small employers in those industries. Available data discussed above indicate that these stakeholders may be overstating the economic impact of the proposed rule. While the median number of lost workdays for certain MSDs is quite high, as discussed above, OSHA estimates that most MSDs do not result in any days away from work, and data on those that do indicate that half of all such reported MSDs (*i.e.*, lost workday MSDs) resulted in 7 or fewer days away from work (Ex. 26–1413). Once the proposed rule's provisions stressing the importance of early reporting become effective, the number of MSDs requiring more than 7 days away from work should decrease further. Thus, OSHA believes that the requirement to provide WRP will encourage employers to more quickly implement an effective ergonomics program (1) to detect MSDs, (2) to institute effective controls, and (3) to prevent other employees in the same job from developing a covered MSD. These actions will reduce the number and severity of MSDs, thus reducing WRP costs.

Will WRP be abused? Some stakeholders stated that WRP will be abused by employees. These stakeholders contend that MSDs are too difficult to reliably diagnose; thus, they contend that WRP will give employees an incentive to report injuries that occur ''off-the-job'' as injuries that are work-related. Certain stakeholders also fear that an employee could persuade an HCP to write a medical recommendation for six months of removal, even though the employee is not injured or not injured to the extent that such a period of removal is necessary.

OSHA has drafted the proposed standard to reduce any potential for employee abuse that may exist. First, OSHA is only requiring employers to maintain 90% of employees' after-tax earnings if they are removed form work entirely. If an employee is placed in work restrictions short of complete removal, the employer must maintain 100% of the employee's after-tax earnings. OSHA believes that this scheme provides little incentive for employees to persuade an HCP to write an unnecessary removal recommendation for six months or otherwise abuse WRP. To the contrary, OSHA believes that WRP will encourage employees to report signs and/or symptoms of MSDs as early as possible to avoid complete removal from work.

Second, OSHA emphasizes that employers have the ability to prevent abuse. Under the proposed rule, employers make the determination as to whether a reported MSD is covered by the standard, *i.e.*, whether the MSD is an OSHA

recordable MSD and meets the screening criteria in § 1910.902. This gives employers the ability to prevent employees from receiving WRP benefits for injuries that are not work-related and covered by this standard. In addition, OSHA believes that implementation of an ergonomics program under this standard will decrease significantly any opportunity for abuse as MSD hazards are removed from the workplace.

Third, the proposed standard only requires that employers provide temporary work restrictions (and thus WRP) where necessary or when recommended by an HCP to whom the employee was referred by the employer. The employer need not remove the employee from work based only on a request made by the employee.

Fourth, when an employer refers an employee to an HCP and that HCP provides recommended temporary work restrictions, the proposed rule only requires the employer to provide the temporary work restrictions that the HCP actually recommends. This means that if the HCP recommends restricted duty, the employee is not entitled to time-off from work. Where employers provide the HCP with information and communicate with them about alternative duty jobs, OSHA believes that the HCP will be more likely to recommend restricted work activity than complete removal. Recent BLS statistics bear this out: since 1992, the percentage of restricted workdays for all occupational injuries and illnesses has increased by 50%, while the percentage of lost workdays has decreased by a substantial amount. This trend, which reflects the influence of return-to-work programs among other factors, shows no signs of abating.

Finally, the proposed standard does not require employers to provide WRP if they correct the hazards associated with the MSD such that there is no risk of harm to the employee during the recovery period. A workplace with hazard controls further reduces any potential for employee abuse associated with WRP.

For all of these reasons, OSHA believes that WRP will not provide employees with an incentive for abuse.

Part C—Alternatives

A number of stakeholders, including some who participated in the SBREFA process, and the SBREFA panel, have recommended that OSHA look at various alternatives to the proposed WRP provisions. OSHA has examined the following alternatives:

- Require employers to maintain 100% of an employee's after-tax earnings whenever the employee is placed on temporary work restrictions, including complete removal from work;
- Reduce the amount of time an employer would be required to provide WRP to an employee with an MSD;
- Propose a WRP provision that includes special provisions or an exemption for small businesses such as those included in the Methylene Chloride standard;
- Phase-in WRP over a period of time ranging from a number of months to as long as three years; and
- Require employers to provide employees with non-monetary incentives to report MSDs, instead of requiring WRP.

OSHA has carefully considered these alternatives. For the reasons that follow, OSHA has preliminarily decided not to include these provisions in the proposed ergonomics rule.

Require employers to maintain 100% of an employee's after-tax earnings whenever the employee is placed on temporary work restrictions, including complete removal from work. As stated, WRP requires employers to maintain 100% of an employee's after-tax earnings, plus full benefits, if the employee is placed on temporary work restrictions short of complete removal from work; however, if an employee is removed entirely from work, the employer must maintain 90% of the employee's after-tax earnings, plus full benefits. This differs from the WRP provisions in other health standards. In other health standards, OSHA requires that employers maintain an employee's full earnings, rights, and benefits when an employee is medically removed from work. See, *e.g.*, 29 CFR 1910.1025 (Lead); 29 CFR 1910.1027 (Cadmium). OSHA considered requiring employers to maintain an employee's full take-home pay and benefits whenever the employee is placed on any temporary work restrictions, including complete removal from work, but OSHA preliminarily has decided not to include this alternative in the proposed rule. As discussed in the Preliminary Economic Analysis (Ex. 28–1), this alternative would increase the costs of WRP by 36 percent.

OSHA believes that the proposed WRP provision provides the requisite economic protection to encourage employees to participate fully in the MSD management program. OSHA anticipates that few employees will require complete removal from work during the recovery period. For those few employees requiring complete removal, maintenance of 90% of their after-tax earnings (and full benefits), coupled with the cost savings from the elimination of such expenditures as commuting expenses, will provide them the requisite economic protection to effectuate the purposes of WRP: encouraging employee participation in MSD management. As stated, OSHA also believes that the proposed WRP design is uniquely suited to encourage employees to report MSDs as early as possible, a critical aspect of the proposed rule.

Reduce the length of time an employer would be required to provide WRP to an employee with an MSD. OSHA is proposing that employers may stop providing WRP benefits when the first of certain cutoff points occurs. The cutoff points are: the ability of the employee to return fully to the job; the successful control of the job; and, as a last resort, 6 months of WRP. OSHA considered reducing the length of time employers would have to provide WRP.

The vast majority of MSDs resolve in substantially less than six months. According to the Liberty Mutual Insurance Company, the largest workers' compensation insurer in the United States, 75% of all UEMSD claims in 1994 did not involve any days away from work and only about 11% of those involving lost workdays resulted in more than 6 months away from work (Ex. 26–54). This evidence indicates that most MSDs, if detected early, can be resolved very quickly. Even for CTS cases, the injury and illness with the highest number of median days away from work, the median number of days away from work in 1996 was 25 days, according to BLS (see Section VII). (The average number of lost workdays for CTS cases is likely to be higher since more than 42% of all CTS cases resulted in more than 30 days away from work.)

For claims for MSDs of the lower back, the most prevalent of all work-related MSDs, according to Liberty Mutual, the median number of days away from work was 7 days in 1996 (Ex. 26–54). Therefore, although the proposed rule provides 6 months of WRP protection, the evidence indicates that it is unlikely that 6 months would be the first cutoff event to occur.

However, there is also evidence that some employees may require an extended period to recover, and that a small percentage may require even more than 6 months. According to Liberty Mutual, for the one-quarter of the UEMSDs that

did involve at least one day away from work, the average length of disability was 294 days and the median was 99 days (Ex. 26–54). One reason for the longer disability period may be that a high percentage of these cases involved surgeries, such as carpal tunnel release surgery, which would require a longer recovery period.

In other health standards that have WRP provisions, OSHA has set the length of WRP based primarily on its ''best estimate'' as to the rate (*i.e.*, time) at which employees will recover from the adverse health effect. In the Lead standard, the length of the WRP represented the rate at which employees with high blood-lead levels would naturally excrete lead if removed from lead exposure. See 43 FR 54354. 54469, November 21, 1978. Applying that principle, OSHA said in the preamble to the Lead standard that a maximum of 18 months was a reasonable and appropriate length of time, particularly since some workers had high blood lead levels: ''Very few workers should require longer than 18 months to decline to acceptable blood lead levels, and 18 months is not in excess of what some long-term lead workers may require.'' *Id*. at 54469.

The criterion OSHA applied in the Lead standard also supports OSHA's preliminary determination that employers should be required to provide up to 6 months of WRP for employees with MSDs, if necessary. According to BLS, 42% of all reported CTS cases involved more than 30 days away from work in 1992 (see Section VII). Data from Liberty Mutual confirm this. Liberty Mutual reported that for those UEMSDs involving lost-work time, the typical disability duration was more than 3 months (Ex. 26–54). Given these data, OSHA believes that the 6-month maximum time is reasonable because it would allow the majority of employees time to recover before losing WRP benefits. The six-month period is appropriate because this phase of the ergonomics rule is focusing on those jobs where employees have the highest numbers and rates of MSDs that are serious enough to result in days away from work.

In the Preliminary Economic Analysis, OSHA has provided preliminary cost estimates for three alternatives to the 6-month time period for WRP:

- A 3-month WRP provision;
- No WRP during the average workers' compensation waiting period (3 days);
- Providing WRP only for a limited number of days.

3-month WRP Provision. Cutting the WRP period in half to 3 months would reduce WRP costs somewhat. This alternative, however, would not cut the costs of WRP in half. This is because the vast majority of MSDs (75%) do not involve days away from work and the percentage of cases involving employees who are out of work for 3 months is not substantially less than the percentage out of work for 6 months. To illustrate, Liberty Mutual found that 89% of all workers' compensation indemnity cases for UEMSDs involved less than 6 months away from work, while 85% involved less than 3 months away from work—a difference of only 4% (Ex. 26–54).

If the WRP period were reduced to 3 months, however, many employees with UEMSDs that involve more than 3 months away from work would not receive WRP after the original 3 month period. According to Liberty Mutual, a majority of UEMSD workers' compensation claims resulted in more than 3 months away from work. In addition, the median number of lost workdays for these cases was 99 days and the mean was 294 days (Ex. 26–54). Thus, even looking only at UEMSDs, a 3-month WRP period would provide no WRP benefits after the first 3 months to more than 12% of all lost workday cases. This percentage of cases is hardly the equivalent to the ''very few'' cases of lead-poisoned workers who were estimated to need more than 18 months to recover. If the WRP period is significantly shortened, injured employees may have to return to their jobs before their condition resolves, which increases the likelihood of reinjury or aggravation of the MSD.

No WRP during the average workers' compensation waiting period (3 days). Under this option, WRP would not be provided until an employee has missed three days of work. All State workers' compensation systems have a waiting period. The waiting periods range from 1 to 7 days; most States have a waiting period of either 3 or 7 days. This alternative would not require employers to cover the expenses of an injured employee for the first 3 days, the average workers' compensation waiting period. While this alternative may reduce the costs of WRP somewhat, if adopted, it would reduce employee protection by 75%. Once again, this is because the vast majority of all reported MSDs involve no lost workdays or only a few lost workdays.

OSHA believes that, particularly for employees in low-wage jobs, this alternative would not achieve the goal of WRP: the early reporting of all MSDs. Stakeholders have told OSHA that workers in these low wage jobs are so fearful of the consequences of losing up to a few days of wages that they would not report MSDs or participate in MSD management if faced with the threat of this economic loss. Under this alternative, employers would not be prohibited from sending an employee with an MSD home after three days, even if an alternative duty job would be an effective way of managing the employee's recovery. While OSHA is aware that some employers currently pay employees during the State workers' compensation waiting period (see Exs. 26–23 through 26–26), stakeholders also said that a number of employers do not pay employees during this period, even if they are sent home (see Exs. 26–23 through 26–26). Some employers have policies to send any employee who reports an MSD home without pay for some number of days (see Exs. 26–23 through 26–26). Other employers told OSHA that they do not permit employees to use their sick leave to cover work-related injuries (see Ex. 23). These types of practices indicate that this alternative to the proposed WRP provision is unlikely to reduce employee fears of reporting MSDs early. Again, if employees do not report, it could result in increased harm to that employee and others in the same job. Indeed, this alternative would have the perverse effect of encouraging employees to wait until an MSD is serious enough to warrant more than three days away from work before reporting the MSD.

In only one standard has OSHA delayed the removal of injured employees and the application of WRP benefits. In the Formaldehyde standard, OSHA allows employers to wait two weeks before removing an employee from exposure. 29 CFR 1910.1048 (l)(8). In the preamble to that standard OSHA explained that the delay in removing employees was to give employers an opportunity to ascertain whether the signs or symptoms would subside without treatment or with the use of PPE and first aid (which imposes a barrier between the skin and the irritant). The two-week delay was based on evidence that the initial irritation exposure effects sometimes disappeared as employees became accustomed to working with compounds containing formaldehyde. The opposite exists in dealing with this hazard. WRP is particularly necessary at the onset of an MSD, because that is when the MSD is the least likely to result in permanent damage or disability. As exposure continues, MSD signs and

symptoms get worse rather than abating (with the exception of initial work conditioning periods). As such, limiting WRP until after the employee has additional exposure to workplace risk factors could result in adverse health effects.

WRP only for a limited number of days. Under this option, WRP would only be provided for a limited number of days (*e.g.*, three, five, or seven days). This alternative is designed to provide protection for employees for the short period of time before workers' compensation payments begin.

As stated, the median number of lost-work days from MSDs is 7; thus, requiring employers to provide WRP benefits for three, five, or seven days may provide protection for some employees. At the same time, however, many MSDs are not resolved in those time periods. Even for those MSDs where the median number of days away from work is five, for example, statistically, 50 percent of those cases involve more than five days away from work. In addition, as indicated above, the median number of days away from work for CTS is 25 (see Section VII).

OSHA believes that this alternative would not provide the requisite protection to employees to encourage them to report MSDs early and to actively participate in MSD management. For those employees who have MSDs that do not resolve within the short time period called for by this alternative, this alternative leaves workers only with workers' compensation. In addition, many workers' compensation waiting periods extend beyond three or five days. For those employees in a state with a longer waiting period, if their MSDs do not resolve within the short time period covered by this alternative, they may be without any protection for several days (even though their injury may be covered by their State's workers' compensation system). The loss of even a few days pay is devastating to many employees. Furthermore, for those injured employees whose MSDs are not covered by their respective workers' compensation systems, this alternative would only provide protection for three, five or seven days. Because of this great financial strain, these employees may return to work too early, before their MSD is fully resolved, and reinjure themselves. OSHA believes that this alternative would have a chilling effect on early reporting of MSDs.

This alternative also reduces the employer's incentive to fix the job quickly. Under OSHA's proposal, one way an employer can avoid paying for WRP for 6 months is to fix the job so the injured employee can perform it. Under this alternative, however, the WRP payments would generally end before the employer is able to identify and fix the MSD hazards. Without that incentive, employers may opt for a longer timeline for controlling the job.

Apply Methylene Chloride WRP provision to small businesses covered by the ergonomics standard. The proposed WRP provision applies WRP universally to large and small employers. In this respect, WRP is similar to the WRP requirements in other health standards. See, *e.g.*, 29 CFR 1910.1025 (Lead); 29 CFR 1910.1027 (Cadmium); 29 CFR 1910.1028 (Benzene); 29 CFR 1910.1048 (Formaldehyde). To illustrate, the Lead standard applies the WRP requirements to all employers even though a substantial number of industries with lead exposures contain small businesses (*e.g.*, non-ferrous foundries, construction). In construction, for example, more than 75% of all establishments have fewer than 10 employees; however, the Lead standard (29 CFR 1926.62) applies to all employers, regardless of size. OSHA examined applying the feasibility limitations in the WRP provision in the Methylene Chloride standard to small businesses that would be covered by the ergonomics rule.

The Methylene Chloride standard allows small businesses to make a case-by-case analysis regarding the feasibility of WRP if one or more employees are already receiving WRP benefits and the employer is informed that removal is appropriate for a second employee. 63 FR 50712, 50717, September 22, 1998. If a second employee required removal while the first employee was being paid WRP benefits, the Methylene Chloride standard would not require the employer to remove the second injured employee from the job and pay WRP if:

> comparable work is not available and the employer is able to demonstrate that removal and the costs of extending [WRP] benefits to an additional employee, considering feasibility in relation to the size of the employer's business and the other requirements of the standard, make further reliance on [WRP] an inappropriate remedy * * *. *Id.* at 50730 (citing 29 CFR 1910.1052(j)(11)(I)(B)).

In each of the standards that have a WRP provision, the costs of the standards, including those of WRP, were found to be economically feasible for both large and small businesses in all affected industries. The same is true for the proposed ergonomics standard. The Preliminary Economic Analysis discussed below indicates that the proposed standard, including the 6-month WRP provision, is economically feasible for all industries. This is true even for very small businesses (those with fewer than 20 employees). OSHA's Preliminary Economic Analysis indicates that for very small businesses affected by the proposed standard, the impacts of the proposed rule are not likely to affect the viability of firms.

The WRP provision in the Methylene Chloride standard resulted from a settlement resolving several challenges to the final standard. OSHA and the parties to the settlement agreed that the WRP provision noted above was appropriate to the hazards posed by exposure to methylene chloride. The WRP provision agreed to in the settlement is limited to the unique characteristics of methylene chloride exposure. OSHA does not believe that a similar WRP provision would be appropriate here.

Delay or phase-in implementation of the WRP provision. OSHA also considered delaying or phasing-in implementation of WRP, perhaps by up to three years. The proposed standard does not delay or phase-in implementation of either MSD management or WRP. OSHA believes that, because so many workers already are experiencing MSDs every year, it is critical that both MSD management and WRP be implemented as soon as possible. Delaying WRP could result in serious damage or disability for employees who have MSD signs and symptoms but fear severe economic loss if they report an MSD. Moreover, if WRP were delayed for the recommended 3 years, as many as 1.8 million employees that are likely to have lost-workday MSDs over that time period would not have WRP protection. While OSHA acknowledges that some of these employees may be able to use sick leave pay during a recovery period, many employers either do not offer sick leave or prohibit employees from using sick leave for work-related MSDs. In fact, delaying the implementation of WRP could result in injured employees receiving less protection than they currently have. For example, employers who currently do not reduce the wages of employees on restricted duty would not be prohibited from changing their policies in the future, particularly since reports of MSDs will, after the standard's effective date, impose costs on employers for job analysis and control.

With regard to phasing-in WRP, some members of the SBREFA panel recommended that the phase-in be done according to establishment size, that is, phase-in large employers first and delay implementation of WRP for small businesses. However, such a phase-in would not be consistent with past OSHA practice (Ex. 23). The Lead standard is the only rule in which WRP has been phased-in. In that standard, OSHA determined that phase-in was necessary because seriously elevated blood levels were so persistent in the lead-using industries that removal presented feasibility problems:

> The weight of the evidence in the lead record demonstrates that immediate imposition of the entire ultimate [WRP] program is not feasible. Put simply, existing worker blood lead levels are so high that major segments of the lead industry would have to immediately remove at least 25 percent to 40 percent of their productive work force from lead exposure. Sufficient transfer opportunities would not exist thus extensive layoffs would result with accompanying [WRP] costs.
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> * * * * *
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> OSHA is persuaded that several industry segments could not reasonably be expected to comply with an immediate imposition of the overall [WRP] program. 43 FR 54354, 54452, November 21, 1978.

Given this, OSHA decided to phase-in WRP based on the severity of employees' blood lead levels. By contrast, there is no evidence that immediate implementation of WRP in the ergonomics standard would present feasibility problems for employers, even for very small employers. The Preliminary Economic Analysis indicates that it would be feasible to apply the WRP provision to all covered employers. The Preliminary Economic Analysis shows that the proposed standard will neither affect the economic viability of any industry as a whole, nor of the small or very small establishments in those industries.

Delaying or phasing-in WRP would also render the proposed standard's hazard identification system ineffective. The hazard identification system in the proposed rule does not consist of assessing each job in the workplace to see if employees have excessive exposure to workplace risk factors. Instead, the hazard identification system is based on employees coming forward with reports of MSDs. In order for this hazard identification system to produce accurate results, it is essential that employees voluntarily come forward with their reports. However, if they fear severe economic loss for reporting, employees will not come forward. Phasing in WRP would have a chilling effect on employee's willingness to report MSDs and/or signs and symptoms of MSDs. This ''chilling effect'' will delay job hazard analysis and identification and the implementation of controls, subjecting employees to workplace risk factors and MSD hazards.

Finally, delaying or phasing-in WRP is not necessary to ease employers' transition because OSHA is already proposing to phase in all but the MSD management provisions of the standard. OSHA is proposing that employers be given a start-up time of up to 3 years to set up a full program and implement controls. These proposed start-up times are longer than the corresponding provisions in almost all other OSHA health standards. If job control is delayed while employers plan ergonomics changes and work those changes into their production cycle changes, it becomes even more important that employees not be without WRP protection in the interim.

Also, OSHA is proposing that general industry employers who are not brought under the scope of the standard until after all compliance deadlines have passed (*e.g.*, there are no covered MSDs among their employers until after compliance deadlines have passed) be given additional time to come into compliance. At that point, employers would have up to one year to put in controls and determine if their program is effective. This extension of compliance deadlines has not been included in other OSHA standards. In other standards, once the deadlines occur, employers must be in compliance from that point forward. For example, in many other OSHA standards, employers who build new facilities must be in compliance with OSHA standards from the very start (*e.g.*, the employer must be in compliance with the PEL when the facility first opens). This would not be the case under this proposed standard. Rather, employers in general industry are given additional time to come into compliance with the standard's requirements after an employee develops a covered MSD.

Use non-monetary incentives, instead of WRP, to increase employee reporting and participation in MSD management. OSHA also considered replacing WRP with non-monetary incentives for employees to report MSDs.

OSHA decided to propose a WRP provision because non-monetary incentives do not appear to be working. Section 11(c) of the OSH Act already includes a prohibition against employers retaliating against employees who report MSDs and MSD hazards:

> No person shall discharge or in any manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this Act or has testified or is about to testify in any such proceeding or because of the exercise by such employee on behalf of himself or others of any right afforded by this Act. 29 U.S.C. 660(c).

However, despite this provision, several studies show that MSDs are significantly underreported. Although the reasons for such underreporting are believed to be many (including, for example, unintentional and intentional discouragement by employers, failure on the part of employers and employees to recognize the work-relatedness of many MSDs), OSHA believes the fear of severe economic loss is one of the primary reasons for the underreporting. The proposed rule includes a provision prohibiting employers from having practices that discriminate against employees who make a report. Nonetheless, there is evidence that non-monetary incentives can result in increased rather than decreased underreporting.

A number of stakeholders have said that employers use various non-monetary incentives to achieve a safer and more healthful workplace (see Exs. 26–23 through 26–26; Ex. 23). Some of these incentives include recognition and nominal rewards (company caps, plaques) for reporting hazards or presenting ideas to fix problem jobs or reduce severity rates. These types of incentives can increase employee reporting. There are also other incentives such as ''safety bingo'' and bonuses for supervisors and/or employees reporting low numbers of injuries or no injuries. According to stakeholders, incentives of this second type can have the unintended result of pressuring employees not to report injuries or other problems. For example, in *Wilson* v. *IBP*, 558 N.W.2d 132, 143–44 (Iowa 1996), the court found that the defendants had engaged in the following conduct which could discourage employee reporting and result in discrimination of employees who did report an MSD:

> [The registered nurse who was the plant manger of occupational health services] had another reason for responding to workers' injuries as she did. IBP had a financial incentive program,

somewhat disingenuously called 'the safety award system.' As part of the safety award system, IBP recorded the number and severity of injuries and the number of work days missed by employees due to work-related injuries. Employees of the division with the lowest injury statistics received gifts or extra year-end bonuses. Through its financial incentives, the safety award system provided strong motivation for management to reduce the number of lost time days.

* * * * *

From the evidence in this record, a reasonable juror could have found the following: [the plant nurse] lied to Dr. Hamsa to keep him from referring [the injured employee] to a neurosurgeon, that IBP and [the plant nurse] would profit financially by getting workers back to work quickly (via IBP's safety award system), and that [the plant nurse] maliciously manipulated [the injured employee's] medical treatment for personal profit, knowing that he had an unstable disc in his back * * *.

A reasonable juror could also have found as follows: IBP actively sought ultra-conservative physicians to avoid surgery costs; it hired a staff of investigators to spy on injured employees, one of whom looked into [the injured employee's] apartment windows; workers who were uncooperative in the company's planned medical treatment were assigned by [the plant nurse] to a light duty job, watching gauges in the rendering plant, where they were subjected to an atrocious smell while hog remains were boiled down into fertilizers and blood was drained into tanks.

This climate of suspicion toward the legitimacy of injuries to workers and their treatment, well known to [the plant nurse], could be found by a reasonable juror to corroborate a finding of willful and wanton disregard for the rights and safety of [the injured employee].

At this point, OSHA has not been able to identify non-monetary incentives that would be as effective as WRP in encouraging employees to report MSDs early and in protecting employees who do come forward voluntarily.

Requests for Comment

OSHA requests information and comments on the WRP provision in the proposed standard. Specifically, OSHA requests information and comments on the alternatives to WRP discussed in this section as well as other non-monetary alternatives that would achieve the same goals and be as protective as WRP. OSHA is particularly interested in whether commenters believe that for WRP to be effective in encouraging employee participation in MSD management and encouraging early reporting, employees must be guaranteed 100% of after-tax earnings and benefits if they are placed on any type of temporary work restriction, or whether a guarantee of 90 percent or less is sufficient to accomplish this goal.

Program Evaluation (§§ 1910.936–1910.938)

Sections 1910.936–1910.938 of the proposed Ergonomics Program standard would require that employers evaluate their ergonomics program to ensure that it is effective. Good management, as well as common sense, suggest that periodic review of a program's effectiveness is necessary to ensure that the resources being expended on the program are, in fact, achieving the desired results and that the program is achieving these results in an efficient way. Additionally, program evaluation is a tool that can be used to ensure that the program is appropriate for the specific MSD hazards in the employer's problem jobs.

OSHA has long considered program evaluation to be an integral component of programs implemented to address health and safety issues in the workplace. For example, the Ergonomics Program Management Guidelines for Meatpacking Plants (''Meatpacking Guidelines'') recommend regular program review and evaluation (Ex. 2–13). These guidelines suggest that procedures and mechanisms be developed to evaluate the implementation of the ergonomics program and to monitor progress accomplished. Program evaluation is included in the Meatpacking Guidelines as a program component that involves both management commitment and employee involvement. OSHA's 1989 voluntary Safety and Health Program Management Guidelines also recommend regular program evaluation as an integral program component (Ex. 2–12). Furthermore, OSHA's Voluntary Protection Programs (VPP) and its Consultation Program also require periodic evaluations of an employer's safety and health program. The following discussion presents OSHA's reasons for proposing the three program evaluation provisions described below.

Section 1910.936 What is my basic obligation?

You must evaluate your ergonomics program periodically, and at least every 3 years, to ensure that it is in compliance with this standard.

Proposed section 1910.936 informs employers of their basic obligation. This section would require employers to ''evaluate [their] ergonomics program periodically, and at least every 3 years, to ensure that it is in compliance with this standard.'' This means that employers would have to, at a minimum, analyze the functioning of the ergonomics program, compare it to the requirements of this standard, and identify any deficiencies in the program. Employers would be required to make sure that the ergonomics program they have implemented controls the MSD hazards in the problem jobs in their workplace. A program designed for a large site with many different problem jobs, for example, is likely to be more formal and extensive than one designed for a small site with one or two problem jobs. Similarly, an ergonomics program that fits a manufacturing facility may not be appropriate for a work environment in the service sector.

Program evaluation goes beyond a mere inspection or audit of problem jobs. It must ask questions to determine whether the required ergonomics program elements have been adequately implemented and whether they are integrated into a system that effectively addresses covered MSDs and MSD hazards. Such questions include:

- Has management effectively demonstrated its leadership?
- Are employees actively participating in the ergonomics program?
- Is there an effective system for the identification of MSDs and MSD hazards?
- Are identified hazards being controlled?
- Is the training program providing employees with the information they need to actively participate in the ergonomics program?
- Are employees using the reporting system?
- Are employees reluctant to report covered MSDs or MSD hazards because they receive mixed signals from their supervisors or managers about the importance of such reporting?
- Is prompt and effective MSD management available for employees with covered MSDs?

Program evaluation, in other words, involves a review of how various aspects of an employer's ergonomics program are working together to ensure that employees are protected from MSD hazards.

Program evaluations can be conducted by those responsible for carrying out the employer's program, but

evaluations performed by persons who are not involved in the day-to-day operation of the program are often even more valuable because these individuals bring a fresh perspective to the task. They can often identify program weaknesses that those routinely involved in program implementation may fail to see. In any event, it is important that the ergonomics program be evaluated regularly for effectiveness and that program evaluation be routinely integrated into the program.

The extent of the evaluation that would be required by proposed section 1910.936 will vary from one workplace to another. However, the basic tools of evaluation are the same, even though their application may range from informal to formal. These tools include:

- Review of pertinent records, such as those related to covered MSDs and MSD hazards;
- Consultations with affected employees (including managers, supervisors, and employees) regarding the ergonomics program; and
- Reviews of MSD hazards and problem jobs.

The records to be reviewed would include all available documentation of covered MSDs and MSD hazards. These records might include:

- The OSHA 200 log;
- Reports of workers' compensation claims;
- Reports of job hazard analyses and identification of MSD hazards;
- Employee reports to management of covered MSDs or, for employers with manufacturing or manual handling jobs, persistent MSD symptoms;
- Insurance company reports and audits; and
- Reports from any ergonomic consultants engaged by the employer.

If the employer has a written ergonomics program, it should be included in the review of pertinent records.

Some employers may have very few of these records and will have to rely on other methods to assess effectiveness. For example, under § 1904.15 and § 1904.16 of OSHA's recordkeeping regulation (29 CFR part 1904), employers with fewer than 10 employees and employers in certain low-hazard Standard Industrial Classification (SIC) codes are exempt from the requirement to maintain an OSHA log. Therefore, these employers will have fewer records for review and will need to place more emphasis on employee interviews and surveys of MSD hazards and problem jobs when they perform ergonomics program evaluations.

Record review can also reveal valuable information on the effectiveness of an ergonomics program when comparisons are made from year to year and trends are identified. For example, if an employer compares the list of MSD hazards during consecutive program evaluations and finds that the number of identified hazards has decreased over time, then the employer may conclude that the program's job hazard analysis and control activities have been effective. Similarly, a reduction in the number of covered MSDs from year to year suggests that the program may be effective. However, program evaluation must include consideration of the accuracy and reliability of the records under review. It is essential to be sure that the identified trends are real and not the product of underreporting, loss of interest, or carelessness. For example, a downward trend in covered MSDs or MSD hazards may indicate that employees are being discouraged from reporting or that the employees performing job hazard analysis and control are not adequately trained to do so.

Another essential tool in any ergonomics program evaluation is interviews of employees doing, supervising, or managing problem jobs at all levels of the organization. Interviews of employees are designed to elicit information on how well the ergonomics program has been communicated to the people who rely on it the most. If employees cannot explain what MSD hazards they are exposed to in the course of their work, do not know what steps their employer is taking to eliminate or control these hazards, are unclear about the procedures they should follow to protect themselves from these hazards, or do not understand how to report covered MSDs or MSD hazards, the hazard information and reporting and training components of the program are not working. If a supervisor is unclear about how to reinforce proper work practices, the management leadership and training components of the program need improvement. Similarly, if managers are not aware of the covered MSDs and MSD hazards employees are reporting and what corrective actions are being taken, the management leadership and training components of the ergonomics program should be improved. Because interviews allow the program evaluator to assess how the program is actually working, there is no substitute for direct input from employees in the evaluation process.

Program evaluation must also include a review of MSD hazards and problem jobs at the worksite. This review goes beyond inspection and analysis of problem jobs because it is concerned not only with identifying hazards but with identifying the ergonomic program deficiencies that resulted in the continuation of these hazards. If the program evaluation identifies problem jobs that have not been evaluated for ergonomic hazards, the job hazard analysis component of the program needs to be improved. Further, if a previously identified MSD hazard remains uncorrected, the evaluator should conclude that the job hazard control component of the program is not effective. Likewise, if a MSD hazard is identified and controlled in one part of the facility but the same job has not been properly controlled in another part of the facility, two program components may need attention: the management leadership component, which failed to coordinate and disseminate MSD hazard information throughout the facility, and the training component, which failed to provide the employees performing the job hazard analyses with adequate training.

Proposed section 1910.936 also specifies the frequency of the program evaluations. It would require ergonomics program evaluations to be conducted periodically and at least every three years. Given the diversity of workplaces covered by this proposed rule, OSHA has chosen a flexible approach for the frequency of program evaluations. In § 1910.945 of this standard, the section that defines key terms, OSHA defines periodically as meaning a process or activity that is ''performed on a regular basis that is appropriate for the conditions in the workplace.'' The definition of periodically further clarifies that ''the process or activity is conducted as often as needed, such as when significant changes are made in the workplace that may result in increased exposure to MSD hazards.'' It is OSHA's intention to reduce unnecessary burden while ensuring that program evaluations, which are essential to program effectiveness, are conducted at some minimal frequency.

OSHA believes that the employer is in the best position to determine how often the ergonomics program at a particular worksite needs to be evaluated to ensure its effectiveness. A site undergoing process or production changes, or one experiencing high turnover, may need more frequent evaluations to ensure program effectiveness.

Similarly, an increase in covered MSDs in the workplace should suggest that a program evaluation is warranted. In work environments with a stable workforce and work operation, program evaluations conducted once every three years may be sufficient.

Guidance on the frequency of ergonomics program evaluations is also available from other sources. For example, the Meatpacking Guidelines (Ex. 2–13) recommends semi-annual reviews by top management to evaluate the success of the program in meeting its goals and objectives. The NIOSH publication, titled Elements of Ergonomics Programs (Ex. 26–2), distinguishes between short-term indicators and long-term indicators for evaluating the effectiveness of controls. According to NIOSH, subsequent to the implementation of controls to eliminate or reduce MSD hazards, a follow-up evaluation is necessary to ensure that the controls were effective and did not introduce new ergonomic risk factors. The follow-up evaluation should use the same measurement tools, for example MSD hazard checklists or MSD symptom surveys, that were used to document the original problem job. NIOSH recommends that this follow-up evaluation take place no sooner than one to two weeks after implementation, with one month being the most preferable time interval.

Section 1910.937 What must I do to evaluate my ergonomics program?

You must:

(a) Consult with employees in problem jobs to assess their views on the effectiveness of the program and to identify any significant deficiencies in the program;

(b) Evaluate the elements of your program to ensure they are functioning properly; and

(c) Evaluate the program to ensure it is eliminating or materially reducing MSD hazards.

Proposed section 1910.937 provides employers with the procedures that would be required to evaluate the effectiveness of the ergonomics program. It answers the question: ''What must I do to evaluate my ergonomics program?'' Through this proposed requirement, OSHA intends to inform employers of the minimal evaluation procedures necessary to assess whether or not their ergonomics program is working.

Proposed paragraph (a) would require employers to ''consult with employees in problem jobs to assess their views on the effectiveness of the program.'' Additionally, employers would be required to consult with employees ''to identify any significant deficiencies in the program.'' OSHA believes that employee participation in the ergonomics program is critical for success, and the involvement of employees in program evaluation is just one more way that employees can take an active role in the program. A requirement that employers consult with employees regarding program evaluation is not unique to the proposed Ergonomics Program standard. OSHA promulgated a similar provision in the Respiratory Protection final rule (29 CFR 1910.134).

Employees in jobs that have been identified as problem jobs are in the best position to judge whether or not job hazard analysis and control measures are effectively reducing or eliminating MSD hazards. Perhaps even more importantly, they will be most knowledgeable about whether the implemented controls have introduced new, unintended MSD hazards to the job. By consulting with employees, employers can also have direct feedback on the effectiveness of other ergonomics program elements, such as opportunities for employee participation, hazard information and reporting, and training. OSHA is aware that employers sometimes act in good faith to implement ergonomics program elements, but that the actual result experienced by employees can differ markedly from the intention. Thus, by checking directly with their employees, employers can be sure that their ergonomics program resources are being effectively invested.

Through collaboration with their employees, employers will also have the opportunity for input on major program shortcomings. If an ergonomics program is not successfully reducing the incidence of covered MSDs or MSD hazards, employees in problem jobs will most likely have valuable information to share on identifying and correcting the program weaknesses. OSHA believes that employers should have the opportunity to access this input from their employees and use it, together with their own independently collected information, to improve the effectiveness of their ergonomics program.

Proposed paragraph (b) would require employers to ''evaluate the elements of [their] program to ensure they are functioning properly.'' These elements, as identified in this proposed Ergonomics Program standard, include:

- Management leadership and employee participation;
- Hazard information and reporting;
- Job hazard analysis and control;
- Training; and
- MSD management.

OSHA believes that employers are best able to determine which evaluation criteria for these elements are most appropriate for their workplaces. Additionally, OSHA believes that employers should be able to define ''functioning properly'' according to the specific characteristics of their problem jobs, in particular, and their work environment in general. Thus, OSHA has not proposed specific evaluation criteria or goals for each ergonomics program element.

Proposed paragraph (c) would require employers to ''evaluate the program to ensure it is eliminating or materially reducing MSD hazards.'' The intention of this proposed paragraph is to require employers to evaluate the overall effectiveness of their ergonomics program, in addition to evaluating the individual program elements, as required in proposed paragraph (b). The primary purpose for implementation of an ergonomics program is the elimination or material reduction of MSD hazards. Thus, OSHA would expect employers to establish evaluation criteria to assess success in meeting this goal. There are a wide variety of methods available to employers that will facilitate the observation of trends that document program performance. OSHA believes that employers are best able to determine the specific evaluation criteria that will most effectively tell the story of their efforts to eliminate and materially reduce MSD hazards.

Section 1910.938 What must I do if the evaluation indicates my program has deficiencies?

If your evaluation indicates that your program has deficiencies, you must promptly take action to correct those deficiencies so that your program is in compliance with this standard.

Proposed section 1910.938 informs employers of what to do if their ergonomics program has deficiencies. This proposed section would require that employers ''promptly take action to correct those deficiencies so that [their]

program is in compliance with this standard.'' Deficiencies are findings that indicate that the ergonomics program is not in compliance with the standard because, for example, it is not successfully controlling MSD hazards or is not providing needed MSD management. Employers would be required to respond to deficiencies in the ergonomics program by identifying appropriate corrective actions to be taken, assigning the responsibility for these corrective actions to an individual who will be held accountable for the results, setting a target date for completion of the corrective actions, and following up to make sure that the necessary actions were taken. This proposed requirement will help employers to improve their ergonomics program on an ongoing basis.

In anticipation of concerns that employers will be ''liable'' if their evaluations reveal deficiencies, OSHA emphasizes that the Agency's primary goal is to protect employees from MSD hazards, not to hold employers liable for ergonomics program deficiencies. In fact, OSHA expects that in the process of complying with the requirements of this standard, most employers will find deficiencies in their ergonomics program at one time or another. OSHA's concern will be whether or not employers act on the information obtained during the program evaluation. Employers who act in good faith to correct identified program deficiencies will satisfy this requirement. On the other hand, employers who identify ergonomics program deficiencies through the evaluation process and then do not act on this information may not be in compliance with this requirement.

In order to provide employers with maximum flexibility, OSHA has not specified a time frame in which identified program deficiencies must be corrected. OSHA recognizes that the time needed to correct a program deficiency will vary according to many factors. Such factors include:

- The nature of the MSD hazard;
- Previous attempts to correct the problem;
- The complexity of the needed controls;
- The expense of the needed controls;
- Whether the hazard is a higher or lower priority in the list of identified program deficiencies; and
- The expertise needed to control the hazard.

However, OSHA expects that employers will use good faith efforts to correct program deficiencies as quickly as possible.

What Records Must I Keep? (§§ 1910.939–1910.940)

Occupational injury and illness records are a vital part of any ergonomics program. These records provide employers, employees, and consultants with valuable information on conditions in the workplace and can be used to identify trends over time and to pinpoint problems. Nevertheless, OSHA recognizes the need to reduce paperwork burdens for all employers, especially small employers, to the extent that this can be done without reducing safety and health protection. The proposal accordingly limits the records this proposal requires employers to keep. Also, the proposed standard limits the applicability of the proposed recordkeeping requirements to employers with 10 or more employees, which is consistent with the Act's emphasis on minimizing paperwork burdens on small employers.

OSHA is exempting employers with fewer than 10 employees from the proposed standard's recordkeeping requirements because, in these very small workplaces, information can be communicated and retained informally. Larger employers must keep records of employee reports of MSDs and the employer's responses to them; the results of job hazard analysis; records of Quick Fix controls; records of controls implemented in problem jobs; program evaluations; and records of the MSD management process.

The following paragraphs discuss the specific requirements of the recordkeeping sections of the proposed standard.

Section 1910.939 Do I have to keep records of the ergonomics program?

The proposal states, ''You only have to keep records if you had 10 or more employees (including part-time employees and employees provided through personnel services) on any one day during the preceding calendar year.'' In section 1910.939, OSHA is thus proposing to exempt employers with fewer than 10 employees from having to keep any records for this proposed standard. Most of the small business representatives on the SBREFA panel said that they would choose to keep records even if they were not required to do so (Ex. 23). However, OSHA's experience indicates that, because of the absence of management layers and multishift work, informal communication is effective and formal recordkeeping systems are not necessary in very small companies. A small establishment may have a very simple ergonomics program that does not need written records.

This section indicates that part-time employees and employees provided through personnel services must be included in the count of employees for the purpose of this section. These workers are personnel retained and supervised on a daily basis by an employer for a limited time, and they include personnel under contract, written or oral, with the employer. OSHA believes that these employees should be included in the count of employees because many employers today have workforces composed largely of part-time or temporary employees. If these employees were not counted toward the size threshold for recordkeeping, large workplaces that operate with few permanent employees but many temporary employees would not be required to keep records even though the workplace had several levels of management and complex methods of communication.

By ''any one day during the preceding calendar year,'' OSHA means that so long as there are fewer than 10 employees, including employer-supervised part-time and temporary employees, at all times during preceding one-year period, the employer is not required to keep written records under this proposed standard.

Section 1910.940 What records must I keep and for how long?

This proposed section describes the records of the ergonomics program that employers would have to keep. It reflects OSHA's preliminary conclusion that recordkeeping is necessary for employers to measure their progress in establishing an effective program and in controlling MSD hazards.

The proposed standard requires employers to keep records of employee reports, employer responses, the results of job hazard analyses and controls, records of quick fix controls, and MSD management records for the purposes of musculoskeletal injury and illness prevention.

The following paragraphs discuss the specific requirements of the recordkeeping section of the proposed standard.

Section 1910.940 What records must I keep and for how long?

This table specifies the records you must keep and how long you must keep them:

YOU MUST KEEP THESE RECORDS . . .	FOR AT LEAST . . .
• Employee reports and your responses	3 years
• Job hazard analysis • Hazard control records • Quick Fix control records • Ergonomics program evaluation	3 years or until replaced by updated records, whichever comes first
• MSD management records	The duration of the injured employee's employment plus 3 years

Note to § 1910.939: The record retention period in this standard is shorter than that required by OSHA's rule on Access to Employee Exposure and Medical Records (29 CFR 1910.1020). However, you must comply with the other requirements of that rule.

The period the employer is required to keep exposure and medical records (*e.g.,* MSD management records) under this proposed standard is much shorter than is the case for other health standards. Health standards generally require exposure records to be kept for 30 years and medical surveillance records to be kept for the duration of employment plus 30 years, as required by 29 CFR 1910.1020, Access to employee exposure and medical records. These lengthy retention periods are appropriate for many toxic substances and harmful physical agent standards because of the long latency between exposure on the job and the onset of disease. However, for ergonomic disorders, there is a shorter latency period than for many of the chronic conditions and illnesses covered by these other rules. Also, changes in the workplace may make old ergonomics records irrelevant to current jobs and the present workplace environment. An employer's ergonomics program will continue to evolve, with the most recent aspects of that evolution being the most relevant for employee protection.

The three-year retention period in the proposed standard coincides with the required frequency of program evaluations mandated by the proposed standard. OSHA believes that employers will use these records to perform the required evaluations of the effectiveness of their program under this standard, and that records prior to the last evaluation would be of little use.

A note to section 1910.940 states that employers must continue to comply with the other requirements of the records access rule (29 CFR 1910.1020; Access to employee exposure and medical records), although the proposed ergonomics program rule permits a shorter records retention period than would otherwise be required by the records access rule.

When Must My Program be in Place? (§§ 1910.941–1910.944)

Sections 1910.941 through 1910.944 propose both compliance start-up deadlines and provide future compliance deadlines for certain situations, *i.e.*, for employers who are ''triggered'' into the scope of the standard after the compliance dates have passed.

OSHA is proposing certain variations in the approach to compliance deadlines that differ from the approach taken in other standards. First, OSHA is proposing a long start-up period so employers have time to get assistance before the compliance deadline comes due. Second, even after the compliance deadlines come due, OSHA is proposing to give employers newly covered by the standard additional time to set up a program and put in controls in certain situations. In other OSHA standards, once the compliance deadlines have occurred, employers must be in compliance with the standard continuously, even on the first day they open a new facility. Third, OSHA is proposing to allow employers to discontinue large portions of their program if no further MSDs are reported for a period of time.

Section 1910.941 When does this standard become effective?

This standard becomes effective 60 days after [publication date of final rule].

Proposed section 1910.941 establishes the effective date of the standard. The effective date is the date on or past which the standard is in effect and the date from which the compliance deadlines in this section are counted. In addition, only covered MSDs reported after the effective would be covered by the ergonomics standard.

Section 1910.942 When do I have to be in compliance with this standard?

This standard provides start-up time for setting up the ergonomics program and putting in controls in problem jobs. You must comply with the requirements of this standard, including recordkeeping, by the deadlines in this table:

YOU MUST COMPLY WITH THESE REQUIREMENTS AND RELATED RECORDKEEPING . . .	NO LATER THAN . . .
• MSD management	Promptly when an MSD is reported
• Management leadership and employee participation • Hazard information and reporting	[1 year after the effective date]
• Job hazard analysis • Interim controls • Training	[2 years after the effective date]
• Permanent controls • Program evaluation	[3 years after the effective date]

Note to § 1910.942: The compliance deadlines in this section do not apply if you are using a Quick Fix.

In § 1910.942, OSHA is proposing to give long phased-in start-up times ranging from one to three years for meeting various requirements of the ergonomics program standard. OSHA believes that the long start-up period is appropriate for several reasons.

First, OSHA plans to provide extensive outreach and consultation as soon as the final ergonomics rule is published. OSHA believes that the 3-year start-up period will allow employers to take full advantages of these materials and services, as well as those developed by others, without concern that enforcement action would already be underway.

Second, OSHA also believes that giving employers additional time to comply with the rule will reduce the compliance burden for small employers and will facilitate

compliance for all employers. OSHA recognizes that it takes time to put an ergonomics program in place and that small employers, in particular, need additional time to learn about the details of the rule and how to implement it in their workplace. Small employers, in particular, should take full advantage of OSHA's outreach, compliance assistance, and consultation services in meeting the standard's requirements.

At the same time, this section would require employers to begin setting up their ergonomics program step by step so they will have an effective process in place by the time compliance comes due. Without phased start-up, OSHA is concerned that some employers may wait until the last minute to take action. The phase-in of compliance is also important to ensure that those employees who report MSD signs and symptoms during the start-up period are provided with prompt intervention (both MSD management and work restrictions) in order to help the problem resolve quickly and without permanent damage. Finally, the longer start-up period would also allow employers to work needed job modifications into their regular production change schedules or processes. Because the best way to control MSD hazards is often in the design process, allowing additional compliance time will allow establishments of all sizes to make needed changes to their processes as part of regular production changes, and thus to make those changes at less cost.

Finally, the phase-in compliance deadlines fit the structure of the proposed rule. The rule itself envisions two levels of ergonomics programs: a basic program (for manual handling and manufacturing jobs) and the full program, and the compliance start-up deadlines track those phases. The basic program addresses management leadership and employee involvement and hazard information and reporting. Accordingly, the compliance deadlines for these preliminary requirements occur first. Later compliance deadlines correspond with elements of the full program, which requires job hazard analysis, job controls, training, and program evaluation if a covered MSD is reported. (The MSD management deadline is also consistent with this approach. The first start-up deadline for MSD management requires that MSD management be put into place ''promptly when an MSD is reported.'')

The proposed standard does not contain different compliance deadlines for small and larger employers, because OSHA believes that the proposed deadlines already build in enough time even for very small employers to get information about the rule and ways to implement an ergonomics program. OSHA also believes that the 3-year period is adequate for larger employers who may have more complex processes, more employees, more problem jobs, and more controls to implement.

Section 1910.943 What must I do if some or all of the compliance start-up deadlines have passed before a covered MSD is reported?

If the compliance start-up deadline has passed before you must comply with a particular element of this standard, you may take the following additional time to comply with that element and the related recordkeeping:

YOU MUST COMPLY WITH THESE REQUIREMENTS AND RELATED RECORD-KEEPING . . .	WITHIN . . .
• MSD management	5 days
• Management leadership and employee participation • Hazard information and reporting	30 days (In manufacturing and manual handling jobs, these requirements must be implemented by [1 year after the effective date])
• Job hazard analysis	60 days
• Interim controls • Training	90 days
• Permanent controls • Program evaluation	1 year

Note to § 1910.943: The compliance deadlines in this section do not apply if you are using a Quick Fix.

In section 1910.943, OSHA is proposing to give additional compliance time to those employers who do not have any problem jobs until after some or all of the compliance deadlines established in § 1910.942 have passed. This is because the first occurrence of an MSD in a job is unpredictable and may not occur until years after the standard is in effect.

The additional time OSHA is proposing is appropriate in those situations in which employers who do not have any covered MSDs reported until after certain deadlines have passed. The standard permits employers who do not have manufacturing or manual handling jobs to refrain from implementing an ergonomics program until after a covered MSD is reported. Even for employers who have manual handling or manufacturing jobs, extended dates are needed for the requirements that would not be triggered until after a covered MSD occurs.

OSHA believes that the additional time this section proposes is reasonable. This section would require that employers take certain critical preliminary actions very quickly after a covered MSD occurs (*i.e.,* provide MSD management within 5 days, analyze the job with 2 months and put in at least interim controls within 3 months). At the same time, it would allow employers up to a year to get effective permanent controls into place. OSHA believes this time period would be sufficient to allow employers to use the standard's incremental process of trying out one or more controls first to see if they work before moving on to other controls. Finally, to ensure that the additional time is reasonable in those cases in which some of the compliance deadlines have passed, this section would allow employers to comply by the compliance deadlines in this section or those in section 1910.942, whichever comes later.

Section 1910.944 May I discontinue certain aspects of my program if covered MSDs no longer are occurring?

Yes. However, as long as covered MSDs are reported in a job, you must maintain all the elements of the ergonomics program for that job. If you eliminate or materially reduce the MSD hazards and no covered MSD is reported for 3 years, you only have to continue the elements in this table:

IF YOU ELIMINATE OR MATERIALLY REDUCE THE HAZARDS AND NO COVERED MSD IS REPORTED FOR 3 YEARS IN . . .	THEN YOU MAY STOP ALL EXCEPT THE FOLLOWING PARTS OF YOUR PROGRAM IN THAT JOB . . .
A manufacturing or manual handling job	• Management leadership and employee participation, • Hazard information and reporting, and • Maintenance of implemented controls and training related to the controls.
Other jobs in general industry where a covered MSD had been reported	• Maintenance of controls and training related to the controls.

In section 1910.944, OSHA is proposing to allow employers to discontinue some significant portions of their ergonomics program when no covered MSD has been reported in a problem job for 3 years after the problem job was controlled. OSHA is proposing this provision because, where employers have implemented controls and those controls have eliminated or materially reduced the MSD hazard to the extent that a covered MSD is not reported for several years, it is reasonable to conclude that the physical work activities and conditions in that job are no longer reasonably likely to cause or contribute to an MSD. When this level of control has been reached, OSHA believes it is appropriate for employers to focus their efforts on maintaining the controls that have corrected the problem (along with the training related to those controls).

OSHA is proposing a 3-year time period to coincide with the timing of other requirements of the proposed standard. For example, in the proposed rule periodic program evaluation must be done every three years, and the start-up deadlines for implementing permanent controls and initially evaluating the program is 3 years. OSHA believes that employers should only be permitted to discontinue parts of the program where permanent controls have been implemented and an evaluation of the program and controls shows that the program and controls have been effective in eliminating or materially reducing the MSD hazards in the job. Without this type of information, employers would not have the knowledge and information necessary to make a determination about whether another MSD is reasonably likely to occur. Allowing employers to discontinue certain elements only after a program evaluation has been done will help to ensure that the employer's decision is based on knowledge that the MSD reporting system has been effective, that the job hazard analysis did identify all of the MSD hazards, and that the permanent controls are in place and working.

If a covered MSD has not been reported in a problem job for 3 years, employers would only be required to maintain the controls in the problem job (including the training related to those controls) and to continue those elements of the program they must have even where no covered MSDs have been reported. Employers with manufacturing and manual handling jobs would be required to implement the management leadership and employee participation, and hazard information and reporting elements of the program. Employers with jobs other than manufacturing and manual handling would not be required to do anything beyond maintaining the controls (and related training).

Definitions (§ 1910.945)

Section 1910.945 What are the key terms in this standard?

The proposed ergonomics program standard includes a number of definitions which should be consulted to properly understand the terms used in the standard. Most of the definitions are straightforward and self-explanatory. Clarification of many terms is provided in the summary and explanation of the sections where those terms are used. Other definitions are explained in greater detail in the following paragraphs.

Musculoskeletal disorders (MSDs) are defined in the proposal as injuries and disorders of the muscles, nerves, tendons, ligaments, joints, cartilage and spinal disks. Examples of some of the more frequently occurring occupationally induced MSDs are given in the definition. These are medical conditions that generally develop gradually over a period of time, and do not typically result from a single instantaneous event. This definition specifically states that MSDs do not include injuries caused by slip, trips, falls, or other similar accidents. They can differ in severity from mild periodic symptoms to severe chronic and debilitating conditions.

No cost to employees means that the employer must bear any costs associated with the proposed requirements. Employees must be compensated at their regular rate of pay for time spent receiving training and medical management, or obtaining personal protective equipment. Where these activities require employees to travel, the employer must pay for the cost of travel, including travel time when the activities are not scheduled during the employee's normal work hours. The intent of this definition is to include any financial or other cost which, if borne by the employee, would serve as a disincentive to participating in the proposed rule's training, medical management, and personal protective equipment activities.

Periodically means on a regular basis appropriate for the conditions in your workplace, or as needed. The proposed standard would require that certain activities occur periodically; these activities include hazard identification, evaluation of the ergonomics program and the effectiveness of controls, and provision of information and training. The term periodically does not establish a specific frequency that is acceptable for conducting these activities; rather, the activities must be performed as often as necessary in order for them to be effective in the particular workplace in question. In some work environments with relatively few MSD hazards and little or no change in the work process over time, for example, refresher training may be adequate if performed every three years. A workplace with more substantial hazards or more complex controls may require training at more frequent intervals to ensure employee retention of information. If significant changes to the job occur, if new MSDs or MSD hazards are identified in the job, or if unsafe work practices are observed, then additional training would be necessary. The same performance orientation would apply to the other activities that the proposed standard would require to be provided periodically.

Physical work activities include any movements of the body or any static exertion involved in performing a job. This term is intended to cover all activities that have the potential to stress or strain muscles, nerves, tendons, ligaments, joints, cartilage or spinal disks.

Work restrictions are limitations prescribed by the employer, other qualified individuals, or health care professional on the work activities of an employee who is recovering from a MSD. Work restrictions are designed to prevent the employee from futher exposure to the MSD hazards that gave rise to the covered MSD. Work restrictions may involve limitations on activities the employee is permitted to perform in the current job, assignments to an alternative job (light duty), or complete removal from the workplace.

V. Health Effects

Activity-related disorders of the musculoskeletal and neuromuscular systems, acquired in the course of adult working life, are common in the population. Unlike acute injuries, these chronic conditions usually cannot be attributed to a single traumatic event. Instead, they often result from repeated episodes of exposure to causal and exacerbating factors.

The purpose of the Health Effects Section is to summarize knowledge in the field of musculoskeletal disorder (MSD) etiology and provide an overview of the multidisciplinary evidence that has established the relationship between work and these disorders. This body of evidence also provides the basis for the growing literature of intervention studies. These studies demonstrate the practical value of applying this well-established etiological knowledge to the reduction of the incidence of musculoskeletal disorders.

A more complete analysis of the studies underlying OSHA's Health Effects section is identified as Exhibit 27–1 in the docket for this rulemaking, (Docket S–777).

Following this introduction are five sections detailing the concepts of risk factors and their effects:

- Section A, Issues of Causation. This section discusses the etiology of MSDs and describes the multifactoral causation and exacerbation of MSDs by exposure to workplace risk factors, the role of personal factors and pre-existing disease, and medical and diagnostic issues.

- Section B, Biomechanical Risk Factors for MSDs. This section begins with an examination of the epidemiological criteria used to strengthen the argument for a causal relationship between a risk factor and an adverse health outcome. This is followed by a discussion of the basic biomechanical risk factors and modifying factors involved in MSD etiology.

- Section C, Evidence for the Role of Basic Risk Factors and Modifying Factors in the Etiology of MSDs. This section presents an overview of three bodies of evidence supporting the causal relationship between these risk factors and disease development: epidemiological studies, laboratory/medical studies, and psychophysical research. The Health Effects Section demonstrates that the sheer volume of evidence, plus the congruence of evidence from very different research traditions, makes a very strong case implicating of workplace biomechanical risk factors in the causation and/or exacerbation of MSDs. The Appendices provide a more detailed treatment of this evidence.

- Section D, Pathogenesis and Pathophysiologic Evidence for Work-Related MSDs. This section presents an overview of the mechanisms through which the risk factors detailed in Section B may cause physiological alterations, anatomical alterations, and disease in different types of soft tissues. Because one of the criteria useful in establishing a causal relationship between a risk factor and disease is the existence of a plausible biologic mechanism, the pathophysiological evidence in this section is an important link in the argument establishing such a relationship between workplace exposures and MSDs. Some redundancy exists between this generic discussion of risk factors and target tissues and the site-specific disorders examined in the Appendices. However, the goal is to underline common exposure and injury patterns without trivializing the complexity of tissue function and remodeling in disease and in health. For example, the ligamentures of the knee and the carpal bones are highly dissimilar in function and structure, requiring both generic and site-specific discussion.

- Section E, Glossary and List of Acronyms. This section provides definitions of terms and acronyms used throughout the document.

These basic overview sections are supported by set of Appendices (Ex. 27–1) that present, in much greater detail, the evidence linking workplace risk factors to outcomes of musculoskeletal disease:

- Appendix I, Epidemiology of MSDs, examines in more detail the epidemiologic evidence for work-related causation and exacerbation of MSDs. The Appendix begins with a summary of the NIOSH publication Musculoskeletal Disorders and Workplace Factors and continues to detail research in specific body areas. This section also contains a detailed overview of individual factors associated with work-related MSDs.

- Appendix II, A Review of Biomechanical and Psychophysical Research on Risk Factors Associated with Upper Extremity Disorders, details laboratory and psychophysical studies as well as the value of using biomechanical modeling to estimate risk associated with low-back and upper-extremity disorders.

- Appendix III, Pathophysiology of Regional MSDs, examines the pathophysiology of common MSDs by body region.

The Health Effects Section focuses on research in which investigators have found sizable and consistent results associating clinical disorders, such as chronic low back pain and injuries to muscle-tendon units in the forearm, with identifiable (extrinsic) work characteristics such as force and posture. There is less attention to conditions in which personal (intrinsic) risk factors or underlying disease status predominate, or in which there is conflict over disease etiology. However, there is widespread agreement in the literature that workplace risk factors play the major, although not the only, role in the development of work-related MSDs.

The Health Effects Section concentrates on external factors or stressors, because this is where the causes of human disease and discomfort in the workplace have been most clearly identified and where interventions have produced the greatest reduction in injury and illness. Intrinsic or personal factors, such as anthropometry, gender, age, physical conditioning, and general health are treated within each major subject area, where appropriate. Intrinsic predispositions are treated as modifiers of effect, reflecting the variability of their influence and the primacy of the basic risk factors.

The case of aging provides an example. The important body of information on physical performance and injury risk evolving from Finland (Tuomi, 1997) invalidates the notion

of a simple relationship between dysfunction and age, even when the complex issues of survivorship are taken into account. Further, it is difficult to separate the effects of aging from the effects of years of exposure to workplace risk factors. The ergonomic literature in general, and the materials cited in this section specifically, have not been designed to explore associations between subtle predisposition and observed risk. Moreover, much of the literature on acquired physical injury has identified particular patterns of susceptibility within each age stratification (Krause *et al.*, 1997).

Finally, the Health Effects Section concentrates on well-recognized studies and common disorders, and does not address the more unusual disorders and patterns of injury. The study of MSDs is an evolving field that requires improved and broad-based surveillance techniques to identify less common patterns of association between exposure and disease. However, the body of evidence in this Health Effects section makes a convincing case for the work-relatedness of many MSDs and the effectiveness of interventions designed to reduce the risk factors that caused the MSD in the first place.

A. Issues Of Causation

1. Multifactoral Causation and Exacerbation by Extrinsic Risk Factors at Work

MSDs usually result from exposure to multiple risk factors (Putz-Anderson, 1988; Kourinka and Fourcier, 1995, Ex. 26–432; Bernard and Fine, 1997, Ex. 26–1), with the possible exception of vibration-related disorders, which are discussed in Section D. The present state of knowledge does not allow a clear determination of whether these multiple risk factors act additively or synergistically (*i.e.*, in a true, multiplicative interaction) within the workplace, although some studies suggest the latter (*e.g.*, Silverstein, Fine, and Armstrong, 1986, 1987, Exs. 26–1404 and 26–34). The combination of this multifactoral causation, lack of knowledge about interaction, and the unavoidable difficulty of studying risk factors in isolation makes it difficult to determine a numerical limit for a given type of biomechanical exposure.

A more practical approach, accepting the intricate interplay of risk factors in MSD causation, may be to simultaneously assess all the risk factors in a given workplace. Punnett (1998) has demonstrated the effectiveness of predicting MSD prevalence using an exposure index that combines assessment of multiple risk factors: work pace, grip force, postural stressors, contact (compressive) stress, vibration, and machine-pacing of work. This research found that the prevalence of MSDs (whether defined by symptom reports or physical examination) increased markedly as the number of risk factors contributing to the index increased. The obvious corollary is that multifactoral interventions will reduce MSD incidence more effectively than interventions targeting only a single risk factor or a small subset of the risk factors actually present in the workplace.

2. Multifactoral Etiology and Other Contributions to MSD Causation and Exacerbation

The concept of multifactoral etiology of MSDs can easily lead to confusion. Various literatures define the concept in at least three different ways, as follows:

- ''Multifactoral etiology'' means that MSDs generally result from simultaneous exposure to, and often synergy among, several different risk factors—*e.g.*, high force requirements and awkward postures. (This is the meaning of ''multifactoral'' in Section A.2.a above.)
- ''Multifactoral etiology'' means that MSDs often result from exposure to and interplay between both work and non-work risk factors, although work factors are the greater influence in most cases (see Section A.2.b below).
- ''Multifactoral etiology'' means that MSD incidence and severity are affected by personal characteristics (physiological susceptibility and repair capacity, anthropometry, psychological characteristics, level of fitness, etc.) and underlying or preexisting disease (see Section A.2.b.ii below).

This Health Effects Section primarily uses the first of these definitions, which focuses on the contribution of multiple risk factors in the workplace to MSD etiology. Because the other two definitions can complicate the establishment of worksite MSD causation, the contribution of non-work exposures, personal (intrinsic) factors, and underlying or preexisting disease are briefly addressed here. Other parts of the Health Effects Section address issues of work-relatedness in detail, by specific body location, and also discusses personal factors where appropriate.

a. Non-Work-Related Risk Factors. The risk factors presented in Section B are not encountered solely in the work environment. Non-work risk factors obviously may contribute to disease causation, but they are as likely to exacerbate existing or work-related disease as to cause new disorders. Most non-work activities are not performed with the duration or intensity, or under the time constraints characteristic of occupational exposures. In addition, certain industries, such as meatpacking (OSHA, 1990, Ex. 26–3), demonstrate disease clusters and rates of disease that are substantially above population background rates and rates found in other industries. Franklin *et al.* (1991, Ex. 26–948) reviewed Washington State workers' compensation claims from 1984 to 1988. These investigators found that, compared to industry-wide carpal tunnel syndrome (CTS) incidence rates, oyster and crab packers demonstrated a relative risk (RR) of 14.8 (95% CI: 11.2–19.5) and the meat and poultry industries had an RR of 13.8 (95% CI: 11.6–16.4). The recent NAS report (National Academy of Sciences, 1998, Ex. 26–37) concludes, ''There is a higher incidence of reported pain, injury, loss of work, and disability among individuals who are employed in occupations where there is a high level of exposure to physical loading than for those employed in occupations with lower levels of exposure'' (p. 23). The existence of these elevated rates, despite the random variety of non-work risk factors experienced by employees in all industries, suggests the primacy of workplace risks in MSD causation.

MSD genesis represents a complex combination (and possibly interaction) of exposures to work and non-work risk factors, modified by the individual's ability to tolerate physical job stress. It is not the intent of this document to attribute sole causation to the workplace, but to establish work-relatedness. Non-work exposures certainly contribute to disease, but OSHA's mandate to create a safe and healthy workplace does not require that the only diseases to be controlled are those caused solely by work. Since the goal of the Health Effects Section is the clarification of workplace risk factors involved in MSD causation or exacerbation, the epidemiological studies cited generally represent research carried out in occupational settings.

b. Personal Factors and Underlying Disease. The third meaning of ''multifactoral,'' which includes personal factors and pre-existing disease, is also generally beyond the scope