



Building Your Quality of Life













ZURICH[®]

Trainer's manual

Soft tissue injury prevention program



Table of Contents

	Page 3	Trainer's manual	Introduction
	Page 4	Trainer's manual	Preparing for an actual workshop
	Page 6	Trainer's manual	Short program (45 – 60 minutes)
	Page 8	Trainer's manual	Long program (3 – 4 hours)
	Page 16	Section one	The worker, the employee, the person
	Page 17	Section two	Failures of the human machine
	Page 19	Section three	Risk factors that can contribute to soft tissue injuries/illnesses
	Page 23	Section four	Measures to control risks and minimize occurrences of soft tissue injuries/illnesses
	Page 33	Section five	Stretching, wellness and conditioning, programs —the construction athlete
	Page 39		Notes

Introduction

This trainer's manual has been developed to help new or experienced trainers work with people in their organizations to increase awareness of how to reduce the occurrence of soft tissue injuries. It provides session outlines and resources to work at all levels in the organization: individuals, supervisors and executives. This resource should be supplemented with further reading to understand more deeply the concepts and methods behind this training. Additional information is available through the AGC, Zurich or your insurance carrier.

Adults as learners

- Adults seek out learning experiences to deal better with life-changing situations and events.
- The more life-changing events encountered, the more likely adults will seek out learning opportunities.
- Adult learners need to see how the materials and information apply directly to them in their day-to-day work.
- Adult learners look for immediate payoffs. They want to know how they can apply the learning to their own jobs as soon as possible.

Facilitator style

Be professional, yet informal in your presentation. Facilitators who are approachable, friendly and share their personal stories about workplace safety are well received. Your openness with the group will encourage participants to share their experiences and questions with each other.

So, relax and let your personality, experience, knowledge and skills come through when you facilitate these materials.



Preparing for an actual workshop



Group size

While this program can be delivered to groups of five to 500, there is a diminishing rate of return as the attendee numbers grow. To encourage the greatest degree of participation, a group size of five to 25 employees seems to work best.

Materials and equipment

- Trainer's manual
- Participant's guide for each attendee
- "Soft Tissue Injury Prevention" video
- PowerPoint presentation, laptop and projector
- Pencils or pens for participants
- Laptop with DVD player, projector or monitor, and DVD or internet access (depending on the video source)
- Flipchart, markers and masking tape (if needed)

Short program options and long program options

- The short program is designed to run approximately 45-60 minutes and makes use of the participant's guide and video. See specific agenda on page 5.
- The long program is designed to run approximately three or more hours and makes use of the Participant's guide, video and PowerPoint presentation. See specific agenda on page 8.

Using the trainer's manual

- The trainer's manual is a tool, or roadmap to assist the trainer in preparing and presenting the soft tissue injury prevention program.
- To be the most effective in your training efforts, review all program materials in detail before delivering the session.
- Before facilitating a session, it is recommended that facilitators review this document completely as this material will assist in developing their background knowledge of soft tissue injury avoidance.
- The facilitator may wish to include all or part of this information in a presentation, depending on the amount of time available and the responsibility level of the individuals undergoing training.

Using the participant's guide

- The participant's guide is to be used as a support document to enhance the participant's learning experience during the session.

Using the training video

- The training video is approximately 20 minutes in length and identifies behaviors and conditions that can cause soft tissue injuries, as well as techniques to help reduce exposure to soft tissue injuries.
- The video can be shown in both the short (45-60 minutes) and long (three or more hours) training programs.
- The video can be run in its entirety and then summarized at the conclusion of the video, or the facilitator may choose to start/stop the video, integrating commentary and discussion after each specific section.

Using the PowerPoint presentation

The PowerPoint presentation is designed to be used in different training situations:

- As a stand-alone presentation
- In conjunction with the trainer's manual and the participant guide
- In conjunction with other parts of the soft tissue injury prevention program to allow a more in-depth training program as the facilitator deems appropriate

Short program agenda

Time needed:

45-60 minutes

Materials needed:

Trainer's manual, participant's guide and video

Objectives:

- Learn about soft tissue injuries.
- View a video to familiarize you with the techniques to prevent soft tissue injuries.
- Discuss how to manage and control soft tissue injuries on the job site.

Suggested timeline:

Workshop opening (10 minutes)

Workshop video (20 minutes)

Workshop discussion: Our exposures and controls (20 minutes)

Workshop discussion: Commitment to change/action plan/Q&A (5-10 minutes)

Short program (45-60 minutes)



10 minutes

Workshop opening

Welcome and introductions

Introduce yourself and any other speakers/guests. Provide background information and qualifications for presenting at the session. If the session is to be taught in an unfamiliar environment, it is advisable to give a short safety briefing regarding location of exits, fire extinguishers, restrooms, telephones, etc.

Session logistics

Review session start and end times, break time (if any) and any other relevant housekeeping issues.

Session objectives

- Learn about soft tissue injuries.
- View a video to familiarize yourself with the techniques to help reduce soft tissue injuries.
- Discuss how to manage and control soft tissue injuries on the job.

Participant's guide pages 2-3

What are soft tissue injuries?

Soft tissue injuries are injuries/illnesses to the body that affect the soft tissues, such as ligaments, tendons, muscles, nerves and fascia, but do not involve bone fractures. These injuries can result from common activities. Soft tissue injuries may occur from activities at home, during recreational activity or at work

20 minutes

Workshop video

Show video in its entirety.

20 minutes

Participant's guide pages 3-5

Workshop discussion: our exposures and controls

Question: Overall, what is our experience with soft tissue injuries? Where are our greatest exposures?

Discussion: Let the group know you will be using the participant's guide to help focus the discussion of our company's exposures and controls. Encourage the group to actively participate and follow along in its materials. Within each page, lead the group discussion on: What is our exposure/experience? How do we manage or control this exposure? What can we do differently in the future?

- Awkward postures
- Extreme forces
- Mechanical stress
- Prolonged vibration
- Extreme temperatures
- Repetitive motion
- Lifestyle choices
- Equipment operation
- Tool safety
- Total wellness
- Stretching
- Exercise
- Tobacco products
- Healthy weight

5-10 minutes

Workshop discussion: Commitment to change/action plan/Q&A

Discuss: The company's commitment to providing a safe working environment. Highlight any recent changes or enhancements, safety award winners or procedures and management's comments or insights.

Conduct Q&A: Ask if there are any questions on this topic, the organization's exposure and controls, or the commitment to address soft tissue injury.

Thank everyone for attending. Adjourn.

Long program (3-4 hours)



Long program agenda

Time needed:

3-4 hours

Materials needed:

Trainer's manual, participant's guide, PowerPoint presentation and video

Objectives:

- Provide a proactive educational awareness program.
- Reduce the occurrence of soft tissue injuries.
- Focus on construction activities.
- Provide practical, usable resources.
- Identify methods/procedures to help develop programs to control/minimize soft tissue injuries in your workplace.

Suggested timeline:

Workshop opening (10-20 minutes)

What are soft tissue injuries? (5 minutes)

The worker, the employee, the person (5 minutes)

What are the most common types of soft tissue injuries? (10-15 minutes)

Soft tissue injury risk factors (15-30 minutes)

Measures to control and minimize occurrences (30-40 minutes)

Activity to develop controls and prevention plan (30-40 minutes)

Stretching, wellness and conditioning programs (30-40 minutes)

Workshop summary (5-10 minutes)

10-20 minutes

Workshop opening

PowerPoint slide #1

Welcome and introductions

Introduce yourself and any other speakers/guests. Provide background information and qualifications for presenting the session. If the course is to be taught in an unfamiliar environment, it is advisable to give a short safety briefing regarding location of exits, fire extinguishers, restrooms, telephones, etc.

Session logistics

Review session start and end times, break times and any other relevant safety or housekeeping issues.

PowerPoint slide #2

Goals and objectives

- Provide a proactive educational awareness program.
- Reduce the occurrence of soft tissue injuries.
- Focus on construction activities.
- Provide practical, usable resources.
- Identify methods/procedures to help develop programs to control/minimize soft tissue injuries in your workplace.

Posted on flipchart, if available.

Optional participant introductions

Ask participants to introduce themselves, using any or all of the following questions:

- Name
- Job/job location
- Time with company
- Experience or knowledge of soft tissue injuries and/or prevention.

5 minutes

Participant's guide pages 2-3

PowerPoint slide #3

What are soft tissue injuries?

Soft tissue injuries are injuries/illnesses to the body that affect the soft tissues such as ligaments, tendons, muscles, nerves and fascia, but do not involve bone fractures. These injuries can result from common activities. Soft tissue injuries may occur from activities at home, during recreational activity or at work. They can be from sudden or long-term exposure. Soft tissue injuries are also known as Musculoskeletal Disorders or MSDs.

5 minutes

PowerPoint slide #4-5

The worker, the employee, the person

The Body: Soft tissue of the human machine

In this section, we are going to compare the human body to an identifiable piece of construction machinery, for example a person to a crane. Many activities and physical conditions can impact the soft tissues of the human body, some favorably, some not.

See also Section one, page 16

- **Muscles** provide the movement to the body segments. Compare this to the engine on the crane.
- **Nerves** provide communication to the body. Compare the human nervous system to the operators' controls on the crane; the complex electrical system that sends messages from the controls to the various parts of the crane.
- **Connective tissue** connects our body parts. Compare connective tissue to various cables, connectors and rigging in the crane's system.
- **Skin** provides protection and filtration of internal body parts. Compare our skin to the exterior of the crane, providing structural strength and protection from the elements.
- **Ligaments** connect bone to bone and stabilize joint structures. Compare our ligaments to the pins of the crane boom.
- **Tendons** transmit force from muscle to bone. Compare our tendons to the load cable.
- **Fascia** acts as general connective tissue. Compare our fascia to the rigging providing connectivity to the load.

Ask for any questions or comments.

10-15 minutes

Failures of the human machine: common types of soft tissue injuries

The human body is an amazing biological machine capable of self-healing, independent thought and control. Similar to a mechanical machine, the body has limits that vary from person to person. We, as humans, do not have an instruction or maintenance manual as a crane does, so we have to depend on constant feedback, self-maintenance and care.

PowerPoint slides #6-9

See also Section two, pages 17-18

What are the most common types of soft tissue injuries?

- Neurological
- Carpal Tunnel Syndrome
- Double Crush Syndrome
- Cubital Tunnel Syndrome
- Sciatica
- Vascular
- Thoracic Outlet Syndrome
- Reynaud's Syndrome
- Muscular
- Connective tissue
- Strains
- Tendonitis
- Tenosynovitis
- DeQuervain's disease
- Bursitis
- Intervertebral disc damage
- Back
- Myalgia
- Spasms

15-30 minutes

(Depending on size of groups and time needed for exercise and discussion)

Flipchart paper and markers

Soft tissue injury risk factors

Small group exercise:

Split the group into two similar-sized teams.

- Ask one team to list as many activities as possible that could lead to a soft tissue injury within the home/play/recreational environment. Provide flipchart paper and markers.
- Ask team two to list as many activities as possible that could lead to a soft tissue injury within the work/job site environment. Provide flipchart paper and markers.
- Ask each group to report back to the large class their findings and discussions. Comment where necessary.

Participant's guide Pages 3-4

PowerPoint slides #10-16

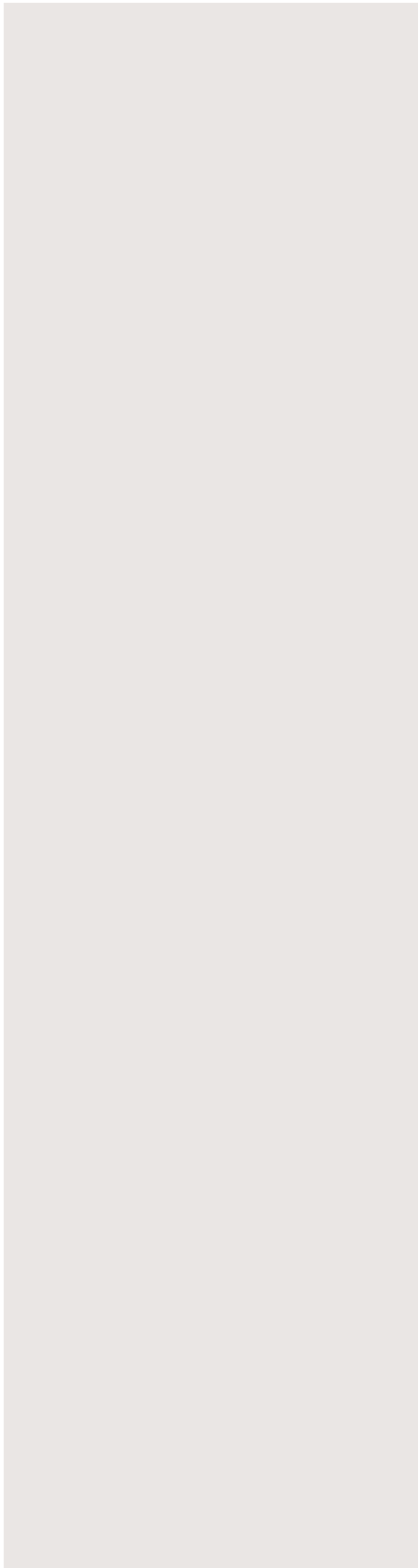
See also Section three, pages 19-22

Discuss the following risk factors in detail:

- Individual response
- Occupational
- Repeated motions
- Awkward postures
- Extreme forces
- Mechanical stress
- Prolonged vibration
- Temperatures extremes
- Physiological
- Obesity
- Diabetes
- Hormonal imbalances
- Circulatory disorders
- Arthritis, bursitis, other conditions
- Wrist size and shape
- Gender
- Smoking
- Alcohol consumption
- Poor Physical conditioning
- Age
- Psychological/psychosocial
- Stress
- Job security
- Happiness

10-15 minute

Break!



30-40 minutes

Measures to control and minimize occurrences

This section includes a variety of methods that individuals and companies may employ that will help decrease the likelihood of suffering soft tissue injuries from work, recreational or home activities. Soft tissue injuries can be prevented by each individual being aware of the hazards and the risk factors and by applying control measures to lessen their own risk.

Video

Let's watch a video that will provide us with additional information and insights. Run video in its entirety (approximately 20 minutes).

Participant's guide pages 4-5

PowerPoint slides #17-31 (Use slides appropriate for your topics)

See also Section four, pages 23-32

Discuss the following control measures in detail:

- Risk Indicators
- Performance Indicators
- Observations and communication
- Task design
- Postures
- Forces
- Repetition
- Rate, duration and recovery
- Substitution/mechanization
- Breaks/job rotation
- Static vs. dynamic muscle activity
- Work area planning
- Sit vs. stand
- Work surface height
- Reach zones/work envelopes
- Visual zones
- Sharp edges/hard surfaces
- Floor mats/insoles
- Shelving
- Environment planning
- Housekeeping
- Lighting
- Temperature
- Noise
- Vibration
- Awkward postures
- Mechanical stress
- Personal protection equipment (PPE)
- Manual material handling guidelines
- Lifting techniques
- Push vs. pull
- Equipment selection
- Incident Management
- Immediate/thorough injury illness investigation
- Focus on future prevention
- Medical/rehabilitation personnel
- Job descriptions
- Return-to-work protocols and modified duty
- Modified job activities
- Reducing risk factors
- Control factors adequately addressed
- Medical treatment

30-40 minutes

Activity to develop controls and prevention plan

In this section, the facilitator will need to create a well-thought-out activity ahead of time. This activity should be a common job to most of the participants attending and a common job that has the potential for soft tissue injury risk. For example: stripping overhead formwork.

Break the participants into small sub-teams and ask each team to reenact the task as outlined by the facilitator. Each team will need to record their analysis for possible soft tissue injury risk on flipchart paper.

After all the risks have been identified, each team will need to discuss and create a prevention plan for doing that activity (e.g.: stripping overhead formwork). Have the teams list their prevention plan on flipchart paper and be prepared to share with the large group.

Allow 15-20 minutes for each group to reenact, analyze and create a prevention plan.

Ask each team to report on their identified risks and prevention plan.

30-40 minutes

Participant's guide page 5

PowerPoint slides #32-35

See also Section five, pages -33-38

Stretching, wellness and conditioning programs

Professional athletes have several things in common with construction workers:

- They identify their limits.
- They work within their limits.
- They exercise to maintain good physical condition.
- They stretch before performing to protect their muscles and help reach maximum performance.
- They wear protective gear to help prevent injuries.
- They work to improve their skill level.
- If they are hurt, the whole team stands to suffer.

Benefits of stretching

- Stress relief
- Enhanced coordination
- Increased flexibility
- Improved circulation
- Better posture

Stretching policies/programs

- Mandatory vs. optional
- Pre/Post-work vs. Pre/Post-task
- Types of intervention

Stretching routines

- Warm up first
- Static vs. dynamic stretching
- Hold each stretch for 30 seconds
- Don't bounce
- Focus on a pain-free stretch
- Relax and breathe freely
- Stretch before and after work

Participant stretching demonstration

PowerPoint slides #36-39

Ask all participants to stand and find some open space in the room for an upcoming demonstration on stretching.

The stretching we will be doing in the next few minutes is designed to help keep the muscles that you use during your regular workday loose and strong. These exercises can also help strengthen the muscles that stabilize your spine. A stronger and more stable spine will help reduce the risk of injury to your back musculature.

Do these exercises slowly. Do not use quick motions. Stretch only until you feel light to moderate tension in the muscles. Do not hold your breath. Remember to breathe deeply. If you have any specific muscular soreness or pain, you should not join in on this demonstration. As always, make sure to report any injury to your supervisor immediately. Ready?

Trunk flexion. Stand with feet together. Bend at waist and reach toward toes. Keep knees straight, but not hyper-extended. Do this for 30 seconds. Remember not to bounce while doing this stretch.

Low back stretch. Stand and place both hands on your lower back/hips. Arch your torso backward and look to the ceiling. Hold this for 30 seconds.

Side stretch. Stand with feet apart. Reach overhead with left arm while bending to the right side. Hold for 30 seconds. Repeat on other side of body.

Encourage participants to stretch each and every day to help reduce the risk of soft tissue injury.

10 minutes

Participant's guide page 5

PowerPoint slides #40-51

See also Section five, pages 32-33

Stretching, wellness and conditioning

Discuss the following topics in detail:

- Wellness
- Health
- Diet
- Lifestyle choices
- Conditioning
- Strengthening and conditioning
- Cardiovascular
- Industry/task specific
- Personal protective equipment

Cost benefit analysis

- Human benefits – provide examples from your company
- Business benefits – provide examples from your company

5-10 minutes

PowerPoint slides #51-52

Workshop summary

Preparation for the construction athlete

- Acknowledging real life situations
- Enhancing the way work is done
- Creating a safer workplace
- Education
- Increasing the longevity of muscle and joint regions

Next steps/action steps

Discuss: The company's commitment to providing a safe working environment. Highlight any recent changes or enhancements, safety award winners or procedures, and management's comments or insights.

Conduct Q & A: Ask if there are any questions on this topic, the organization's exposure and controls, or the commitment to address soft tissue injury.

Thank everyone for attending. Adjourn.

Section one



The worker, the employee, the person

Compare the human body to an identifiable piece of construction machinery (e.g. person to a crane)

The body – soft tissues of the human machine. Many activities and physical conditions can impact the soft tissues of the human body, some favorably, some not.

Muscles provide the movement to the body segments. Compare to engine on a crane.

Nerves provide communication to the body. Compare human nervous system and the operators' controls on the crane, the complex electrical system that sends messages to the various parts of the crane.

Connective tissue links various body parts. Compare connective tissue to various cables, connectors and rigging in the crane system.

Skin provides protection and filtration of internal body parts. Compare to the exterior of the crane, which provides structural strength and protection from the elements.

Ligaments connect bone to bone and stabilize joint structures. Compare to pins of the crane boom.

Tendons transmit force from muscle to bone. Compare to the load cable.

Fascia acts as general connective tissue. Compare to the rigging providing connectivity to the load.

Failures of the human machine

The human body is an amazing biological machine capable of self-healing, independent thought and control. Similar to a mechanical machine, the body has limits that vary from person to person (model to model)

We, as humans, do not have an instruction or maintenance manual as a crane does, so we have to depend on constant feedback, self-maintenance and care. The wisdom we use in applying feedback, maintaining and caring for our bodies will determine how resistant our bodies will be to failure.

Common types of soft tissue injuries/illnesses

There are many types and variations of soft tissue problems. We have some individual control over most of these issues – our daily decisions on and off the job impact both frequency and seriousness of soft tissue injuries.

Muscular: Issues related to the human muscular system. Muscles are our motors; they power our movement and are subject to many influences.

Myalgia: Refers to sore muscles. If you play baseball with your child on an irregular basis, your muscles may become sore after a day of chasing fly balls they hit. This is an example of myalgia.

Strains: An injury to a muscle or tendon may be as simple as a stretch in the muscle or tendon, or it may be a partial or complete tear in the muscle-and-tendon combination. If you turn your ankle stepping on someone's poor housekeeping, you may strain your ankle. Overexertion, sudden load shifts, etc., can also lead to a strain.

Spasms: A local twitch response of a muscle - an involuntary reaction of a muscle. One of extended, continuous duration may also be called a cramp. A spasm is usually a secondary response to a mild or severe injury. It can come from mental or physical stress and other associated risk factors.

Neurological: Issues related to the human nervous system. Neurological problems are often created by pinching or pressure on a nerve. These types of injuries often follow activities that include direct pressure, repeated joint movement, frequent gripping/torque, awkward postures, high forces, vibration and pre-existing physical conditions.

Carpal tunnel syndrome: Related to pressure/pinching of the nerves in the carpal canal in the wrist. Symptoms are numbness, tingling, weakness, and sometimes pain.

Double crush syndrome: Pressure/pinching in the nerve path from the neck to the hands causes pain and symptoms similar to carpal tunnel syndrome in a hand. Double crush syndrome is often related to pressure/pinching of the brachial plexus nerve bundle that runs from the neck to the hands. Symptoms can be confused with carpal tunnel syndrome.

Cubital tunnel syndrome: Pressure/pinching the ulnar nerve across medial elbow. Symptoms include numbness and tingling of the ulnar nerve area. Hand weakness is common in later stages. Cubital tunnel syndrome is related to pressure/pinching of the ulnar nerve as it passes through the cubital tunnel in the elbow.

Sciatica: Nerve impingement in the low back resulting in pain and numbness, tingling in the low back and lower extremities. Sciatica is related to pressure/pinching of nerves passing through the spine.



Vascular: Issues related to the human circulatory system, such as restricted blood flow.

Thoracic outlet syndrome: Obstruction of brachial plexus at the thoracic outlet in the supraclavicular space. A combination of issues may lead to a literal “pain in the neck.” It can cause pain in the arm or hand and adversely affect circulation to the hand. Poor posture is closely tied to this, as well as carrying heavy loads.

Reynaud’s syndrome: Microvascular vasospasms to digits in the hand which affect the circulatory system and nerves and leads to cold hands. Cold environments, vibration exposure and repetitive activities may contribute to this condition.

Connective tissue: Issues related to soft tissue that connects muscle tissue to bone, organs to organs, etc. A variety of symptoms may be related to soft tissue injury in the connective tissue.

Strains: Damage to ligaments surrounding a joint stemming from numerous exposures such as overexertion, sudden and unanticipated overstretching, the use of muscles before they are warmed-up or stretched, etc.

Tendonitis: Inflammation of the tendon, the fibrous cord that attaches muscle to bone. “Tennis elbow” is another name for tendonitis of the elbow. Tendonitis may result from exercise or from doing the same thing repeatedly for long periods.

Tenosynovitis: Inflammation of the sheaths surrounding the tendons. Commonly seen in the fingers, this condition appears to be primarily related to aging. The sheath surrounding the tendon thickens and loses flexibility. Heavy use of the hand may make the condition worse.

DeQuervain’s disease: Inflammation of the extension tendons of the thumb. Heavy repetitive use of the hand/wrist can lead to irritation of the first dorsal compartment of the wrist. There may be some swelling of the wrist at the base of the thumb. Repetitive actions such as grasping, pinching, squeezing and wringing can lead to inflammation.

Bursitis: Inflammation of a bursa. The bursa is a small sac that is located at points where friction might occur between bone, muscle and skin. It serves to reduce friction and provide greater range of motion. The number of bursa varies by individual but generally, people have about 160 of these. Some (the deep ones) form at birth, some (the ones separating skin and muscle) form after birth. Irritation may cause these to swell, fill with fluid and become painful. Irritation may come from a blow or overuse.

Intervertebral disc damage: Deterioration, chronic or acute, to the intervertebral disc of the spine. The disc serves as a shock absorber between the vertebrae in the back. The top of the disc is thinner than the bottom. The disc may become diseased through degeneration or injury and rupture along the weaker top, allowing the jelly-like fluid to escape into the spinal area. This causes pressure and pain and can lead to weakness or numbness in the limbs served by the affected nerves.

Back: A common problem with many contributing factors. Back problems may include one or more of the previously mentioned issues. Can be a muscular, nerve, ligament, tendon or any other soft tissue issue in the back. May be related to poor posture, heavy loads, overuse, failure to plan lift activity, degeneration through age, poor body positioning, etc. Back injuries are among the most feared because of the potential for serious, lifestyle-changing impact.

Risk factors that can contribute to soft tissue injuries

Individual responses to stimulus differ greatly to every risk factor noted.

Personal: As is the case with many things, individuals undergoing the same stimulus to the same soft tissues may respond differently. The human body has the ability to repair itself to a great extent if given adequate sleep and nutrition. The more you take care of your body at home, work and play, the more likely you are to avoid a soft tissue injury/illness.

The human body is a tough, resilient machine if well maintained. The capacity of each individual to respond to a given stimulus in his or her own way is one of the main reasons soft tissue injuries are best recognized and controlled at an individual level.

Occupational: An excellent training activity is to have the class generate a list of tasks they perform that could relate to soft tissue injuries. Then discuss the types of activities that each requires and see which ones fall into more than one category. The list can be evaluated for home, work or recreation.

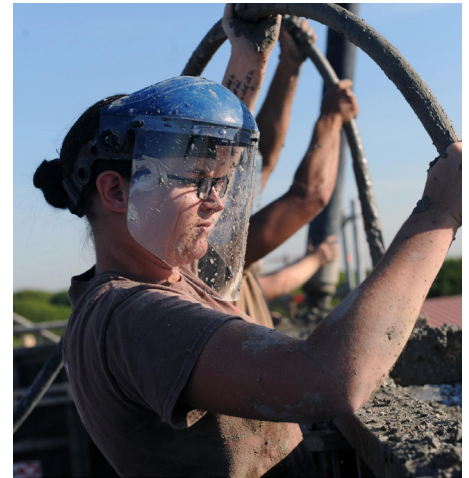
The same soft tissue injury issues may be experienced at home and in our recreational activities that we can experience at work. Occupational distinguishes work-related issues from other issues. This exercise can be carried into the next section by relating potential control methods for each item when they are discussed.

This becomes a punch list of occupational issues to look into for the management. It also provides individuals with specific issues they can focus on in their recreational and home life.

One of the benefits of training employees to be aware of the issues and controls is that it enables them to better care for themselves at home as well as on the job.

Repetitive motions: The more repetitive the task, the more rapid and frequent are the muscle contractions. Muscles required to contract at a high velocity develop less tension than when contracting at a slower velocity for the same load. Therefore, tasks requiring high rates of repetition require more muscle effort, and consequently more time for recovery, than less repetitive tasks. Tasks with high repetition rates can become sources of injury even when the required forces are minimal and normally safe. Jobs that require the worker to perform highly repetitive motions can contribute to the onset of soft tissue injuries. The occurrence of tenosynovitis and tendonitis has been associated more with repetitive activity than variable activity.

Examples of repetitive motions include finishing concrete with a trowel, painting your house with a brush and roller, etc. Fortunately for construction workers, their work is more variable so they rarely perform the same task over and over, day after day as happens in manufacturing and some other industries. This injury type is not as common as in some other industries.



Awkward postures: An awkward posture of a joint is defined as any posture that deviates away from the “neutral posture” of the joint. Subsequently, there are degrees of awkwardness. The neutral posture of a joint is generally considered about midpoint of the range of motion for the joint. The further one deviates from the neutral position of a joint, the weaker and more susceptible to injury that joint becomes. As one deviates away from the neutral position, strength is reduced, biostatic pressure within the joint increases, and the structural strength of the joint is compromised. The pressures and stresses on supportive and connective tissue increases significantly. Examples of awkward postures are bending over a drill, picking a load up over the side of a pickup truck bed, bending to work underneath something, etc.

Extreme forces: Naturally, as increased loads are placed on any anatomical structure, increased strain will occur. As muscle effort increases in response to high-task load, circulation to the muscle decreases, causing more rapid muscle fatigue. In some cases, the time it takes the muscle to “rest” or recover its ability to respond, can exceed work time. Deprived of sufficient recovery time, soft tissue injuries may occur. Under extreme loads, bones can break and skin, muscles, ligaments and tendons can tear. Not all forces are generated by heavy external loads. Internal loads can be generated from contact with sharp edges or by awkward postures.

Examples include pushing, pulling, carrying heavy loads, etc. Extreme force is generally considered to occur when you must overexert yourself to accomplish the task. An example might be pulling back a bow or pulling up a heavy load suspended from a rope.

Mechanical stresses: External mechanical stress can contribute to internal strain, pressures or restrictions. Mechanical stressors can result in restricted blood flow, soft tissue compressions, and neuro-impingements. Prolonged exposure to external mechanical stress can have permanent or chronic

consequences. Examples include kneeling on a hard surface, pressure of the body against an object, using the fist/hand as a hammer, etc.

Prolonged vibration: The body absorbs energy, primarily through the buttocks and hands, which may result in fatigue and soft tissue damage. Continuous exposure to vibration can also induce vascular constriction and blanching of the skin. Two examples are operation of vibratory hand tools and ride-on vibratory equipment.

Extreme temperatures: Extreme heat and cold can place excessive physiological strains on the body. With increased heat, skin blood flow is increased, vasodilation occurs, and perspiration increases – total circulatory demand increases, heart rate increases, blood and oxygen levels decrease and sweating increases significantly. With cold, skin blood flow is decreased, vasoconstriction occurs and nerve conduction decreases – circulatory demand decreases, blood flow to extremities is reduced and nerve conduction/speed of reflex is reduced. Reduced blood flow to muscles, lower neurological response time, and wet skin can contribute to soft tissues injuries and other neuromuscular disorders. Examples include extreme winter or summer weather, extreme industrial environments, etc.

Physiological: There are certain conditions that can affect the human body. We sometimes overlook these conditions as a contributing factor for soft tissue injuries. A few are listed for consideration and comments.

Obesity: Obesity can cause greater loads on the musculoskeletal system, higher levels of fluid retention and higher tension curves with muscular movement. Obesity remains a sensitive subject. Extra weight places additional strain on the back and may contribute to soft tissue injuries. Not only is there a soft tissue impact, but there is an impact on use of equipment as well. Ladders and fall protection equipment, among other construction site issues, are rated by weight with maximum allowable limits.

Diabetes: Tingling and numbness in the extremities is one common symptom of diabetes. The anesthetizing effect can prevent or inhibit neurological function and reduce neurological feedback. An example would be people with diabetes becoming unable to feel their grip on a hand-tool. People with diabetes also frequently suffer problems related to their feet. Long periods of standing, wet conditions, etc. can promote foot ulcers and other problems in diabetics. The weakened tissue may be more susceptible to soft tissue injuries. Professional medical assistance should be sought by any diabetic having issues with symptoms.

Hormonal imbalances: Thyroid-related issues are common to men and women and may result in hormonal imbalances. Anyone who suspects they have an issue with hormone balance should seek assistance from their personal physician.

Circulatory disorders: Lack of blood flow and the resultant lower levels of oxygen to muscles and other tissues may impede soft tissue injury recovery. Localized fatigue can occur. Many factors may contribute to poor circulation. Watch for loss of color in the skin. Pale or gray skin tone may indicate poor circulation. One of the goals of stretching and exercise is to improve circulation in the muscles. Remember, an ashen face, chest pain and shortness of breath are indicators of serious problems and must receive immediate medical attention.

Arthritis, bursitis and other joint conditions: Diseases that impact the joints and create swelling, stiffness, pain and other symptoms.

A person with arthritis or joint conditions may be unable to grip a hand tool, use a computer keyboard or reel in a fish. Persons with these symptoms should seek assistance from their personal physician.

Wrist size and shape: Smaller and flatter wrist sizes have been associated with an increased risk of soft tissue injuries to the wrist. Humans differ in bone and muscle structure. Individuals with wrists that are naturally structured to provide larger openings for nerves to pass through may be less likely to develop symptoms of soft tissue injuries. Size of the wrist is not a definitive factor, however, only an indicator.

Gender: The female physique is structured for physical strength somewhat differently than the male. Whether male or female, avoiding soft tissue injuries requires individuals learn to “work within themselves” to use their musculature without injury.

Smoking: Smoking displaces oxygen molecules with other harmful chemicals inhaled by smoking. The reduction of oxygen inhibits recovery and increases fatigue. Smokers may see a longer recovery time compared to non-smokers for soft tissue injuries.

Alcohol: Alcohol consumption displaces oxygen molecules with other chemicals absorbed into the blood stream. The reduction of oxygen inhibits recovery and increases fatigue. The use of alcohol affects one’s motor skills and reaction times much sooner than most of us realize. Consuming alcohol may have a negative impact on recovery due to oxygen displacement and the tendency to do things to cause further injury while under the influence.

Physical conditioning: The inability of a worker to withstand the demands placed on the body by the task at hand will increase the risk of injuries, fatigue, inefficiencies and errors. It is a mistake to think that because we are engaged in physical work daily, our bodies are well conditioned. Conditioning requires consistent, planned exercise in most cases.

Age: With increasing age, physical strength and flexibility can be lost. Wear and tear, injuries and illnesses are more likely to present themselves. We know that as we age we may lose some flexibility and strength. Naturally, many people may be sensitive to this issue. An example is tendonitis, which occurs more frequently in persons over age 30, but may occur in younger people who “over-do” their exercise. More frequent rest periods, drinking plenty of water, etc., will help minimize the effects but individuals must ensure they work within their body’s abilities.

Psychological/psychosocial: Perceived peer pressure may result in workers trying to exceed their physical limitations to prove themselves worthy. Examples are workers who think asking for assistance is a sign of weakness or that if they can lift more than a fellow worker they are more valuable to the company.

Stress: Stress is essentially a chain of reactions, beginning with the excitation of the brain stem, followed by an increased secretion of hormones from the adrenal gland, especially adrenaline and noradrenalin, known as “performance hormones,” since they keep the body at a state of heightened

awareness. This increased stimulation increases heart rate, blood pressure, glucose levels, and metabolism. These increases reflect an intensified readiness to defend life, including fighting, fleeing or other physical achievements.

Stress can come from marital problems, financial concerns, illness and many other sources. Stress can wear you down, lessen the ability to focus as needed and may contribute to serious accidents.

Security: Lack of security and unhappiness may contribute to lower productivity, motivation, attention to detail, absenteeism, retaliation, symptom magnification and stress. Questions about security is an example of a source of stress that can have significant negative impact on a worker’s performance. Attention to detail is necessary if soft tissue injuries are to be avoided.

Happiness: Every individual’s attitude toward life in general as well as their work influences their performance. Many of the factors already discussed influence a person’s happiness. A happy person is less likely to exhibit stress that may divert his or her attention and contribute to an injury.

Measures to control risks and minimize occurrences of soft tissue injuries

This section includes a variety of methods that individuals and companies may employ to help decrease the likelihood of suffering soft tissue injuries from work, recreational or home activities. Soft tissue injuries can be prevented by each individual being aware of the hazards and the risk factors and applying control measures to lessen their own risk. Soft tissue injuries are prevented on a more personal level than perhaps any other type of bodily injury.

Risk indicators: Risk indicators are numerical representations of events such that they show frequency and trends of injury types. Indicators draw a picture of what is going on.

Injury data: Injury data is a reflection of past activities. Injury data can provide valuable information on how to design changes in the workplace including rotation of workers, design of the work area and other changes to prevent recurring accidents. OSHA logs, insurance loss runs and other internal company data can help provide needed insight. It is reactive, useful only after accidents happen.

Surveys/questionnaires: These tools can be more proactive sources than injury data. Workers can often tell you what is affecting the way they can work safely before an accident occurs. Surveys can be formal or informal, written or verbal. They can provide more real-time information. Surveys are more useful if the employees trust management to use the data gathered to help prevent injuries. Survey data can be difficult to present as it may contradict management beliefs.

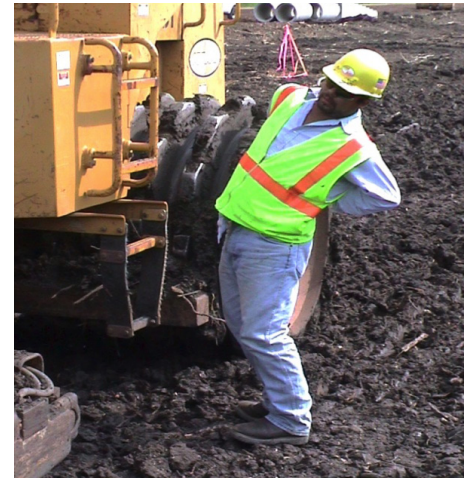
A good exercise is to conduct a pre-class survey asking a few questions about soft tissue injury exposures and the job. Follow it up by using the same questions in a post-class survey. This method can provide you insight as to the effectiveness of your class and the kind of hazards the people are seeing on the job.

Performance indicators: Use of data to show status, progress, quality, absenteeism, etc. Numbers representing absenteeism, scrap, rework, quality, cost, productivity, flow time, output, etc. These indicators may be more likely to indicate potential problems when employees work long hours for extended periods.

Observations: Soft tissue injury avoidance lends itself to using trained observers who use check sheets to tally what they see, identify trends and help workers recognize actions they perform that may increase their risk of sustaining a soft tissue injury by providing timely feedback. In a top-notch program, observers will explain to the workers the issue and the control method that will best help them avoid a soft tissue injury. This is similar to observations in a behavioral safety program. Companies with a behavioral safety program can easily adapt their list of critical behaviors to include soft tissue injury issues. Companies without a behavioral safety program have the option of beginning with a focus on soft tissue injury prevention and then expanding into other injury prevention activities.

Job performance issues: Job performance issues are closely related to observations. However, workers may identify issues related to task performance that they feel may increase the risk of soft tissue injury occurrence. For example, a deer hunter can learn through building deer stands over the course of several years the best way to do that task or he or she may talk it over with friends who have done it, compare notes and learn from the experience of others. It is no different on the job, where we can learn by talking to others and avoid some potentially painful learning experiences. Learning to perform tasks without injury, especially soft tissue injuries, is a mark of success in the construction industry.

Task design: How we set up our jobs, at home and at work, has much to do with our chance of success in completing them efficiently, without injury and at an acceptable quality level. Plan for success.



Effective planning must be based on knowledge. After workers identify potential injury causes and how to control the hazard, they can develop methods of performing the task in a productive, efficient and injury-free manner.

Who: The task designer is the person who plans the task at hand. The person doing the job may also be the task designer. The foreman or superintendent may be task designers.

Postures: Tasks that regularly require the worker to deviate from the neutral position should be evaluated to determine if improvements can be made.

There are many opportunities to control posture exposures on typical construction sites. Rotating a flagman to an assignment that requires body movement is an example of eliminating static posturing. An electrician working overhead could swap tasks with a coworker installing wall receptacles.

Maximizing optimum posture for each task can maximize strength, reduce fatigue and minimize injury potential. It is also desirable to redesign tasks so that extreme range of motion postures and static posturing are minimized or eliminated.

Changing tasks allows workers to rotate the muscle groups being worked. The electrician installing wall receptacles might be stooping or bending. The electrician working overhead would be stretching his/her leg and back muscles. Other than rotating the workers, task redesign might lead to using a wheeled mechanics stool for the receptacle installer to work from, controlling the bending/stooping exposure. Avoiding continual use of a muscle group may help prevent soft tissue injuries.

Forces: Forces can be encountered through weight or applied physical force. For example, the worker who operates a concrete vibrator during an extended concrete pour or one who operates a jackhammer for an extended period. Extreme forces can contribute to overexertion, fatigue and repetitive stress injuries.

Another example would be workers who carry materials with sharp edges (beams or siding) on their shoulders for long periods. Use of padding can dilute the effect of the sharp edge and using two people to carry a heavy object helps control the effect of weight. Heavier loads create more stress to the musculoskeletal structure when lifting, carrying, transporting, pushing, pulling and gripping. Applied force can occur when the body is exposed to hard or sharp surfaces.

Repetition: The number of repetitions of a movement within a given time period is associated with risk for developing repetitive motion disorders. Repetitive motion disorders are not as common in construction as in other industries; however, some activities to consider for rotational work are:

- Troweling concrete
- Hammering nails while building forms
- Using a circular saw to make repetitive cuts

What are some other examples the people in your class might face?

The best rule of thumb is to avoid designs using repetitive motions, or at least minimize them, since the point at which repetition will cause injury remains unknown, and probably varies from one person to another.

Designing out using repetitive motion may be achieved through engineering and administrative means.

Rate, duration and recovery: Fast-paced, long exposure jobs require more recovery than moderately paced and multi-tasked jobs. Using a vibrator during a concrete pour, raking concrete, stripping forms and installing forms are examples of fast-paced, long exposure jobs. The longer the period of stress on the musculoskeletal system, the longer the recovery period should be.

Substitution/mechanization: Use of mechanical aids such as forklifts, chain falls, etc., rather than lifting and carrying.

As an industry, we have the tendency to think we can do it all. “Why wait for help when I can do it myself?”

The reason to use assistance is that machinery is easily repaired or replaced; people are not. On the job we may see two people moving a pallet of material weighing over 150 pounds when a forklift is sitting nearby. Do not waste that available assistance; plan it into the work and use it.

Breaks and job rotation: Breaks and job rotation are two primary administrative tools for minimizing exposure to repetitive motions.

Having workers rotate from one assignment to another during high exposure operations may allow the recovery time needed to reduce the potential for an injury.

Breaks should be designed according to recovery needs.

Static vs. dynamic muscle activity: Dynamic effort is characterized by a rhythmic alternation of contraction and extension, tension and relaxation.

Workers who trowel or rake concrete during a pour are experiencing dynamic muscle activity. Workers who hold a heavy concrete vibrator on their shoulders have a static muscle activity.

Static effort is characterized by a prolonged state of contraction of the muscles, which usually implies a postural stance. During static effort, blood vessels are compressed by internal pressure of the muscle tissue, so blood no longer flows through the muscle. During dynamic effort, the muscle acts as a pump.

Providing tasks that mix static and dynamic work is the ideal approach to help prevent soft tissue injuries. In construction work, there are few purely static tasks. Construction work usually requires movement with intermittent periods of static positioning.

At 60 percent of maximum muscular contraction, blood flow is almost completely interrupted. At 15-20 percent of the maximum, blood flow should be normal. The onset of muscular fatigue from static effort will be more rapid the greater the force exerted—in other words, the greater the muscular tension.

Compare this with factory work where employees sit or stand in one place and use their arms and hands to perform a task over and over. Factory workers may have static issues in their legs and backs while they have repetitive issues with their shoulders, arms and hands.

Construction has more stooping and kneeling issues in the static field that we have to deal with. In construction our focus is in balancing static and dynamic, avoiding extended periods of either.

Work area design: How do we set ourselves up for success?

A look at the fishing sport shows us how a workplace, in this case, a bass boat, is designed with the task and the person in mind. We need to do as well in setting up our job site work areas. The following tips will help you achieve this.

Sit vs. stand: Sitting changes the geometry of the spine. Sitting or standing depends on the job assignment, but a combination of both sitting and standing would likely be better than all of one or the other. The changes can increase disc pressures, ligament strains, vascular impingements and muscular strains.

Standing can be stressful on the lower extremities, low back and joints. If a task involves extended periods of standing, remember the old bartender's trick – have a place where the person standing can raise a foot, like the rail under the bar. Bartenders learned centuries ago that raising one foot put less strain on the back and enabled them to stand in one place longer.

Where feasible, designing tasks so that sitting and standing can be complementary will provide variability.

Work-surface height: Work-surface height is critical to ensuring proper posture. This is especially observable in storage/staging areas where materials are usually stored at ground level, requiring workers to bend and lift material needed for their work assignment. Store material as close as possible to where it will be used. Try to store material high enough so that workers will not have to bend too far to pick it up. Set up workbenches at a comfortable height, adjustable when possible. Remember, in most cases, more than one person will be using that workbench and they will likely differ in height and build. Depending on the individual's stature, the work being performed and the work material, optimum height will vary.

Reach zones/work envelopes: Extending the arms forward to reach or hold objects may diminish one's optimum neutral posture. Keeping material, work and supplies within comfortable reach will improve posture and productivity. Providing employees with adequate room to work allows them to practice better body mechanics.

Employees should know about the zone in which they can handle the maximum weight with the least strain on their body. Like a mechanical crane, if we keep the load close to our body we can lift more with less strain. In the human body, this equates to keeping your upper arms from shoulder to elbow along your sides, bending your elbows and working within that power zone. Remember, flexing the knees for short lifts and lifting with the legs keeps some strain off the back and shoulders.

Visual zones: Being able to clearly see everything you need to see helps workers make good decisions. Providing clear lines of sight that are not blocked as the job progresses or moving the worksite as needed will help. Maintaining a clear line of sight is especially important when carrying materials.

Sharp edges/hard surfaces: Contact, especially prolonged contact, with sharp edges and hard surfaces can cause soft tissue compression injuries. Often something as simple as an orthopedic or gel insert in a shoe can significantly reduce soft tissue injury potential for a worker who spends all day working on a concrete surface. A simple shoulder pad for workers who carry sharp-edged beams on their shoulders may greatly reduce pressure on the shoulder and lower the potential for a soft tissue injury.

Floor mats/insoles: Jobs that require prolonged standing or walking on hard surfaces can benefit from floor mats and viscoelastic insoles. Prolonged standing on hard surfaces such as stone or concrete places added stress on our ankles, knees, hips and backs. Using a softer surface such as a floor mat (or even cardboard for a short period) will provide those joints some relief. Remember, if workers are performing a spark-producing activity, cardboard or other flammable material may not be suitable. Another control measure for prolonged standing is to provide a footrest so one leg at a time can be slightly elevated. Both matting and insoles are designed to provide protection and impact attenuation to the employee.

Shelving: Shelving heights and the subsequent height of stored materials can affect the lifting postures of employees. When storing materials, place the more frequently used heavy items in the strongest lift zone. To determine an individual's strongest lift zone, place their arms along their sides and bend at the elbow, keeping the upper arm as straight as possible. As you extend your upper arms outward away from your body, (forward or to the side) you rapidly lose strength and put increased strain on the shoulder and elbow joints. Material handling is a major source of workers' compensation injuries and proper shelving is a key issue in preventing them. Heavy and frequently handled material should be located within the "strikezone."

Environmental design: Construction worksites are often outside and workers are exposed to weather, noise, dust and other factors addressed below. These factors will provide challenges to construction workers for years to come.

Consider the work to be performed and the needs of the individuals doing the work. Provide heaters, shade, covering, etc. when possible. Try to work in the dry and avoid noise where possible. When the environment cannot be controlled, personal protective equipment can often be used. Specific risk factors are listed below.

Housekeeping: Keeping our worksites clear of slip-and-trip hazards, having materials stored to prevent slippage, etc. are key methods of preventing soft tissue injuries.

When workers carrying a load that partially obscures their vision come across a piece of conduit, 2" x 4" or a soft drink can in the path of travel you have the recipe for a soft tissue injury – if not something more serious. Slips and trips can lead to unexpected, uncontrolled muscle movement. A falling object striking a foot can cause swelling and soreness that may affect the person's ability to walk and perform their job. Housekeeping is an issue that affects every job and every person on the job. Good housekeeping will reduce the risk of soft tissue injury and everyone on the job can help improve housekeeping.

Lighting: Lighting is a critical element in the design of any workplace. Without adequate lighting, important task elements may be incorrectly seen or not be seen at all. Factors affecting the adequacy of lighting are its quality and quantity. General construction guidelines regarding lighting often do not meet the true needs. Make sure employees are able to see well, especially in areas where footing may be uneven or cluttered. Lighting can be direct or indirect. With indirect lighting, there is no direct glare. Glare can cause misinterpretation, confusion, errors and eye fatigue.

Temperature: The temperature in a workplace or work area can strongly influence how effectively a task is performed.

Excessive heat or cold may contribute to soft tissue injuries and may have other physical impact on the worker as well. Key times to pay attention to the temperature are at the start of hot summer and cold winter weather. During the period of change, our bodies may not be acclimatized and we tend to push ourselves too hard. Hot, humid conditions added to the demands of moderately heavy to heavy physical work may cause excessive fatigue and potential health risks by reducing a person's work capacity. Cold conditions can lead to decreases in productivity and potentially unsafe actions because of a loss of flexibility.

Discomfort produced by exposure to conditions outside the thermal comfort zone can distract a person from the task at hand and may increase the potential for unsafe acts.

Noise: When sound becomes annoying, we usually refer to it as noise. The negative effects of noise have been associated with impaired alertness, disturbed sleep, annoyance, and other physiological influences like elevated blood pressure, accelerated heart rate, muscle tension and constricted blood vessels.

Whenever it is too loud to carry on a conversation without having to raise your voice or you must strain to hear, the noise level should be lowered or hearing protection used. An example of noise-related soft tissue injury might be when two people are teaming to carry a heavy object, the front person calls out a turn, the back person does not hear the call and the load becomes unbalanced putting more weight on one person. Noise also impairs concentration and, under such conditions, performance and output may suffer.

Vibration: A consistent movement that is usually produced by a powered hand tool or piece of equipment. Prolonged exposure to vibration can lead to tissue and/or nerve problems, resulting in a loss of strength. Vibration may be caused by an improperly balanced tool. Use of padding, anti-vibration gloves, etc., can help decrease the impact of vibration. When exposed

to vibration, such as operating soil compacts, it is a good idea to switch operators frequently so exposures are not continuous but may be interspersed with periods where the soft tissues can rest and recover from the vibration.

Personal protection equipment:

Several items of personal protective equipment are engineered and designed to help prevent soft tissue injuries. Personal protection equipment such as kneepads, hearing protection and anti-vibration gloves can help prevent soft tissue injuries. Remember, the first choice is to engineer the hazard out of the work. The second is to control the risk administratively. If the risk can not be controlled by those means, personal protective equipment may be required. Many times a combination of the two or even all three methods is used to control soft tissue injury exposures.

Clothing: Tight restrictive clothing may impede movement. Clothing is a key issue in temperature control. Using layering to help ensure the right level of extra warmth is available for any given combination of environmental temperature and physical work performance. In addition, clothing should fit properly, to help avoid soft tissue injuries from tripping or getting loose clothing caught on something in passing. Clothing that is worn as protection can guard against skin abrasions, etc. In the winter, thin, lightweight and thermally protective clothing is recommended over tight, thick clothing.

Footwear: Proper footwear can help prevent slips, trips and falls that may cause soft tissue injuries. Good quality footwear with the appropriate sole for the surface conditions expected is important. Many employees are now using gel insoles to provide comfort during long periods of standing. When having boots resoled, employees should make sure the right type heel and sole are used. Heels and soles that are too hard or otherwise not suitable for the boot design can lead to shock on the knees. A person standing long periods on concrete would want a different boot than one working in brush and mud.

Gloves: There are many varieties of gloves designed to help control specific hazards. Shock, heat, cold, vibration, puncture and laceration are some of the hazards gloves can prevent.

Gloves need to protect against the hazard related to the work being performed. Most commonly, we think of puncture or laceration prevention. Heat/cold and vibration exposure can also be controlled through proper glove selection. Proper selection should include sizing, as gloves that are too large or too small will not be used properly and may present more of a hazard to the person wearing them. A good exercise for the class is to list the types of hazards gloves can be used to address.

Tool use: Discuss proper tool grips, leverage, weight, balance, triggers, torque, vibration, handle design, etc.

- Tools designed so that the operator must grasp a motor housing or an air cylinder, rather than a handle, exposes the hand to vibration, skin compression and abrasion from contact with the tool surface. A properly designed tool handle should isolate the hand from contact with the tool surface, enhance tool control and stability and serve to increase the mechanical advantage of the tool while reducing the amount of required exertion.
- Design for minimum muscular effort. To operate a hand tool at least one hand must support it in place and apply some type of leverage or pressure on a switch. Both support and control require static muscular contractions in the arm and fingers, a process that is fatiguing.

- Workstation layout should also be designed so that between work cycles the tool can either be conveniently laid down or inserted into a holster. Tool balancers and retractable linkages are helpful where applicable.
- The center of gravity of the tool should be located close to the body to reduce fatigue. Heavy and unbalanced tools will tire the muscles very quickly, particularly if the arm is extended outward during use.
- Power tool with motors rather than muscles. Power helps reduce human repetition and force requirements. Careful attention should be paid to selecting power tools of minimum weight and torque.

Additional tips include:

- Bend the tool, not the wrist.
- Keep the weight of the tool low.
- Use special-purpose tools.
- Design tools to be used by either hand.
- Use a power grip for power and a precision grip for precision.
- The minimum handle length for any tool is 100 mm (4 in.).
- Use handle spans appropriate for men and women.
- Avoid form-fitting handles.
- Spring load pliers and scissors.
- Provide large triggers (2-3 fingers).
- Handles should be non-porous, non-slip and non-conductive.

Manual material handling

guidelines: Back injuries account for many workplace injuries.

Back injuries can be reduced by implementing simple programs and measures that teach workers how to avoid such injuries and provide them with simple devices that may prevent injuries.

- In 2015 nearly 200,000 lost workday cases involving back claims per year reported for private industry, representing approximately 17% of all injuries*
- Approximately one of every four employees experience low-back pain costing employers \$51,400 per 100 employees annually in medical costs and lost time**

Research has demonstrated that lifting is a major cause of back injuries. Consider the following control methods in designing your company's approach to controlling back injury hazards.

General lifting recommendations:

These guidelines cover the proper essential points:

- If feasible, design manual lifting (and lowering) out of the task and the workplace.
- For tasks in which manual lifting is unavoidable, perform the lift between knuckle and shoulder height.
- Be in good physical shape. If not conditioned for lifting and engaged in regular vigorous exercise, do not attempt to do difficult lifting or lowering.
- Think/plan before acting.
- Place material at a convenient height.
- Make sure sufficient space is cleared along the path to be traveled with the load.
- Have handling aids available.
- Get a good grip on the load.
- Test the weight before trying to move it.

- If it is too bulky or heavy, get a mechanical assist or somebody else to help, or both.
- Hold the load close to the body.
- Place the feet close to the load.
- Stand in a stable position, with feet pointed in the direction of movement.
- Involve primarily straightening of the legs in lifting.
- Do not twist the back or bend sideways.
- Do not lift or lower, push or pull, awkwardly.
- Do not lift or lower with arms extended. (Keep the load close.)
- Do not continue the lift when the load is too heavy.

Push vs. pull: Pushing primarily invokes abdominal muscles use. Studies involving forces generated by the body and stresses on the joints and back reveal that pushing is less likely to contribute to a back injury. Holding the abdominal muscles tight is also a good practice. Pulling primarily invokes low back muscles use. Pulling heavy loads can easily stress/strain low back muscles. Pulling is more risky than pushing. When pushing, make sure one can see beyond the load being pushed. Make sure the path is clear.

Equipment selection: Care in selection of tools and equipment can provide years of benefits.

When purchasing equipment many factors enter the equation. Some factors that should be considered are: knobs and switches, control locations, lighting, lettering and character size, analog versus digital and colors. More new tools and equipment designed to help prevent soft tissue injuries are hitting the market every month. Train the people doing purchasing to recognize good features and to recognize the desirability of equipping the workforce with soft tissue injury-sensitive tools and equipment.

Focused on future prevention: Use scientific methods to determine how to reduce the risk of future occurrences of soft tissue injuries.

We cannot change the outcome of past events, but we can learn the facts, determine the string of incidences that led to the injury, and identify the best methods to prevent similar injuries in the future. Preventing soft tissue injuries provides happier, more productive employees and a higher level of production; a win for workers and management.

Information for medical and rehabilitation personnel: If an injury/illness does occur, providing information to the Healthcare Professional (HCP) can be worthwhile. Videos, job descriptions, etc., can help the healthcare professional provide the appropriate rehabilitation and therapy.

Sometimes an investigation may reveal facts that are useful to medical professionals. If you are involved in such a case, make sure you share the information as soon as possible. An example might be a person stating they have a really bad headache just a few minutes before they slip and fall. In such cases, speed is often important.

Inviting medical care professionals to visit the job site is a good way to familiarize them with the kind of work taking place and the physical demands on employees.

Return-to-work protocols and modified duty: When an employee returns to work, exposing them to the same risk factors that caused their condition may lead to a repeat injury of similar nature or an aggravation of the existing injury.

Limiting exposure to the soft tissues that were injured while allowing them to perform as much of their normal job assignment as possible is important to recovery. Assessing the workplace for risk factors prior to their return will save time.

Modified job activities: The changes made in performance requirements to provide an injured worker an opportunity to work without further injury to the already affected body part.

Modification is designed to provide time for rest and healing of a specific part of the body. Frequently, the rest of the body can, and should, remain active. Always work within the doctor's requirements when designing modified duty work. If in doubt, seek professional clarification.

Reducing risk factors: The key is in identifying the injured body part, the cause of the injury and a method of reducing exposure to that risk factor.

This presentation is identifying many risk factors. Reducing the frequency and number of exposures will reduce the occurrences of accident/injury. Employees are very capable of identifying what activities cause pain from muscle strain, etc., and asking them for this information gives them an opportunity to help in modifying their job to reduce those risks. Talk to employees before an injury happens and make proactive changes. A proactive safety committee that involves workers may identify significant exposures and ways to eliminate exposures.

Control factors adequately

addressed: Prove that any changes you implement are effective in controlling the risk factors. Critical control factors are essential to having the ability to identify and mitigate issues related to soft tissue injury occurrences and the subsequent recovery period. Maintaining contact with the injured person would be an example.

Oversight and evaluation: Follow-up and feedback are critical in assuring injured persons are recovering from their soft tissue injury and continue to feel a viable part of the team.

Medical treatment: Often a key issue in recovery from a soft tissue injury.

Providing medical treatment that will assist the injured person return to his or her condition just prior to an injury is the basis of workers' compensation. For soft tissue injury-related claims, it is important to the injured person that the right type of doctor be used. Soft tissue injuries need to be reported to the insurance carrier immediately and guidance sought for the proper treatment source. If soft tissue injury type claims are frequent occurrences in your company, work with your insurance carrier to identify a quality medical provider in your area. Working with a physician who is familiar with your work tasks is important.

Stretching, wellness, conditioning programs:

Professional athletes have several things in common with construction workers.

- They identify their limits.
- They work within their limits.
- They exercise to maintain good physical condition.
- They stretch before performing to protect their muscles and help reach maximum performance.
- They wear protective gear to help prevent injury.
- They work to improve their skill level.
- If they are hurt, the whole team stands to suffer.

Once again, knowledge is a key factor in reducing soft tissue injury exposure. Teaching workers about the need for a well-rounded wellness program will promote a safer and injury-free workplace, and also a better quality of life in general. Conditioning that focuses on muscle groups used daily by the worker and stretching programs that focus on muscles that are at risk of injury are important tools that reduce the potential for soft tissue injuries. Construction workers are no different than world-class athletes; they need to engage in pre-and-post work stretching to lengthen muscles.

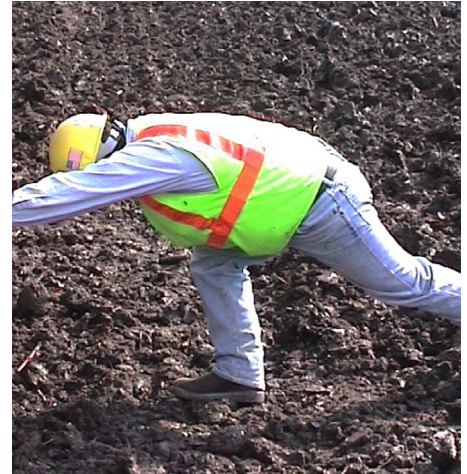
How muscles work: A typical workday will result in muscles contracting and becoming tense. To balance the body and those tired, contracted and tense muscles, encourage employees to take a few minutes to lengthen those muscles – especially after a long, hard day.

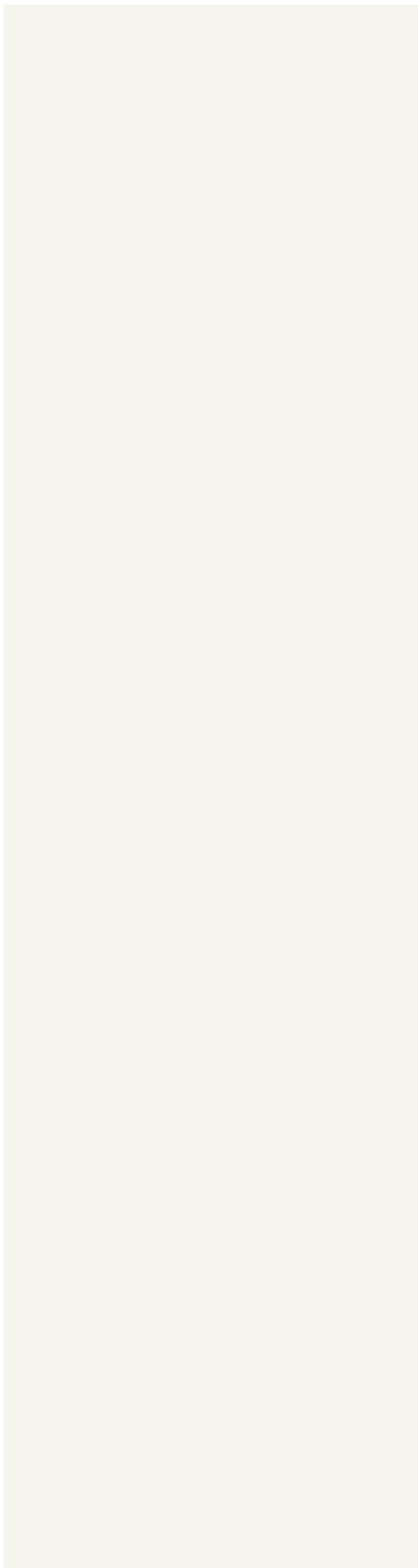
Energy/metabolism: Science has come a long way in determining how our bodies obtain energy from metabolizing food. Energy in the reduced hydrocarbon bonds of glucose is oxidized through the action of enzymes. This process is called glycolysis. For our purposes, we need to know that eating healthy foods helps us perform the heavy work often required in construction.

Lactic acid: Lactic acid is the byproduct of the glycolysis process when food is converted into energy. As lactic acid builds up in the cells of the muscles and is carried through the body in the bloodstream, the muscles will tire quickly. Endurance athletes use techniques such as long distance running at a steady pace, which tends to build capillaries and provide a better supply of oxygen to the muscle cells, thus lowering the rate of lactic acid build-up.

Length-tension curves: The length of a muscle fiber in relation to its optimal length is a factor that determines the amount of force the muscle fiber can generate.

Benefits of stretching: Increased flexibility can improve your daily performance. Flexibility will diminish as you get older, but can be regained and maintained through regular stretching.





Stretching muscles improves circulation by increasing blood flow to your muscles. Increased blood flow brings needed nutrients to muscles and cleanses the waste products that build up in the muscles. Improved circulation may also reduce recovery time if you have suffered a muscle injury. Frequent stretching helps keep muscles flexible and pliable, allowing you to stand straighter. Good posture will help keep you from tiring more quickly, thereby reducing the potential for an injury. Stretching your tired and tense muscles will reduce the stress that often accompanies end-of-workday exhaustion. Maintaining your full range of motion keeps you in better balance, and may reduce the probability of falls.

Wellness: Wellness is a general term for overall fitness that includes a well-balanced diet, avoidance of tobacco products, limited alcohol use, regular aerobic exercise, stress management, adequate sleep and a commitment to leisure time. Wellness is generally an attempt to balance the demands of our everyday lives to avoid harmful effects to our bodies.

Health: A healthy lifestyle includes exercise on a regular basis. Unfortunately, most of us no longer exercise in the normal events of our lives. Incorporating the wellness-orientated activities is good, but it must be complemented by regular medical checkups to ensure the human machine is in good condition and functioning as it should.

Diet: Diet is one of the most highly visible factors affecting overall health and our ability to adequately perform physical activities. We have diet plans, programs, supplements, pills, etc. The bottom line is always to eat only what our bodies need given the conditions of our lives. No one diet is known to help prevent soft tissue injuries. A good diet with regular exercise probably will.

Lifestyle choices: Drug and alcohol use will affect the way we are able to focus on our work assignments. A momentary lack of focus can cause unintended consequences for us and for those who work around us. A poor diet may even cause a worker to get unusually tired before lunch, causing a lack of attention, which may result in a serious accident.

Conditioning: A strong and conditioned body will be able to sustain longer periods of hard work with less potential for injury. Good conditioning is an insurance policy for well-conditioned workers that helps them enjoy, not only an injury-free workday, but also improves the energy and strength they need to play with their children when they return home from work.

Physical/Physiological

Focusing on muscle groups that are frequently used at work and doing exercises that tone and condition those muscles will allow you to work longer without tiring and may reduce the potential for injury. Strong, well-conditioned muscles allow you to remain focused on your work assignment without tiring and losing your ability to stay alert to the exposures that might cause an accident. Strengthening and conditioning is not about large bulging muscles; it is all about toning and conditioning—making muscles stronger and more pliable so they will resist soft tissue injuries.

Cardiovascular: A good cardiovascular exercise program is not about high-intensity activities like long distance running or other activities that cause the heart rate to rise into the aerobic zone. A good brisk walk for 30 to 40 minutes or an hour on a bicycle, for instance, will suffice to strengthen the heart and build endurance.

Stretching policies/programs: Basic stretching policies and programs should focus on the body's major muscle groups (calf, thigh, hip, lower back, neck and shoulder).

Warm up first: Stretching when muscles are cold increases the risk of pulled muscles. Warm up by walking while pumping the arms or a similar favorite exercise for about five minutes.

Hold stretch for 30 seconds: It takes time to lengthen tissues safely. If a muscle is particularly tight, you may need to hold it for up to a minute.

Do not bounce: Bouncing while you stretch can lead to muscle injuries. It causes small tears (microtears) in the muscle, which leave scar tissue as the muscle heals. This scar tissue tightens your muscle even more and makes it less flexible, thereby increasing the potential for a muscle injury or more muscle pain.

Focus on pain-free stretching: If you feel pain while stretching, cease stretching until the pain stops. You should not experience any pain while stretching.

Relax and breathe: Do not hold your breath; enjoy the experience.

Stretch before and after exercises: Light stretching in the morning before work and a more thorough routine after work is the best possible plan for reducing your potential for a soft tissue injury.

Stretching routines: There are many stretching exercises available. Remember that each stretch focuses on a specific muscle or group of muscles. Identify the muscles used most in the performance of your work and stretch those. Most programs will include general loosen-up stretches for the back and neck. Some examples are provided in the material. However, it is best to talk with an exercise expert to identify what is best for your employees.

Industry/task specific: What is good for a ticket taker may not be as good for someone who shovels or finishes concrete. A carpenter uses different muscles than an electrician. Identify the tasks performed and then address needs with a local expert in the field.

Personal protective equipment:

Personal protective equipment is the last means of defense for your body against injury. In many instances, personal protective equipment can even save a life. There is no proven personal protective equipment against soft tissue injuries. There are theories that are thought to help, but none have been fully accepted within the medical/safety community.

Back belts: The National Institute for Occupational Safety and Health (NIOSH) has published a study on back belts that addresses their usefulness. One sentence states, "There is currently inadequate scientific evidence or theory to suggest that back belts can reduce the risk of injury." Many companies insist back belts help and there is no reason not to use them if they appear to help. Use caution, however, as there is some thought that wearing a back belt can provide a false sense of security leading the individual to attempt to lift more than they normally would.

If you furnish back belts to employees or allow them to wear their own on the job:

- It is recommended the use of back belts be through mutual agreement between company and individual employee.
- Provide education on back belts, what they do and do not do.
- Provide training in proper fitting, wear and use of back belts.
- Some recommend a pre-use physical to ensure pre-existing back problems are identified before back belts are issued.
- Always start by reviewing tasks and engineering out as much strain-producing activity as possible.
- Provide a usage audit and feedback process to ensure back belts are used within defined parameters.
- Do your own research before deciding that providing back belts is the answer to your problems. Make an informed decision. Copies of the NIOSH pamphlets "Back Belts—Do They Prevent Injury?" and "Workplace Use of Back Belts" can be found on the NIOSH website.

Knee pads, shoulder pads: Knee and shoulder pads are intended to lessen the force exerted on those joints when kneeling, crawling and carrying objects. They function by distributing the applied force through the pad, taking some of the force off the joint. They are helpful but will not eliminate the risk of injury. For example, two workers carrying steel angle iron on their shoulders. Not only is weight across the flat part of the shoulder – force is generated by the sharper edges. Shoulder pads spread out those forces and absorb some in the pad, especially the sharp edge force. This helps keep the shoulder healthy. The same principle would hold true for a tile worker who spends much of the day kneeling.

Joint braces: Joint braces work to redistribute the force exerted on a joint. Another is an ankle brace, probably the most familiar of braces. Braces may be used to provide healing time for a joint that has sustained a soft tissue injury but should not be used to provide extended capabilities for a joint. Another use for splints or braces is to prevent a joint from moving in a given way, perhaps lessening the risk or extent of injury. A person who frequently rides a motorcycle is at risk of right wrist from rotating the gas feed on the handlebar grip. A wrist splint may force that person to use different muscles to accomplish that task, allowing the normally overused muscles, ligaments, tendons, etc., a better chance to rest and recover. Another type is a skier's boot that firmly holds the ankle in place in an effort to prevent severe strains and fractures.

Gloves: Gloves can be used to improve grip, may protect from laceration or puncture wounds, dissipate the stress of vibration, strengthen the wrist and protect from cold. In short, the use of gloves can provide protection on and off the job. It is important to identify the hazards present in the task and select the appropriate glove that will provide an adequate level of protection.

Shoe/boot insoles: Shoes/boots are among the most overlooked pieces of personal protective equipment. Properly fitting work boots will be sturdy enough to provide protection from external hazards and they will provide support for the foot and ankle, minimizing the impact of standing and walking all day. A good quality work boot is one of the best investments a construction worker can make. One of the most common soft tissue injuries is the ankle sprain. Good quality, high-top work boots can help support the ankle.

Gel inserts are a new product on the market. They are designed to provide some relief from the stress of constant standing. Custom-molded orthotics are available from your medical provider that may provide better support and comfort.

Think ahead – have a game plan:

First and foremost: Think two seconds ahead. Every construction worker should develop the habit of stopping to think before taking action. If the task is to move an object, workers should ask themselves: How heavy is it? How can I lift it without hurting my back? What path will I follow and is it free of trip hazards? Where will I set them down and how will I do that without hurting my back?

Developing the habit of thinking ahead will do more to prevent soft tissue injuries and other injuries than any safety program on the market. It takes constant effort on each employee's part and people helping each other to develop this habit but it will certainly be worth the effort.

The two-second think ahead will benefit people in all facets of life, not just on the job. There is no more effective way to prevent soft tissue injuries than knowing the hazards and controls and thinking ahead to do the right things to protect yourself and your co-workers.

Evaluate your personal work habits: Look at how you do your job. Be honest with yourself – do you take shortcuts that increase your risk of injury? Many of us do. It is a bad habit, reinforced because frequently we get by without injury and it makes the task faster or easier. Eventually we pay with an injury. Take a good honest look at how you do things and if you do your best to protect yourself and your company.

Reinforce when adequate: Often in our assessment of ourselves, we find that we do a good job in some areas. Great – keep up the good work. Strive to maintain those good habits you have developed. Reward yourself occasionally for doing a good job.

Modify when inadequate: When our self assessment tells us we have room to improve, we need to focus our efforts on that area. It is very difficult to develop these new, habits without some help. Of course, in construction, we are independent folks and help is often the last thing we want to ask for. Teaming with a workmate to help each other remember to stop and think, to lift properly, and to bend properly or any of the other dozens of activities that influence our ability to safely perform our tasks can make life better. Sometimes this is done through a formal program and sometimes in an informal conversation over lunch. Do what works best for you to fine-tune your performance level. Remember the teams at home and on the job are both depending on you.



Pay-back/human benefit: The key issue with management is often money. “Do I really need to do this?” is a frequent question when the subject of soft tissue injury prevention is raised. Be prepared to address this question. The same thing holds true for employees. Starting a focus on soft tissue injury prevention is a change. People do not like change. Be prepared to show the potential for benefit.

How-to-do: One of the best methods is to sit down with your company's loss runs and injury records for the last five years. Know what has happened to your workers' compensation insurance program in the last five years. Track your experience modification rate (EMR) over that time. Look at both frequency and cost of injury. Many times, we find soft tissue injuries may account for fewer than 30 percent of the company injuries and as much as 70 percent of their cost. Analyze days away from work due to soft tissue injuries and calculate an impact to the crew of working shorthanded.

Human benefits: For workers, there are enormous benefits to learning what soft tissue injuries are, what causes them and what can be done to prevent them. Identify the similarities between hunting, fishing and other leisure activities to activities performed on the job. Address the impact on their families and loved ones if they suffer a long-term back injury. If an employee who has had a serious soft tissue injury is willing, ask him to describe his experience.

Business benefits: After careful review of the injury statistics, you should be ready to show management how preventing soft tissue injuries are costeffective. Many companies have chosen deductible programs so the initial cost is incurred by the company. The money saved by controlling soft tissue injuries can be allocated for other programs such as a profit-sharing program. Will lowering the EMR open new markets to your company? Improved productivity will also provide financial gain to the company.

*Injuries, Illness, and Fatalities. Bureau of Labor Statistics, 2015.
<https://www.bls.gov/iif/oshwc/osh/case/chart-data-2015.htm>

**Low Back Pain Takes Toll on Worker Health & Productivity, Integrated Benefits Institute Study Finds. Integrated Benefits Institute, 2013 Oct 23. <http://dev.ibiweb.org/events/detail/low-back-pain-takes-toll-on-worker-health-productivity-integrated-benefits>

The Associated General Contractors of America

2300 Wilson Blvd., Suite 300, Arlington, VA 22201
1-800-242-1767 (phone) 703.548.3119 (fax) www.agc.org info@agc.org

The Associated General Contractors of America (AGC) is the leading association for the construction industry. AGC represents more than 26,000 firms, including over 6,500 of America's leading general contractors, and over 9,000 specialty-contracting firms. More than 10,500 service providers and suppliers are also associated with AGC, all through a nationwide network of chapters.

The Zurich Services Corporation

1299 Zurich Way,
Schaumburg, IL 60196-1056
1-800-382-2150
www.zurichna.com

This soft tissue injury program is intended to increase awareness of certain factors that may contribute to soft tissue injuries among construction craft workers and to suggest practices that may reduce the risk of such injuries. This program is not intended to provide specific guidance to any one construction company or for any one construction project. This program does not address the entire range of activities or conditions found in the construction industry or suggest that other approaches to the risk of soft tissue injury do not merit equal consideration. The information that this program conveys is necessarily general in nature.

While certain practices appear to be desirable, none can guarantee that soft tissue injuries will not occur. This program does not create any obligations or establish any specific standards or guidelines for managing the risk of such injuries. It is not an exhaustive or complete treatment of its subject matter.

In making this program available, neither The Zurich Services Corporation (hereinafter "Zurich") nor the Associated General Contractors of America, Inc. (hereinafter "AGC"), undertakes to perform services for or on behalf of any party, whether for that party's own protection or for the protection of others. Neither Zurich nor AGC accepts any delegation of duties or makes any warranties, whether express or implied, or assumes any liability whatsoever for reliance on this program or its contents. Employers and employees are directed to consult with medical professional before engaging in any exercise program.

This soft tissue program does not specify any course of conduct or set of practices required by law or regulation or convey legal, medical or other professional advice.

The information in this publication was Compiled by The Zurich Services Corporation.

©2005-2018 The Zurich Services Corporation and The Associated General Contractors of America, Inc.

A1-112010589-A (03/18) 112010589

