

## **APPENDIX 2**

Risk Factor Identification

## **APPENDIX 2**

This Appendix corresponds with Step 2: Risk Factor Identification, and includes:

- The Level I Ergonomics Assessment Checklist Glossary; and
- A sample of a completed Level I Ergonomics Assessment Checklist

**LEVEL I ERGONOMICS  
ASSESSMENT CHECKLIST GLOSSARY**

## **GLOSSARY**

This glossary provides information on each question in the checklist. Specifically, the glossary describes:

- how exposure to each job and environmental factor impacts the employee
- the ergonomics risk factor upon which the questions are based
- what to look for at the workstation (e.g., is the job factor present and to what extent)

The glossary follows the same order, question by question, as the Level I Ergonomics Assessment Checklist.

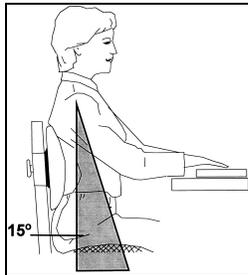
*Note: As you gain experience using the Level I Ergonomics Assessment Checklist and with ergonomics in general, your reliance on this glossary should decrease significantly.*

**Checklist Questions for the Shoulder/Neck Body Area**

Tables 1 through 7 explain the questions relating to assessment of Job Factors for shoulder and/or neck disorders.

**Table 1  
Checklist Question 1**

**Question:** Upper arms held away from body greater than 15 degrees while unsupported away from the body (e.g., using keyboard, mouse).



**Incorrect**



**Correct**

**Targeted Risk Factor Table**

Risk Factor		Risk Factor	
x	Stressful Positions or Movements	x	Static (fixed position) work
	Heavy or forceful work		High Frequency (repetitive) or high speed movements

**Background Discussion**

A sustained posture of greater than 15 degrees from the neutral position has been shown to be associated with fatigue and tendonitis problems. When the arms are held away from the body and are not supported to maintain the arm in one position, static effort occurs. When static effort occurs, the flow of blood is somewhat constricted and over time, muscular fatigue will occur.

**What to Look For**

Look first to see if the arms are held away from the body. If the elbow is out to the side or in front of the body (e.g., you can see air space between the elbow and torso), you have identified the job factor. Refer to the illustration to help judge whether the arms(s), elbow(s), are further away than 15 degrees. This can occur when using a mouse that is located further away and at a different height than the keyboard.

Caution: If the arm(s)/elbow(s) are more than 15 degrees away from the body but the arms are supported (e.g., resting on a table top or other surface), this job factor is not present. (Note: sometimes the individual's body can act as a support).

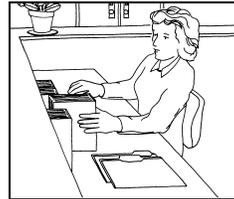
**References:** 4, 25, 26, 27

**Table 2  
Checklist Question 2**

**Question:** Repeated reaching arms greater than 15 degrees away from the body. For example, when an individual is obtaining a reference manual, filing, or accessing the telephone.



**Incorrect**



**Correct**

**Targeted Risk Factor Table**

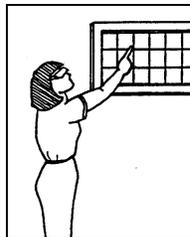
Risk Factor		Risk Factor	
x	Stressful Positions or Movements		Static (fixed position) work
	Heavy or forceful work	x	High Frequency (repetitive) or high speed movements

**Background and Discussion**

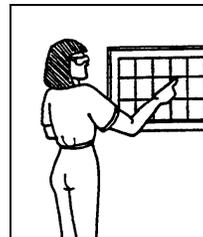
Posture, repetition, and duration have all been found to contribute to muscular fatigue. Posture considerations include positioning the arm away from the body greater than 15 degrees. Repetitive reaching in this area can cause fatigue and shoulder discomfort.

**Explanation**

Look first at the arms. If the arms are away from the body, as illustrated in the diagrams below, this is considered a forward reach beyond the neutral position. Repetition is characterized as reaching every 30 seconds or less or reaching during at least 50 percent of the work period. Putting mail into mail slots that are at shoulder height or above shoulder level is an example of this Job Factor.



**Non-neutral**



**Neutral**

**References:** 6, 25, 28, 29

**Table 3**  
**Checklist Question 3**

**Question:** Shrugging working with the shoulders raised while arms are unsupported (e.g., Keyboard too high).



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factor		Risk Factor	
x	Stressful Positions or Movements	x	Static (fixed position) work
	Heavy or forceful work		High Frequency (repetitive) or high speed movements

**Background and Discussion**

Activities requiring the shoulder to be held in an elevated position while the arms are unsupported may contribute to muscular fatigue. In order to lift (shrug) the shoulders the trapezius and deltoid muscles must continuously work/contract, leading to the onset of muscle fatigue.

Static effort can be considered as a factor when:

1. A high level of effort is sustained for 10 seconds or more.
2. Moderate effort occurs for one minute or more.
3. Slight effort (about one third of maximum force) last for four minutes or more.

**What to Look For**

The worker holds one or both shoulders in an elevated position for prolonged periods of time. The individual appears to be shrugging/lifting the shoulders towards the ears. Examples include elevating the shoulder to compensate for a keyboard set too high or a chair which is set low in relation to the work surface.

**References:** 4, 6, 30

**Table 4**  
**Checklist Question 4**

**Question:** Repeated arm forces exceeding 10 lb. or 4.5 kg. (roughly equivalent to lifting a gallon of milk). For example, pulling files or stapling.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factor		Risk Factor	
x	Stressful Positions or Movements		Static (fixed position) work
x	Heavy or forceful work	x	High Frequency (repetitive) or high speed movements

**Background and Discussion**

Repetitive motions, posture, force, and duration can contribute to muscle fatigue. These can occur when pushing or pulling items of heavy weight or when an item is removed from a small or tight space.

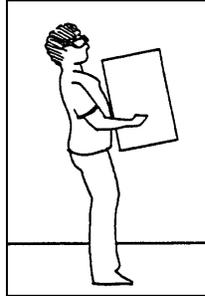
**What to Look For**

Estimate if arm forces exceed those required to lift a gallon of milk (about 10 lb. or 4.5 kg.). Fatigue and discomfort can occur when relatively few movement patterns are repeated, thereby stressing the same parts of the body over and over again. Examples include repeatedly pulling files from full drawers to pull the file loose, or repeatedly pressing down on a stapler or three-hole punch on thick documents.

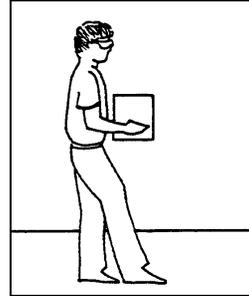
**References:** 6, 10, 31

**Table 5**  
**Checklist Question 5**

**Question:** Holding/carrying materials exceeding 25 lb. (11.3 kg.) (e.g., 10-inch stack of files)



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factor		Risk Factor	
	Stressful Positions or Movements	x	Static (fixed position) work
x	Heavy or forceful work		High Frequency (repetitive) or high speed movements

**Background and Discussion**

Duration of the task, size of the load, position of the load, type of hand holds, and distance traveled all influence shoulder/arm muscle fatigue. Data suggests that for any component of the task the lowest percent of the population represents the maximum weight or force considered acceptable. This takes into account individuals of different size/stature/strength capabilities. *Items less than 25 lb. (11.3 kg.)* takes into account this variance in population and accommodates individuals with less muscle strength.

**What to Look For**

Determine (or ask) if the worker holds/carries objects exceeding 25 lb. (11.3 kg) in weight. Carrying a large stack of files, a full box of photocopy paper and/or a box of office supplies are examples.

**References:** 7, 32, 33

**Table 6**  
**Checklist Question 6**

**Question:** Cradling the telephone between the neck and shoulder.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factor		Risk Factor	
x	Stressful Positions or Movements	x	Static (fixed position) work
	Heavy or forceful work		High Frequency (repetitive) or high speed movements

**Background and Discussion**

Holding a telephone between the neck and shoulder requires a very stressful posture. Postures include elevation of the shoulder and tilting the head to one side. The nerves, vessels, and veins for the arm/wrist/hand exit at the base of the neck through a limited space known as the thoracic outlet. The nerves, vessels, and veins are vulnerable to compression which can occur when tilting the head to one side. Any constriction of this outlet may lead to pain or discomfort.

**What to Look For**

The telephone is positioned between the ear and shoulder. The shoulder is elevated and the head is tilted toward the shoulder.

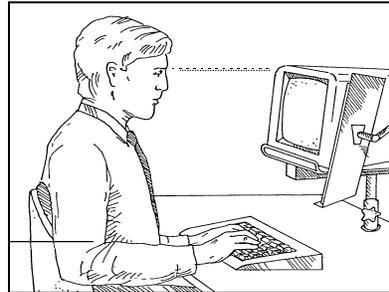
**References:** 13, 25, 34

**Table 7**  
**Checklist Question 7**

**Question:** Head bent down, up or neck is twisted (e.g., monitor or document too high, too low, or off to one side).



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factor		Risk Factor	
x	Stressful Positions or Movements	x	Static (fixed position) work
	Heavy or forceful work	x	High Frequency (repetitive) or high speed movements

**Background and Discussion**

When the head is not upright and straight, muscle demands and stress can increase. As the head deviates from the upright position, muscle fatigue develops more quickly. Even a slight forward bend of the neck can produce significant muscle contraction which may contribute over time (e.g., 1 or 2 hours) to muscle fatigue or pain.

**What to Look For**

Look for the operator looking up or down or to the side in order to view the monitor or any reference documents. (The goal is to have the top line of text on the monitor and any reference documents at eye level.) For bifocal wearers, the monitor and reference documents should be visible through the bifocal lens when the head is held comfortably upright.

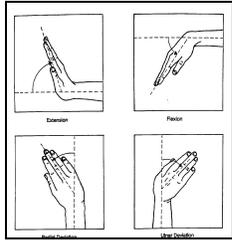
**References:** 12, 13, 25, 34, 35, 36

**Assessment Questions for the Hand, Wrist and Arm**

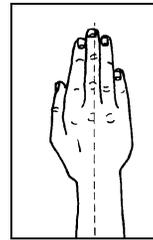
Tables 8 through 14 explain the questions relating to assessment of Job Factors for hands/wrists/arms.

**Table 8  
Checklist Question 8**

**Question:** Bent wrists (e.g., Any instance when the wrist is not straight)



**Incorrect**



**Correct**

**Targeted Risk Factors**

	Risk Factors		Risk Factors
x	Stressful Positions and Movements		External Trauma or Mechanical Stress
	Excessive Forces or Forceful Exertions		Prolonged Exposure to vibration
	High Frequency or Repetition		Temperature Extremes, Especially Cold
	Extreme Duration and/or Pace of the Task		

**Background and Discussions**

Postures that require the wrist to leave the neutral posture can increase stress (e.g., tension and compression in the wrist). As the wrist deviates from the neutral posture there is a decrease in effective strength. Wrist deviations such as bent forward or back, bent towards the little finger or thumb have been associated with a number of cumulative trauma disorders.

**What to Look For**

Look at the position of the keyboard or other equipment such as a mouse and see if the position causes the operator to flex, extend, or deviate the wrist to use the item.

Caution: The functional normal work hand position is tilted back approximately 10 degrees. This may appear to be deviation, but the position is not stressing the tendons.

**References:** 10, 27, 37

**Table 9**  
**Checklist Question 9**

**Question:** Repeated wrist movements (e.g., keyboard, mouse, paper, equipment).

**Targeted Risk Factors**

Risk Factors		Risk Factors	
x	Stressful Positions and Movements		External Trauma or Mechanical Stress
	Excessive Forces or Forceful Exertions		Prolonged Exposure to vibration
x	High Frequency or Repetition		Temperature Extremes, Especially Cold
	Extreme Duration and/or Pace of the Task		

**Background and Discussions**

Repeated movements out of the neutral position may directly damage tendons through repeated shortening and stretching, as well as increase the likelihood of fatigue and decrease the opportunity for tissues to recover. The task can be considered repetitive if the movement is performed every 30 seconds (or less) or 50 percent of the task time.

**What to Look For**

Look for the same movement patterns to be repeated over and over. These movements include flexion, extension, ulnar, and radial deviation of the wrist. This may be seen when repeatedly stapling, sorting paper, or operating a keyboard or mouse.

**References:** 10, 27, 37, 38

**Table 10**  
**Checklist Question 10**

**Question:** Repeated finger movements (e.g., using keyboard, mouse, paper, equipment).

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Stressful Positions and Movements		External Trauma or Mechanical Stress
	Excessive Forces or Forceful Exertions		Prolonged Exposure to vibration
x	High Frequency or Repetition		Temperature Extremes, Especially Cold
	Extreme Duration and/or Pace of the Task		

**Background and Discussions**

Research has indicated that a high number of manipulations or movements per hour may contribute to the long-term development of hand wrist disorders. However, a quantified cause-effect relationship has not been established for the wrist or fingers.

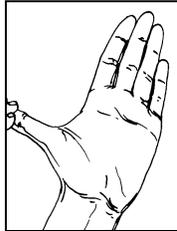
**What to Look For**

Look for the same movement patterns to be repeated, thereby stressing the same parts of the body over and over. These movements include flexion and extension of the fingers. This may be seen when repeatedly stapling, sorting paper, or operating a keyboard.

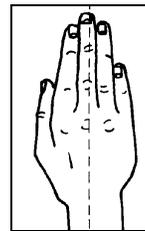
**References:** 38, 39

**Table 11**  
**Checklist Question 11**

**Question:** Hyperextension of finger/thumb away from the rest of the hand (e.g., using ., small input devices).



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
x	Stressful Positions and Movements		External Trauma or Mechanical Stress
	Excessive Forces or Forceful Exertions		Prolonged Exposure to vibration
	High Frequency or Repetition		Temperature Extremes, Especially Cold
	Extreme Duration and/or Pace of the Task		

**Background and Discussions**

Pinching or pressing with the tips of the finger, such as when hitting the keys of a keyboard or positioning the thumb away from the hand, can contribute to fatigue, pain or WMDs if the activity is repeated or sustained over an extended period of time. Deviated postures can place a load on muscles and tendons required to hold the position, and place stress on nerves and vessels, or create pressure on the structures within or around a joint.

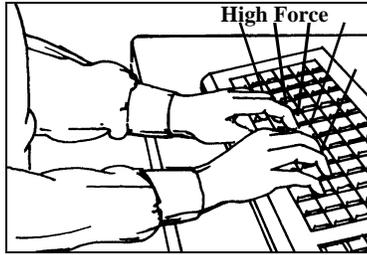
**What to Look For**

Look for the finger or thumb to be positioned out of the functional or neutral position. The thumb or finger will be positioned away from the hand, or extended back like when the hand is in the hitch hiking position. This may be caused by the design of a mouse or the position of a control such as the position of the space bar or the position on the keyboard.

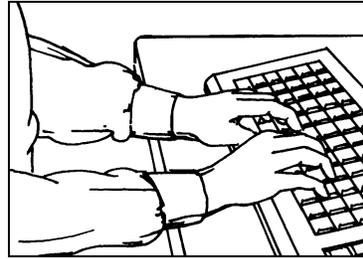
**References:** 12, 40

**Table 12**  
**Checklist Question 12**

**Question:** Hand forces more than minimal force used to key; constant pinch force greater than 2 lb. (0.9 kg.) (e.g. squeeze staple remover, hitting keys, gripping mouse or pencil, pulling files). Constant full hand force greater than 5 lb. (2.3 kg.) (e.g., holding a gallon of water).



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Stressful Positions and Movements		External Trauma or Mechanical Stress
x	Excessive Forces or Forceful Exertions		Prolonged Exposure to vibration
	High Frequency or Repetition		Temperature Extremes, Especially Cold
x	Extreme Duration and/or Pace of the Task		

**Background and Discussions**

High force grips (pinch or power) place a load on the flexor tendons that pass through the carpal tunnel. High tendon load may increase the risk of developing a WMD.

**What to Look For**

Look to see if the operator uses a pinch grip greater than 2 lb. (0.9 kg.) in order to complete the task. Examples include compressing a staple remover to extract a staple and striking the keys (hard) on the keyboard (one can hear the keys being tapped when away from the computer), or holding onto a pen or pencil. Full hand force greater than 5 lb. (2.3 kg.) can be seen when lifting items such as a box of photocopy paper with the finger tips.

**References:** 10, 31, 41

**Table 13**  
**Checklist Question 13**

**Question:** Hard Edges - wrists or forearms rest on hard edges (e.g., desk, keyboard tray, arm rests.)



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors			Risk Factors	
	Stressful Positions and Movements	x		External Trauma or Mechanical Stress
	Excessive Forces or Forceful Exertions			Prolonged Exposure to vibration
	High Frequency or Repetition			Temperature Extremes, Especially Cold
	Extreme Duration and/or Pace of the Task			

**Background and Discussions**

Localized mechanical stresses are caused by physical contact between soft body tissues and an object or tool in the work environment. Localized mechanical stress has been associated with trigger finger, median, and ulnar nerve damage. A precise cause-effect relationship, however, has not been determined.

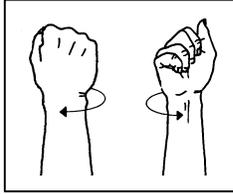
**What to Look For**

Look to see if the wrists or forearms are in contact with a hard edge while keying by resting on the edge of the keyboard tray, desk, or on the armrests.

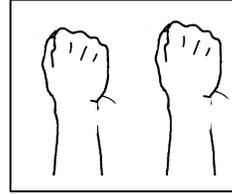
**References:** 13, 41, 42

**Table 14**  
**Checklist Question 14**

**Question:** Repeated Forearm Rotation (e.g., flipping pages)



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Stressful Positions and Movements		External Trauma or Mechanical Stress
	Excessive Forces or Forceful Exertions		Prolonged Exposure to vibration
x	High Frequency or Repetition		Temperature Extremes, Especially Cold
	Extreme Duration and/or Pace of the Task		

**Background and Discussions**

Repeated turning of the forearms between pronation and supination have been noted as risk factors that may contribute to epicondylitis (elbow tendonitis) or muscle fatigue.

**What to Look For**

Look for the worker twisting or turning the wrists or forearms, back and forth while performing the task such as turning pages.

**References:** 13, 27, 37

**Assessment Question for the Back Torso Body Regions**

Tables 15 and 17 explain the questions relating to assessment of risk factors for back and torso disorders.

**Table 15  
Checklist Question 15**

**Question:** Leaning forward or poor lower back posture.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
x	Stressful Positions and Movements		External Trauma or Mechanical Stress
	Excessive Forces or Forceful Exertions		Prolonged Exposure to vibration
	High Frequency or Repetition		Temperature Extremes, Especially Cold
x	Extreme Duration and/or Pace of the Task		

**Background and Discussions**

Positioning the back in a forward flex position is associated with increased spinal loading. If this position is maintained over an extended period of time, it can be associated with low back discomfort or pain.

**What to Look For**

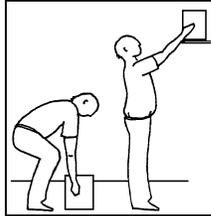
Look for the individual leaning forward and a space (two or more fingers wide) existing between the back and the backrest of the chair. Leaning forward becomes a risk factor when the individual maintains this posture for a period of time, it is not a risk factor when the individual is simply making a change in his/her sitting posture. Changing the position of the back is healthy for the muscles, spinal discs and other tissues of the back.

**References:** 52

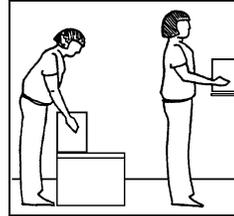
**Table 16**

### Checklist Question 16

**Question:** Repeated Bending while standing greater than 45 degrees forward, bending or any observable leaning to the side, twisting, or backward bending (e.g., lifting below knee height).



**Incorrect**



**Correct**

#### Targeted Risk Factors

Risk Factors		Risk Factors	
x	Awkward Postures		High Force or Forceful Exertions
	Static (fixed positions) Work		High Frequency Movements or Lifting
	High Speed Movements		Duration of Lifting

#### Background and Discussions

Frequent lifting has been correlated with increased low back injury rates. Studies suggest that using a squat lift (lifting with bent knees and a straight back) puts less pressure on the disc than using a stoop lift (lifting with straight knees and a bent back). Repeatedly bending the spine, especially when twisting is involved, can weaken the disc and lead to injuries such as disc protrusions -- a bulging of the outer wall of the disc that can press against the nerve.

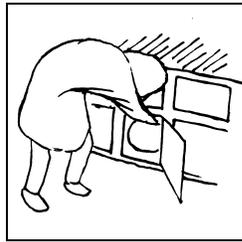
#### What to Look For

Look for the worker who is repeatedly lifting, pushing, or pulling while bent forward, bent sideways, or twisted. Lifting a series of boxes of photocopy paper from the floor or leaning forward to check items off a check-sheet are examples.

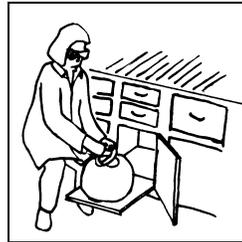
**References:** 13, 25, 26, 43

**Table 17**  
**Checklist Question 17**

- Question:** Lifting Forces:
- handling greater than 50 lb. (22.7 kg.) while close to body;
  - handling greater than 10 lb. (4.5 kg.) while bent and/or reaching (or while seated); or
  - high speed movements.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Awkward Postures	x	High Force or Forceful Exertions
	Static (fixed positions) Work		High Frequency Movements or Lifting
x	High Speed Movements		Duration of Lifting

**Background and Discussions**

Many aspects of the physical act of manually lifting a load have been identified as potentially hazardous to the musculoskeletal systems. They include:

- Weight (force required) and stability;
- Frequency/Duration/Pace (repetitiveness of handling);
- Coupling (texture, handle size and location, and shape);
- Workplace layout (movement distance, direction, obstacles, and postural constraints); and
- Environment (factors such as temperature, noise, humidity, illumination, vibration, and stability of the foot).

**Table 17 - Question 17 (cont'd.)**

**What to Look For**

The worker is required to lift more than 50 lb. (22.7 kg.) in an upright posture, or more than 10 lb. (4.5 kg.) when bending forward to the floor such as lifting a full box of photocopy paper from the floor. In many cases, it may be a good idea to ask the employee if the task includes either of these conditions.

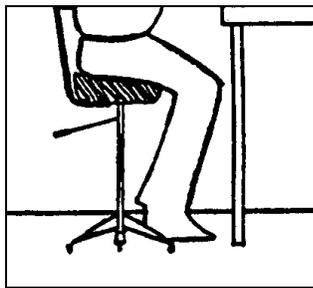
**References:** 13, 15

**Assessment Question for Legs and Feet Body Region**

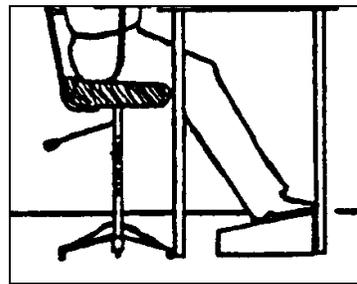
Tables 18 through 21 explain the questions relating to assessment of risk factors for the feet and legs.

**Table 18  
Checklist Question 18**

**Question:** No foot support when sitting; feet cannot rest flat on the floor (e.g., feet dangling, feet tucked back, legs crossed, sitting on leg, etc.) or foot support not used.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
x	Stressful Positions and Movements		Static (fixed positions) Work
	Excessive Forces		External Trauma

**Background and Discussions**

When the feet are not supported or are positioned in constrained postures such as feet tucked back or the legs crossed, pressure can be placed on the nerves, vessels, and veins on the under surface of the thigh or behind the knee. Pressure on these structures can restrict circulation, impact sensation, and cause discomfort.

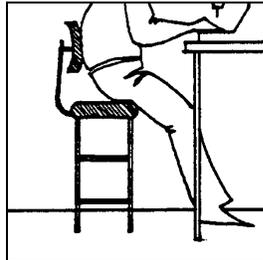
**What to Look For**

Look for the feet dangling, the person sitting on one leg, crossing the legs, or having the feet positioned on the base of the chair. This can occur when the chair is too high to comfortably rest the feet on the floor or a foot support is not provided or used.

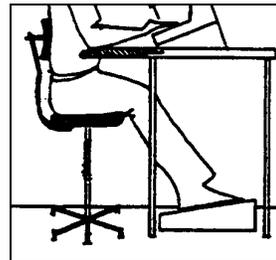
**References:** 13, 25

**Table 19**  
**Checklist Question 19**

**Question:** Edge of seat or work surface presses into legs.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Stressful Positions and Movements		Static (fixed positions) Work
	Excessive Forces	x	External Trauma

**Background and Discussions**

When the seat pan exceeds the length of the thigh, pressure from the edge of the chair can be placed on the nerves, vessels, and veins on the under surface of the thigh or behind the knee. Pressure on these structures can restrict circulation and impact sensation. This can also occur when a surface (e.g., inappropriately designed or positioned articulating keyboard tray) presses into the top or sides of the legs.

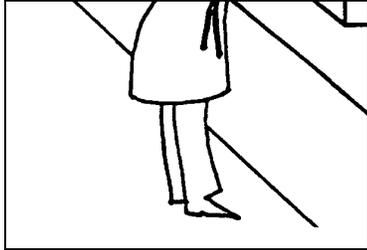
**What to Look For**

Look to see if the length of the seat pan exceeds the workers' upper-leg length or if the edge of the chair presses into the back of the knee area. Also, since circulation and sensation can also be affected when the vertical leg room at the work station is limited, look to see if the upper thigh presses against the under side or edge of the work surface. The proper seat pan depth/leg length combination is when the individual can get two to three fingers comfortably between the knee and the seat pan edge.

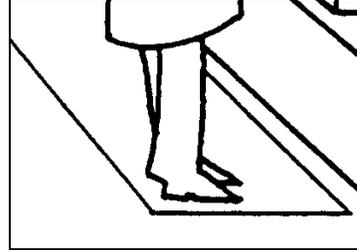
**References:** 13

**Table 20**  
**Checklist Question 20**

**Question:** Hard floor surface: standing and/or walking on hard surfaces.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Stressful Positions and Movements	x	Static (fixed positions) Work
	Excessive Forces		External Trauma

**Background and Discussions**

Standing in one position for prolonged periods can contribute to pooling of the blood in the veins especially in the lower leg. Such conditions can contribute to varicose veins, swelling of the tissues in the lower legs and feet, and blisters in the swollen areas. Prolonged standing can also increase muscle fatigue in the lower back.

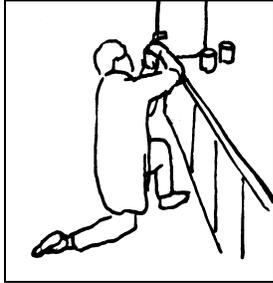
**What to Look For**

The operator stands for prolonged periods of time on a hard floor surface. The work area restricts varying standing postures, or prevents shifting weight from one limb to the other.

**References:** 13, 26

**Table 21**  
**Checklist Question 21**

**Question:** Kneeling/squatting.



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
x	Stressful Positions and Movements		Static (fixed positions) Work
	Excessive Forces	x	External Trauma

**Background and Discussions**

Kneeling or squatting have been included in the OSHA checklist. Kneeling or squatting for extended periods of time can create stress and strain on the ligaments of the knee. Kneeling can also create direct pressure on the bursa sac in the knee joints and causes inflammation or bursitis of the knee.

**What to Look For**

The worker bends more than 20 degrees at the hips and knees, or squats while performing a task. The worker kneels on a hard surface without knee pads or the use of a padded surface for an extended period of time.

**References:** 13, 44

**Assessment Questions for the Head and Eye Body Region**

Tables 22 through 26 explain the questions relating to assessment of risk factors for stress to the head and eyes.

**Table 22**  
**Checklist Question 22**

**Question:** Staring at screen or document.

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Excessive Accommodation		Excessive Adaptation
x	Static Work Postures		

**Background and Discussions**

Studies indicate that the eye tends to focus or stare on the screen for extended periods of time without blinking or at a rate less than one would experience when reading the written or printed document. This can create eye strain and fatigue as well as dryness.

**What to Look For**

The individual stares at the screen or document without blinking or periodically looking away from the document. The individual may complain of tired or dry eyes.

**References:** 20

**Table 23**  
**Checklist Question 23**

**Question:** Glare (e.g., on computer screen, work surface from overhead lights/windows).

**Targeted Risk Factors**

Risk Factors			Risk Factors	
	Excessive Accommodation	x		Excessive Adaptation
	Static Work Postures			

**Background and Discussions**

Glare can be seen in two forms: indirect and direct glare. Indirect glare typically results from reflections of the overhead lights or light off the visual task (monitor). Direct glare can occur when a light shines directly into the eyes from inside or outside light sources. Both types of glare can contribute to eye strain and fatigue.

**What to Look For**

Look for reflections from overhead lights and windows that are visible on the monitor screen. Make sure your eyes are at the same height as the employee's eyes when you check for this Job Factor. Also look for bright windows or unshielded task lights that are visible to the worker. If you are unsure of the source use a mirror. Place the mirror on the monitor facing the operator- the glare source should be easy to identify.

**References:** 21

**Table 24**  
**Checklist Question 24**

**Question:** Light levels too high or too low.

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Excessive Accommodation	x	Excessive Adaptation
	Static Work Postures		

**Background and Discussions**

Light levels which are too bright or too dark can increase visual error rate and cause eye strain and fatigue. Overall light levels for computer work stations should be between 200 to 500 lux (20-50 foot-candles). Light levels below this level may cause the individual to squint or lean forward in the chair.

**What to Look For**

Ambient light levels should be between 200 lux to 500 lux (20 to 50 foot-candles) in work areas where mainly VDTs are used. For areas where general paper-based tasks are done in conjunction with VDT use, task lights need to be used so that the light on the documents is between 500 and 1000 lux (50 to 100 foot-candles).

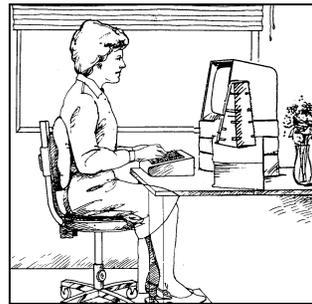
**References:** 22

**Table 25**  
**Checklist Question 25**

**Question:** Screen distance too far away (greater than 30 in. / 76.2 cm.) or too close (less than 18 in. / 45.7 cm.).



**Incorrect**



**Correct**

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Excessive Accommodation		Excessive Adaptation
x	Static Work Postures		

**Background and Discussions**

Documents or screens that are positioned greater than 30 in. (76.2 cm.) or less than 18 in. (45.7 cm.) are too far or too close for comfortable viewing over an extended period of time. If the viewing task is positioned too far, the individual may squint or lean forward in the chair. When the task is too close, the individual may squint or lean back in the chair. Both methods of compensation can create eye strain as well as fatigue and discomfort in the neck and back.

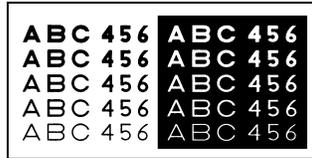
**What to Look For**

Look to see if the monitor or document is closer than 18 in. (45.7 cm.) or further than 30 in. (76.2 cm.) from the viewer's eyes. Hint: An individual's elbow to finger tip length is usually greater than 18 in. (45.7 cm.) in most cases.

**References:** 21

**Table 26**  
**Checklist Question 26**

**Question:** Difficult to read computer screen; documents are difficult to read (e.g., text too small, poor display quality).



**Targeted Risk Factors**

Risk Factors			Risk Factors
	Excessive Accommodation	x	Excessive Adaptation
	Static Work Postures		

**Background and Discussions**

Low brightness, use of colors between the background and foreground contrast on the screen and the document, size, spacing, and style of character can affect the legibility and readability of the monitor and/or document. These factors can contribute to eye strain and fatigue.

**What to Look For**

Look for insufficient contrast between characters and the background on the monitor and reference documents for good legibility. For example, gray text on a white background/green text on a blue background or red text on a purple background can decrease legibility and readability.

**References:** 45, 46

## **Introduction to Environmental Factors**

Environmental risk factors of the office environment include:

- Excessive noise - Background noise in the office can be annoying, distracting, fatiguing or interfere with communication even though the noise levels are below the legislated limits.
- Excessive Temperatures - Most individuals operate comfortably in an office environment when the air temperature is in the high 60's to low 70's° F (low to mid 20's °C). Poor heat and ventilation control can contribute to fatigue and discomfort.
- Awkward Postures - Restricted space layout or arrangement of equipment can lead to awkward postures. These postures can contribute to fatigue or discomfort of the body part awkwardly positioned.
- Poor Quality of Air - poor air quality can affect health, comfort and performance of office worker.

## **Assessment Questions**

Environmental factors are described in Tables 27 through 30.

**Table 27**  
**Checklist Question 27**

**Question:** Noise and/or other distractions (e.g., from printers or equipment, or other employees).

**Targeted Risk Factors**

Risk Factors		Risk Factors	
x	Excessive Noise		Extreme Temperatures
	Static Work Postures		Poor Air Quality

**Background and Discussions**

Sounds in office environments are usually well below acceptable limits required by law and are not high enough to contribute to either permanent or temporary hearing loss. Background noise in the office can still be annoying, distracting, fatiguing or can interfere with communication.

In an office environment, there are basically five main sources of background noise:

1. external noise from traffic, construction;
2. internal facility generation of sounds from heating or ventilation systems;
3. sounds generated from equipment such as printers, telephones and copiers;
4. white noise or purposely induced masking noise - generated electronically; and
5. sounds generated by the individuals in the office such as speech or radios.

Noise levels can impact speech intelligibility or privacy. Speech intelligibility means that the individuals are able to clearly hear and understand information without interference from background noise. Speech privacy is when speech is not inhibited by the background noise.

**What to Look For**

Noise and/or other distractions (e.g., from printers or equipment, or other employees). Individuals will often complain that the background noise interferes with their ability to concentrate or is distracting, communication or causes fatigue. You may answer the question in two ways. First, ask the employee about his/her perception of noise. Check off the appropriate responses. Second, review the relevant portions of the AFOSH STD 48-19, Chapter 2, although noise levels in office environments are expected to be lower than established legal limits.

**References:** 23, 47, 48

**Table 28**  
**Checklist Question 28**

**Question:** Extreme Temperatures - chronically low or high temperatures or extreme fluctuation.

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Excessive Noise	x	Extreme Temperatures
	Static Work Postures		Poor Air Quality

**Background and Discussion**

Most individuals feel comfortable in an office environment when the air temperature is between 68° - 76° F or 20 - 26° C. The normal body temperature is 98.6° F (37° C). In the summer, skin temperature is around 95° F ( 37° C) and in the winter is approximately 91.4° F (33° C). Properly adjusted HVAC systems should allow body heat to dissipate at a controlled rate. Poor temperature or ventilation control contributes to fatigue and discomfort. It is difficult to adjust HVAC systems to keep all individuals comfortable since heat output varies between individuals and comfort is subjective.

**What to Look For**

Extreme temperatures chronically low or high temperature or extreme fluctuation in temperature in the office environment. Individuals may complain of being too cold or too hot affecting their ability to concentrate or increasing their feeling of fatigue especially when the individual feels too warm. Ask the employee to help you rate this risk factor based on their perception. If the employee comments that the temperature is “always” a problem or that the temperature reaches extreme, mark the “strongly agree” response. If the employee simply states that temperature is “sometimes” a problem, mark the “agree” response.

**References:** 24, 49

**Table 29**  
**Checklist Question 29**

**Question:** Indoor air quality (IAQ) concerns.

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Excessive Noise		Extreme Temperatures
	Static Work Postures	x	Poor Air Quality

**Background and Discussions**

The air quality issue is complex. Office buildings can contain a number of pollutants or contaminants. Contaminants in the office environment can include increased levels of carbon dioxide (over 500 ppm); formaldehyde; tobacco smoke; carbon monoxide; allergens (molds and fungi); asbestos; ozone; and, respirable suspended particulates. Most odors do not indicate a hazardous condition. However, they may be a signal of the presence of a chemical or air contaminant. Lack of fresh air is a common problem in office buildings. Ventilation systems which introduce at least 10% fresh air (rather than recirculated air) is recommended. Poor air quality will affect comfort and performance of office workers and less frequently the health of building occupants.

**What to Look For**

Individuals may complain of discomfort and poor health (e.g., headaches and fatigue.) These symptoms may be caused by a number of factors which may not include air quality problems. They may, however, signal air quality concerns, indicating the need to evaluate air quality and ventilation system performance. Ask the employee to help you rate air quality concerns or a detailed evaluation of the IAQ by BEF may be indicated.

**References:** 24, 50

**Table 30**  
**Checklist Question 30**

**Question:** Restricted Space.

**Targeted Risk Factors**

Risk Factors		Risk Factors	
	Excessive Noise		Extreme Temperatures
x	Static Work Postures		Poor Air Quality

**Background and Discussions**

Restricted space is not the same as “confined space.” The design of the work surface should allow for adequate placement of equipment and materials related to the task within easy reach. Adequate work surface space and storage should be provided to accommodate equipment, materials and items used to perform the job throughout the work day. If adequate space is not provided, the individual may have difficulty performing the task. Productivity may also be compromised.

**What to Look For**

Space often becomes restricted when new equipment is introduced, but the space allocated is insufficient to house the equipment and storage of personal items/files/equipment is relegated to the area under the work surface. For example, in the case in the introduction of a new computer to a work surface with a depth of 24 inches (61 cm), the desk may accommodate the keyboard and monitor, but with monitor at a horizontal distance of 16 inches (40.6 cm) from the eye. Individuals may compensate by positioning the monitor off to one side not directly in front of the individual requiring the individual to twist the neck, upper and lower back. The under surface of the desk may also be restricted by personal items or the position of file boxes restricting forward leg room.

**References:** 51

**SAMPLE LEVEL I ERGONOMICS  
ASSESSMENT CHECKLIST**

<b>Level I Ergonomics Assessment Checklist for Administrative Work Areas</b>	Survey Date (YYMMDD) <i>96-10-14</i>	<b>Workplace Identifier:</b>	
<i>(use this space for mechanical imprint)</i>		Base <i>Wright-Patterson AFB, OH</i>	Organization
		Workplace <i>Contracts</i>	
		Bldg. No/Location	Room/Area
		AFSC/Job Series Contract Specialist	
		Job Name:	
BEF Technician: _____ Sign			

# Level I Ergonomics Assessment for Administrative Work Areas

## Part I - Work Content (Description of Tasks Performed)

**Technician:**  
E-Technician

**Date:**  
14 October 1996

For this section, work with the employee to obtain a basic description of the types of tasks that make up his/her job. For each Type of Work performed, indicate the approximate work frequency by checking the most appropriate circle.

1. **Routine:** Performed *three or more days per week*.
  - **1-4 hrs.:** The total amount of time per day spent performing the task is 1-4 hrs.
  - **> 4 hrs.:** The total amount of time per day spent performing the task is more than 4 hrs.
  - **< 1 hr.:** The total amount of time per day spent performing the task is less than 1 hr.
2. **Non-routine:** Performed two days a week or less.
3. **Never/NA:** This type of work not performed

### WORK CONTENT MATRIX

Task <i>If the employee performs tasks which are not listed, write in the additional task types and indicate the work frequency.</i>	<u>Work Frequency</u> (Check one)				
	Routine				
	Never/NA	Non-Routine	< 1 hr.	1-4 hrs.	> 4 hrs.
1. Using a computer - General/word processing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
2. Writing/Reviewing documents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
3. Stapling	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Monitoring (vigilance tasks)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Calling (telephone use)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Copying	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Drafting/illustrating (CAD/graphics)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Filing/general administrative	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Use of calculator/numerical pad	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Lifting/Pushing/Pulling	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Microscope Work	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

= Only complete the checklist for critical tasks which are indicated by the shaded box. [Critical tasks include: Routine tasks and Lifting tasks (regardless of frequency)]

### Performance Measures

How is your performance measured? Promotion and raises are based on low error rates, projects completed on time, customer satisfaction. However, the evaluation process is not formal.

## Part II - Checklist, Shoulder / Neck

### Job Factors

For Routine Tasks (three or more days/week) or Lifting Tasks for each Job Factor, score:

- **Frequently (F):** if **BOTH**
  - **Task** is performed greater than 4 hours per day **AND**
  - **Job Factor** occurs greater than 1/2 of task time
- **Sometimes (S):** Job factor **occurs** but does not meet the conditions for a Frequently
- **Never/NA (N):** if the Job Factor does not occur **OR** is not applicable.

### Critical Tasks

	Job Factor	Task <i>Computer</i> 1-4	Task <i>Writing</i> >4	Task	Task	Comments
	1. <b>Upper arms held away from body continuously while unsupported</b> greater than 15° away from the body (e.g., using keyboard, mouse).	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	2. <b>Repeated reaching arms</b> greater than 15° away from the body, (e.g., obtaining reference manuals, filing, accessing telephone).	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	<i>Reaching for manuals on high shelves while sitting</i>
	3. <b>Shrugging</b> working with both shoulders raised while arms unsupported (e.g., keyboard too high).	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	<i>Keyboard seems too high</i>
	4. <b>Repeated arm forces</b> exceeding 10 lb.(4.5 kg.) (roughly equivalent to lifting a gallon of milk), (e.g., pulling files or stapling).	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	5. <b>Holding/carrying materials</b> exceeding 25 lb. (11.3 kg.) (e.g., 10" stack of files).	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	6. <b>Cradling the telephone</b> between the neck and shoulder	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	7. <b>Head bent down, up, or neck is twisted</b> (e.g., monitor or document too high, too low, off to side).	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	<b>Task Scores =</b> (column total)	2	6			

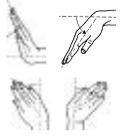
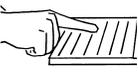
## Part II - Checklist, Hands/Wrists/Arms

### Job Factors

For Routine Tasks (three or more days/week) or Lifting Tasks for each Job Factor, score:

- **Frequently (F):** if **BOTH**
  - **Task** is performed greater than 4 hours per day **AND**
  - **Job Factor** occurs greater than 1/2 of task time
- **Sometimes (S):** Job factor **occurs** but does not meet the conditions for a Frequently
- **Never/NA (N):** if the Job Factor does not occur **OR** is not applicable.

### Critical Tasks

	Job Factor	Task <i>Computer</i> 1-4	Task <i>Writing</i> >4	Task	Task	Comments
	8. <b>Bent Wrists</b> (e.g., any instance when wrist is not straight.)	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	9. <b>Repeated Wrist Movements</b> (e.g., manipulating paper.)	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	10. <b>Repeated Finger Movements</b> (e.g., using keyboard, mouse, paper/equip.)	F=3 S=1 N=0	F=3 S=1 N=0	F=3 S=1 N=0	F=3 S=1 N=0	
	11. <b>Hyperextension of Finger/Thumb.</b> Finger/thumb held away from rest of hand (e.g., using small input devices)	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	12. <b>Hand Forces</b> more than minimal force used to key, constant pinch force > 2 lb. (0.9 kg.) (e.g., squeeze staple remover, hitting keys, gripping mouse or pencil, pulling files) constant full-hand force > 5 lb. (2.3 kg.) (e.g., hold gallon of water.)	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	13. <b>Hard Edges</b> wrists or forearms rest on hard edges (e.g., desk, keyboard tray, armrests.)	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	14. <b>Repeated Forearm Rotation</b> (e.g., flipping pages.)	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	<b>Task Scores =</b> (column total)	1	2			

## Part II - Checklist, Back/Torso

### Job Factors

For Routine Tasks (three or more days/week) or Lifting Tasks for each Job Factor, score:

- **Frequently (F):** if **BOTH**
  - **Task** is performed greater than 4 hours per day **AND**
  - **Job Factor** occurs greater than 1/2 of task time
- **Sometimes (S):** Job factor **occurs** but does not meet the conditions for a Frequently
- **Never/NA (N):** if the Job Factor does not occur **OR** is not applicable.

### Critical Tasks

	Job Factor	Task <u>Computer</u> 1-4	Task <u>Writing</u> >4	Task	Task	Comments
	15. <b>Leaning Forward or Poor Lower Back Posture</b> (e.g., when sitting, when standing)	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	Can't get close enough - Materials under desk
	16. <b>Repeated Bending</b> while standing > 45° forward bending or any observable leaning to the side, twisting or backward bending, (e.g., lifting below knee height)	F=4 S=4 N=0	F=4 S=4 N=0	F=4 S=4 N=0	F=4 S=4 N=0	
	17. <b>Lifting Forces</b> – handling > 50 lb. (22.7 kg.) while close to body or, – handling > 10 lb. (4.5 kg.) While bent and/or reaching (or while seated) or – high speed movements	F=4 S=4 (any duration) N=0	F=4 S=4 (any duration) N=0	F=4 S=4 (any duration) N=0	F=4 S=4 (any duration) N=0	
	18. <b>No Foot Support</b> When sitting, feet cannot rest flat on the floor (e.g., feet dangling, feet tucked back, legs crossed, sitting on leg, etc.)- or foot support not used.	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	<b>Task Scores =</b> (column total)	0	5			

## Part II - Checklist, Legs/Feet

### Job Factors

For Routine Tasks (three or more days/week) or Lifting Tasks for each Job Factor, score:

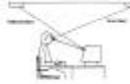
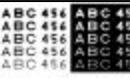
- **Frequently (F):** if **BOTH**
  - **Task** is performed greater than 4 hours per day **AND**
  - **Job Factor** occurs greater than 1/2 of task time
- **Sometimes (S):** Job factor **occurs** but does not meet the conditions for a Frequently
- **Never/NA (N):** if the Job Factor does not occur **OR** is not applicable.

### Critical Tasks

	Job Factor	Task <i>Computer</i> <u>1-4</u>	Task <i>Writing</i> <u>&gt;4</u>	Task	Task	Comments
	19. <b>Edge of Seat or worksurface presses into legs.</b>	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	20. <b>Hard Floor Surface</b> <i>Standing and/or walking on hard surfaces.</i>	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	21. <b>Kneeling/Squatting</b>	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	F=4 S=1 N=0	
	<b>Task Scores =</b> (column total)	0	0			

## Checklist, Head/Eyes

### Critical Tasks

	Job Factor	Task <i>Computer</i> <u>1-4</u>	Task <i>Writing</i> <u>&gt;4</u>	Task	Task	Comments
	22. <b>Staring at Screen or Document</b>	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	
	23. <b>Glare</b> (e.g., on computer screen, work surface, from overhead lights/windows)	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	
	24. <b>Light Levels</b> <i>too high or too low</i>	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	
	25 <b>Screen Distance</b> <i>too far away(&gt;30")(&gt;76.2cm) or too close(&lt;18")(&lt;45.7cm)</i>	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	
	26. <b>Difficult to Read</b> Computer screen/ documents are difficult to read (e.g., text too small, poor display quality)	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	F=2 S=1 N=0	
	<b>Task Scores =</b> (column total)	2	2			

