# Unit 4

# Ergonomics Workstations

## Learning Outcomes

**By the end of this unit the learner will be able to:**

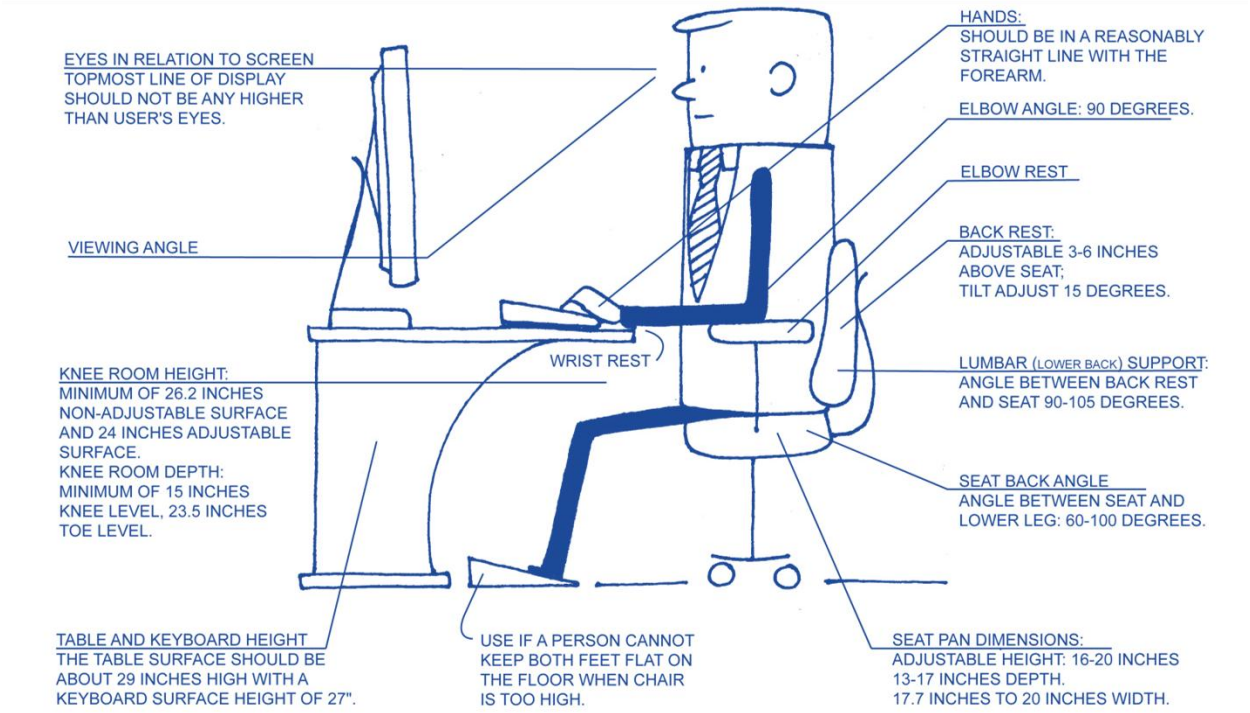
- ✓ Design an ergonomic workstation
- ✓ Identify important ergonomic features of tools and machines
- ✓ Understand the role that environmental factors (such as sound, air quality, and light) play in ergonomics

# Unit 4

## Ergonomic Workstations

**Overview**

When you say "ergonomics," most people think of computers. Indeed, many people suffer from neck, back, and wrist pain that is caused by improperly configured workstations and/or too much time spent at the keyboard. Even if you don't use a computer, your workstation should be configured to make things as easy as possible on your body. Here are some recommended guidelines.




Note that even with an ergonomic workstation, the Washington State Department of Labor & Industries recommends a limit of four hours of typing per day.

*(Source: [http://www.lni.wa.gov/Safety/TrainTools/Online/Courses/courseinfo.asp?P_ID=102](http://www.lni.wa.gov/Safety/TrainTools/Online/Courses/courseinfo.asp?P_ID=102))*

**Tips and Tricks**

Here are some other ways to make computer use as comfortable as possible:

- Take a break to stand and stretch at least once an hour. To relax the eyes, stare into the distance (preferably out a window) every half hour.
- Try using keyboard shortcuts instead of the mouse.
- Choose ergonomic keyboards and mice where possible.
- To raise the monitor, put a package of paper under it.
- Use an ergonomic headset instead of crooking your neck to hold the phone.
- Keep frequently used items within easy reach.

**Test your knowledge**

**Review the main hazards that you identified in your pre-assignment.**

**Which of these ergonomic issues could be resolved with changes to workstations (computer or otherwise)?**

## Safe Tool Selection and Use

**Safe Tool Design**

The tools we use to complete our work should also be designed ergonomically. There are several important factors to consider.

**Are You Using the Right Tool?**

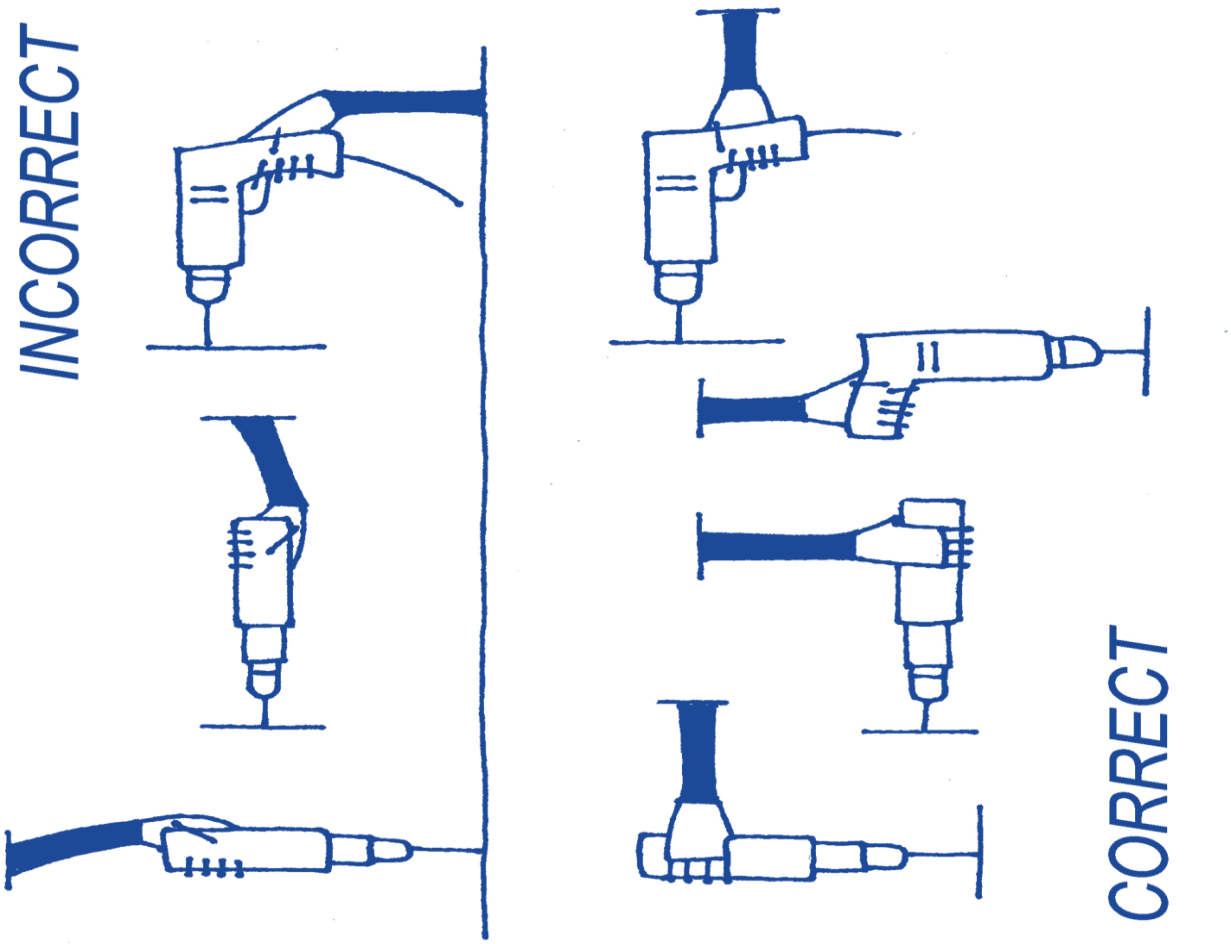
The first factor to consider is if you are using the right (and best) tool for the job. There are many specialty tools designed to make jobs easier and more ergonomic; take advantage of them if you can.

**What Posture Do Tools Require?**

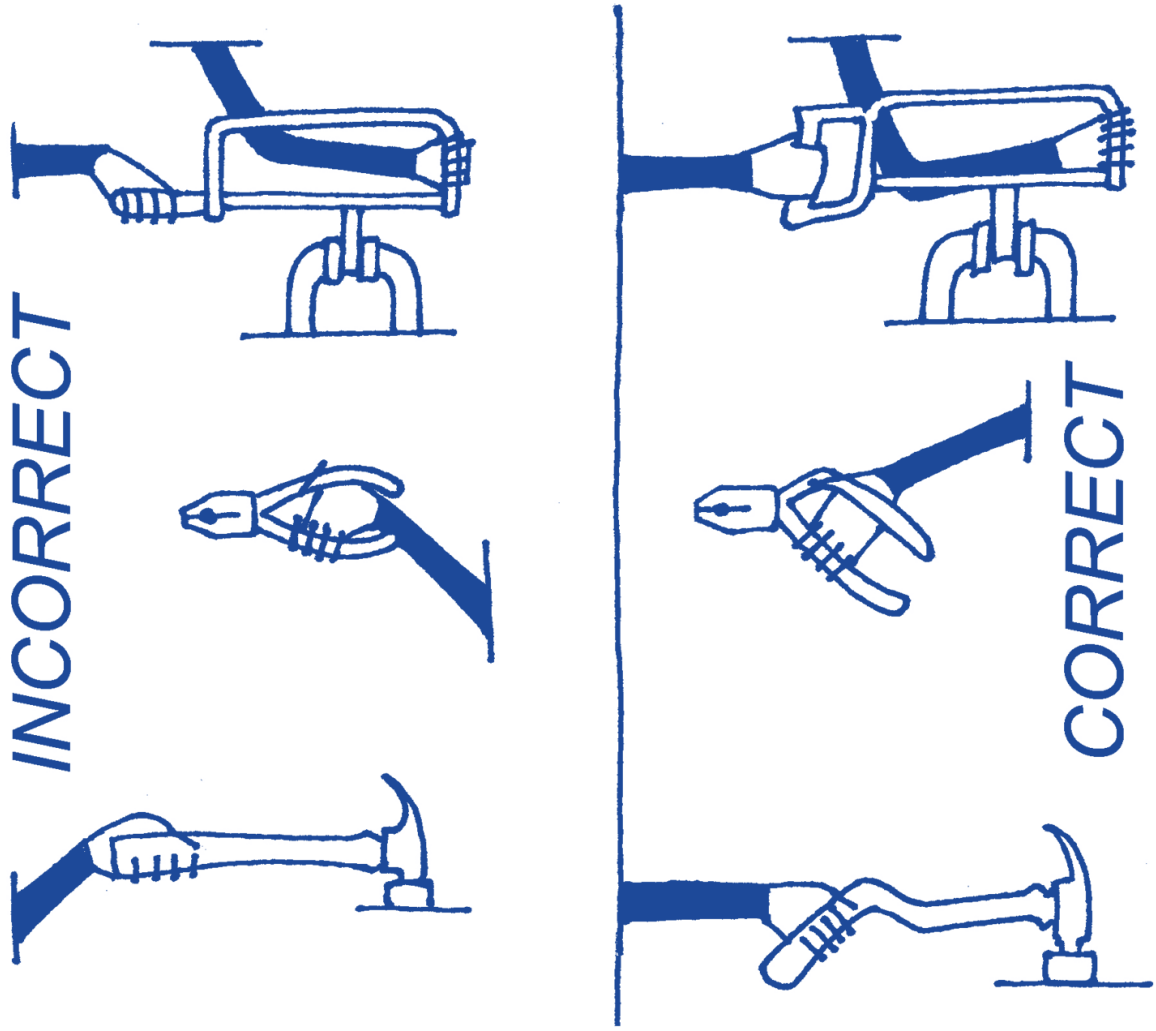
Tools that require you to bend your arm, wrist, or hand into an awkward position can cause severe musculoskeletal issues. These issues can be exacerbated if you are using the tool for a long time, if it is heavy, and/or if it vibrates considerably. (More on these issues in a moment.) Pay attention to what the tool requires of you and identify areas of discomfort.

**Tool Design**

Try to choose a tool that keeps joints in a neutral position as much as possible:



**Proper handgrips** can help with this:




We recommend a slightly convex handgrip that helps to keep joints in a neutral position. Handgrips with finger depressions or other pre-shaped features are not recommended. They are often not ergonomic (as everyone's hands and fingers are a different size and shape) and they can be hard to use if you have gloves on.

As well, consider the advantages of having a motorized tool versus a manual one. Make sure that buttons and other features are easy to reach and make the tool easier to use, not harder.

**Tool Weight**

Sometimes, however, we can go a little overboard in choosing tools. Or, perhaps the tool that you need to use is heavy enough to qualify as a lifting task! If this is the case, a counterweight or stand can be used to reduce the force that you need to exert.

**Maintenance and Upkeep**

Keep tools in good condition and well maintained. When it needs to be replaced, replace it! Take that time to shop around and see what other options might be available.

**Test your knowledge**

**Think of tools that you use at work and at home.**

**Choose three or four items.**

**Re-design them to be more ergonomic.**

| | |
|---|---|
| **Tool One** | **Tool Two** |
| **Tool Three** | **Tool Four** |

### Vibration Considerations

#### Safe Levels

Did you know that exposure to high vibration levels can also cause musculoskeletal issues? Other risk factors (like excessive levels of vibration, extreme temperatures, and long-term exposure) can exacerbate issues caused by vibration.

The Washington State Department of Labor & Industries places hand-arm vibration into two categories:

- **High** vibrating tools (such as jackhammers, chainsaws, and impact wrenches), with a recommended limit of 30 minutes per day
- **Moderate** vibrating tools (such as grinders and drills), with a recommended limit of two hours per day

*(Source: http://www.lni.wa.gov/Safety/TrainTools/Online/Courses/courseinfo.asp?P_ID=102)*

A safe level is about 2.5 meters per second squared ($m/s^2$) for hand-arm vibration. If the source exposes the user to whole-body vibration (such as a machine or a vehicle), the safe level is 0.5 $m/s^2$. Note that this does not include shocks and jolts, which can cause damage to nerves after just one occurrence if the vibration level is strong enough.

#### Reducing Vibration

So how can we reduce the amount of vibration that we are exposed to? Here are some ideas:

- Wear gloves and use tools designed to reduce vibration.
- Know the level of vibration you are being exposed to and adhere to safe limits and practices.
- Reduce exacerbating factors like extreme temperatures and multiple vibration sources.
- Keep tools in good condition and well maintained.
- Vibration-dampening seats in machines and vehicles can help reduce whole-body vibration.

## Creating an Ergonomic Environment

#### See the Light!

The light quality in an environment can have a tremendous impact on your well-being. It is important to choose the right light for the right task. Light is measured in units called **lux**. (You may have also heard

the term **lumens** – one lux equals one lumen over one square meter.) You can also compare lux to **watts**: lux measures the light output, while watts measures the power needed to create that output.

Here is how some **common light sources** measure up on average:

- Moonlight at the equator: 1 lux
- Hallways: 100 lux
- Sunlight output on an overcast day: 100 lux
- Artificial office light: 500 lux
- TV studio: 1,000 lux
- Sunlight at the equator: 100,000 lux

So what kind of light is best for our bodies? The first step is to create the proper **ambient** (or background) lighting. For most offices, 200 to 750 lux is adequate. The preferred setup includes:

- Windows that let in adequate natural light
- Transparent shades over windows that let the user control the amount of natural light
- Overhead lighting that is around 500 lux and controllable (preferably via a dimmer switch; on/off switch at minimum)

Then, set up **task lighting** for the workstation. Ideally, a task light will provide high illumination on a small area of the work surface. The task light should be:

- Easily height-adjustable from the work surface
- Not hot to the touch
- Able to provide different levels of light (including completely turned off)

The brightness of the lamp will depend on the task that you are performing. For computer work, a low-level light of about 250 lux is sufficient. For highly detailed work, a light up to 5,000 lux may be required. Experiment with different levels to see what is most comfortable for you. However, it should be no more than five times as bright as the ambient light in the room.

**Watch out!**

Once you have established adequate light, you have solved half of the lighting equation. The next step is to check for shadows and glare.
One of the biggest culprits can be the surfaces in your workspace. Here are some things to watch for:

- Bare light in your line of vision
- Reflective or bright surfaces (ceilings, walls, floors, and workspaces)

- Bright, reflective colors on ceilings and walls
- White work surfaces are the worst; natural, low-gloss wood is best

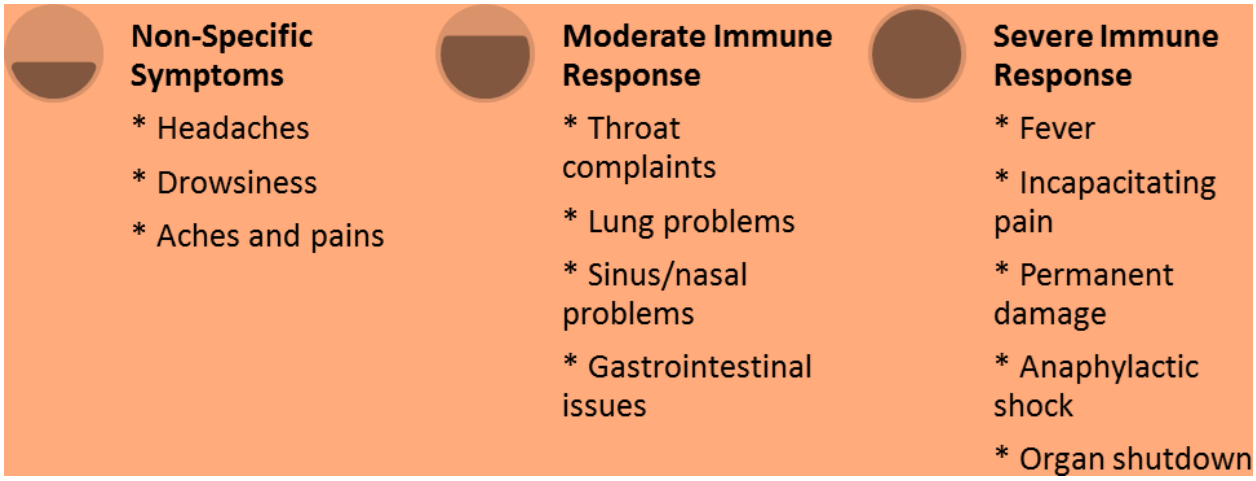
If you are having issues with glare, try the following steps:

- Reposition your workspace or light
- Add denser shades to existing lights
- Use anti-reflective mats for your work surface
- Hang low-reflection art or screens on the walls

**Breathe the Air!**

Good air quality is another part of your ergonomic workspace. Think about the square footage of your workspace that is occupied by machines, furniture, and people. Now think about the square footage occupied by air!

Air pollution usually causes the following **symptoms**. (Typically, symptoms build gradually, unless there is a significant exposure.)




The **circumstances** that most commonly cause air pollution include:

- Allergens such as dust, perfumes, mold, and cigarette smoke
- Hazardous chemicals and materials, such as asbestos
- Fumes from chemicals and machinery that are not properly exhausted

**So what can we do to make our air conducive to an ergonomic workplace?** The most important factor is to ensure that a good ventilation system is in place that replaces stale air with fresh air (rather than just

recycled air). The ventilation system also needs to be well maintained. In particular, filters need to be changed regularly and monitored for indications that it is not doing an adequate job.

**Other measures may include:**

- Special ventilation for areas requiring higher air exchange
- Direct-to-outdoors ventilation for heavy machinery and equipment
- Using less hazardous chemicals where possible
- Awareness of industry-specific issues and ways to mitigate those issues
- Independent breathing equipment (such as respirators or portable air) in areas where air pollution poses a high risk

**Hear the Sounds!**

The final component to creating an ergonomic environment is ensuring the correct level of sound is present. Excessive noise can put a high strain on your body; damage to the hearing system is the biggest risk. Excessive noise also causes tense muscles, an increase in adrenaline, and strain on the eyes and the brain as you try to focus on the task at hand through the noise.

**Acceptable Noise Levels**

The general acceptable noise level is 90 decibels for eight hours a day. Like lifting, louder noises are okay as long as they are for short periods of time. Here are the noise guidelines recommended by the United States Department of Labor Occupational Safety & Health Administration:

| Sound Level in Decibels | Maximum Hours of Exposure per Day |
|---|---|
| 90 | 8 |
| 92 | 6 |
| 95 | 4 |
| 97 | 3 |
| 100 | 2 |
| 102 | 1.5 |

| | |
|---|---|
| 105 | 1 |
| 110 | 30 minutes |
| 115 | 15 minutes or less |

*(Source: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10625)*

As a comparison, here is the average noise level that common tasks generate.

| **Activity** | **Noise Level in Decibels** |
|---|---|
| Breathing | 10 |
| Refrigerator | 40 |
| Quiet conversation between two people | 60 |
| Group conversation | 70 |
| Vacuum cleaner | 80 |
| Traffic | 80 |
| Lawn mower | 90 |
| Subway train | 95 |
| Chainsaw | 110 |
| Sandblaster | 115 |
| Snowmobile | 120 |
| Gunshot | 140 |
| Aircraft at take-off | 180 |

**Curbing Noise in Your Environment**

Your first step should be to use a decibel meter to identify the level of noise. Then, you can identify a target decibel level, do a direct before and after comparison, and see where other improvements need to be made.

Use these methods to turn down the noise level in your environment:

- When possible, use quiet machines. (For example, quiet keyboards are now widely available. Likewise, noise-reduced drills and saws are also common.)
- Ensure that machines are well maintained.
- Have a procedure for reporting unusual or excessive noises caused by machines and tools. This can indicate a mechanical problem.
- Use hearing protection when appropriate. (Did you know that earmuffs are typically more effective than earplugs?)
- Install baffles and muffling equipment in noisy areas to help absorb sound.
- Do not place a noisy area next to a quiet one. (For example, locating the library next to the gymnasium is probably a bad idea.)

**Using White Noise**

With the guidelines above in mind, the workplace also shouldn't be too quiet. Background noise of about 30 decibels is ideal; otherwise, you'll jump out of your skin if the phone rings!

White noise (also known as **background noise**) provides just enough sound to conceal annoying noises. (Think of how, when the air conditioner breaks down, you suddenly notice the traffic outside.)

Let's look at the differences between white noise and **annoyance noises**.

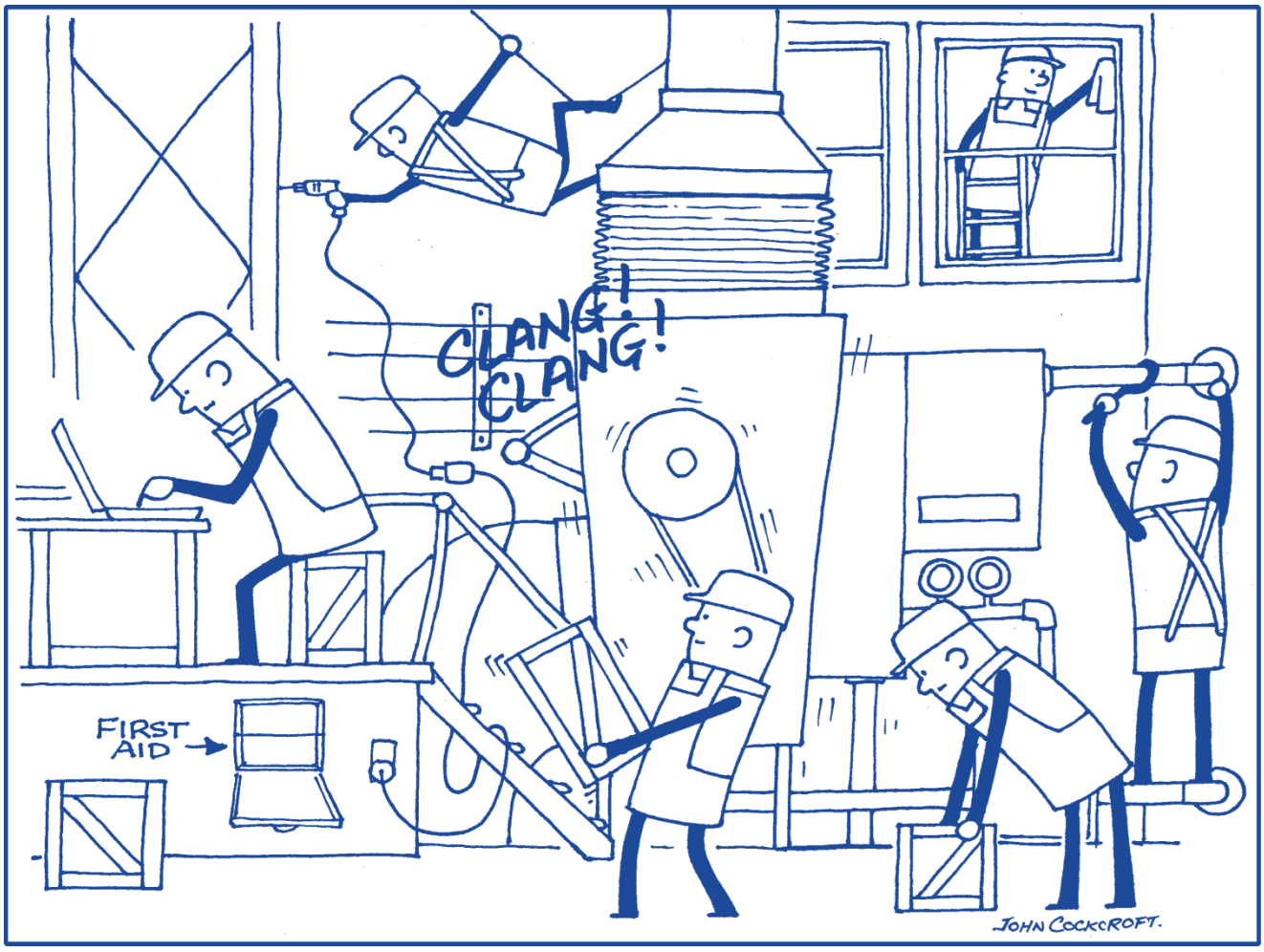
| White Noise | Annoyance Noise |
|---|---|
| Music playing quietly in the background | Radio station playing so loud that you can sing along with it |
| Air conditioner humming | Air conditioner rattling and banging |
| Quiet chatter of the receptionist as he answers the phone | Receptionist talking so loudly that you could transcribe every conversation |
| Outdoor noise filtering in through the | Constant parade of sirens from the police |

| | |
|---|---|
| ventilation system | station next door |

Note that those annoying noises can place a strain on you even if they are well within (or below) the recommended decibel levels. (Think of how that dripping tap slowly drives you out of your mind!) These annoyance noises should be handled like any other ergonomic hazard: identified, rectified, and then evaluated and reviewed.

## Bringing It All Together

**A Day in the Life at the Acme Widget Company**



## Ergonomic Analysis

| Hazard | Resolution |
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