Animal keepers' forum
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Hierarchy of Safety Controls

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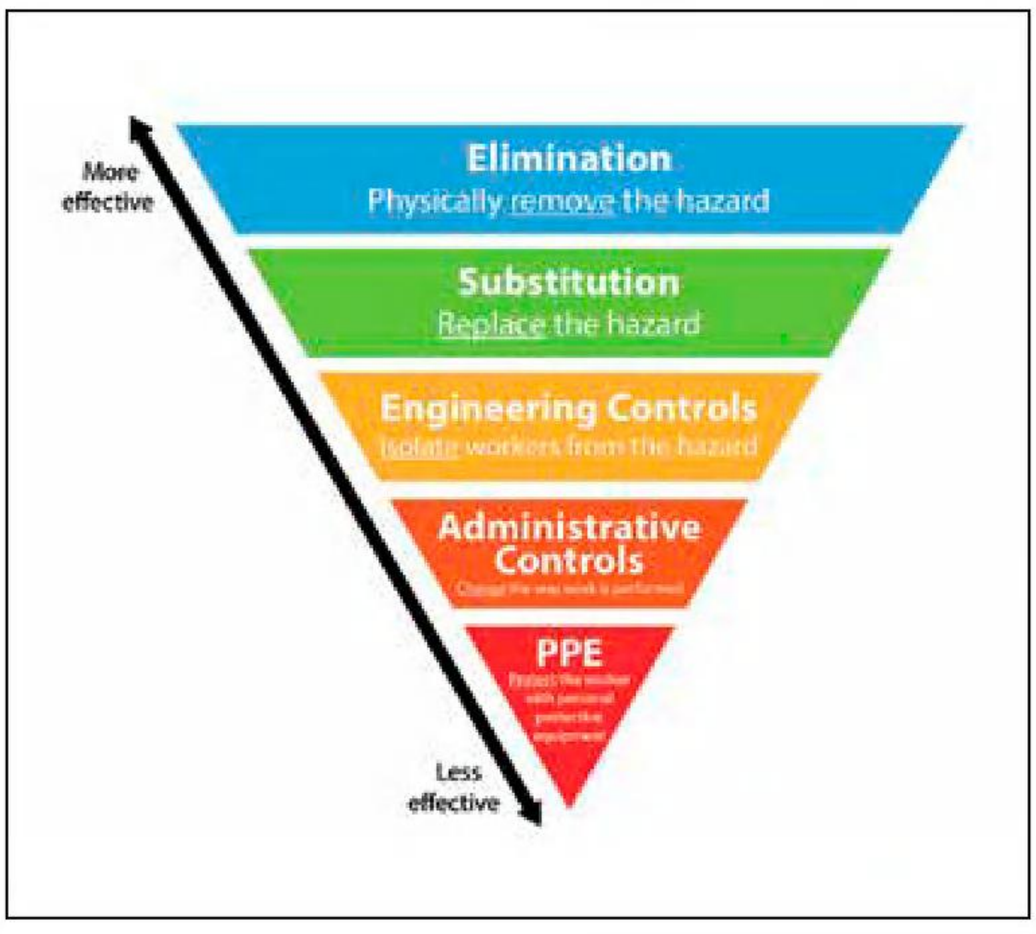
Introduction

Animal keepers are always looking for ways to improve safety when working with dangerous animals. Some tools we can use include creating a positive safety culture and improving our own personal awareness. Another tool at our disposal is called the hierarchy of safety controls. This decision-making tool helps individuals determine how best to manage risks in the workplace. Developed by NIOSH, or the National Institute for Occupational Safety and Health, the tool has commonly been used in aviation, medicine, and construction. We can also use the tool to help us approach situations involving dangerous animals in the zoological field.



The hierarchy of controls includes five different categories of action, listed from most effective to least effective. The first two categories, elimination and substitution, are somewhat difficult to use in zoos and aquariums. The third and fourth categories, engineering controls and administrative controls, are frequently used and will be familiar to almost every keeper, even if they didn't previously know the technical terms. The last category, PPE, tends to be unreasonable when working with dangerous animals except in situations where physical restraint must be used. Understanding how these categories can be and have been applied in the zoological field can help decision makers approach risky situations more easily in the future.

When discussing mitigating risks in zoos, it is important to note that every animal carries an amount of risk and has the capacity to be dangerous. The goal of using a tool like the hierarchy of safety controls is always to reduce risk and danger, not to eliminate danger. Because animals are essential to our facilities' missions and purposes and will always be kept in zoos, we will always face a degree of risk as animal keepers.

Elimination and Substitution

The first two categories in the hierarchy of controls include removing the risk entirely, and in the zoological field these are often not practical options. We cannot eliminate all animals that could be considered dangerous and substituting them for less dangerous animals would often stop our facilities from meeting their missions and goals. However, these options can be utilized when looking at specific situations. For example, if an elephant has a habit of throwing rocks or branches at visitors, these items could be removed from its exhibit. If a gorilla attempts to hit keepers with bamboo, it could be given a different, more flexible type of browse in substitution for bamboo.

We can also eliminate risks by changing our handling method with animals. If we eliminate ourselves from the same space as an animal, we can instantly reduce risk in most situations. For example, working outside of an exhibit that contains orangutans or tigers is likely much safer. However, the increased human safety must always be balanced with other changes to husbandry, care, or maintenance that could occur if keepers do not enter the same area as a specific animal.

Engineering Controls

If we cannot use elimination and substitution as viable courses of action in zoos when dealing with risk, according to the hierarchy of controls we must consider using engineering controls next. Engineering controls attempt to isolate people from a hazard by creating physical barriers. Ideally, these

Example of an engineered control: "Lock Out Tag Out" system.

controls are not subject to human error because they are part of the environment.

Two commonly used engineering controls include a "two lock, two key" system or a "lock out, tag out" system. "Two lock, two key" utilizes padlocks that require different keys from the rest of the locks in the area. If the system is set up appropriately, one individual keeper will be unable to enter an enclosure with a dangerous animal on their own. Similarly, "lock out, tag out" requires a keeper to use a padlock with a different key when entering a specific yard or enclosure. This system prevents another keeper from unintentionally moving an animal into the same enclosure as a person. When these two examples are correctly implemented, there is a physical barrier that prevents humans from unintentionally occupying the same space as dangerous animals.

Engineering controls can also be used in individual risk situations. For example, our rock-throwing elephant could receive exhibit modifications, like a net, to prevent items from being thrown into a crowd of visitors. The gorilla that hits keepers with sticks could also receive exhibit modifications to prevent further danger for keepers, like a board or mesh with smaller gaps. Any modification that physically isolates or protects the keeper from danger is considered an engineering control.

Administrative Controls

Administrative controls could be considered the bread and butter of zookeeping. These controls exist in the form of protocols, best practices, SOPs, and policies. Essentially, administrative controls are methods that change the way people work to create a safer environment. The biggest challenge with administrative controls is that there will always be a degree of human error, unlike properly implemented engineering controls.

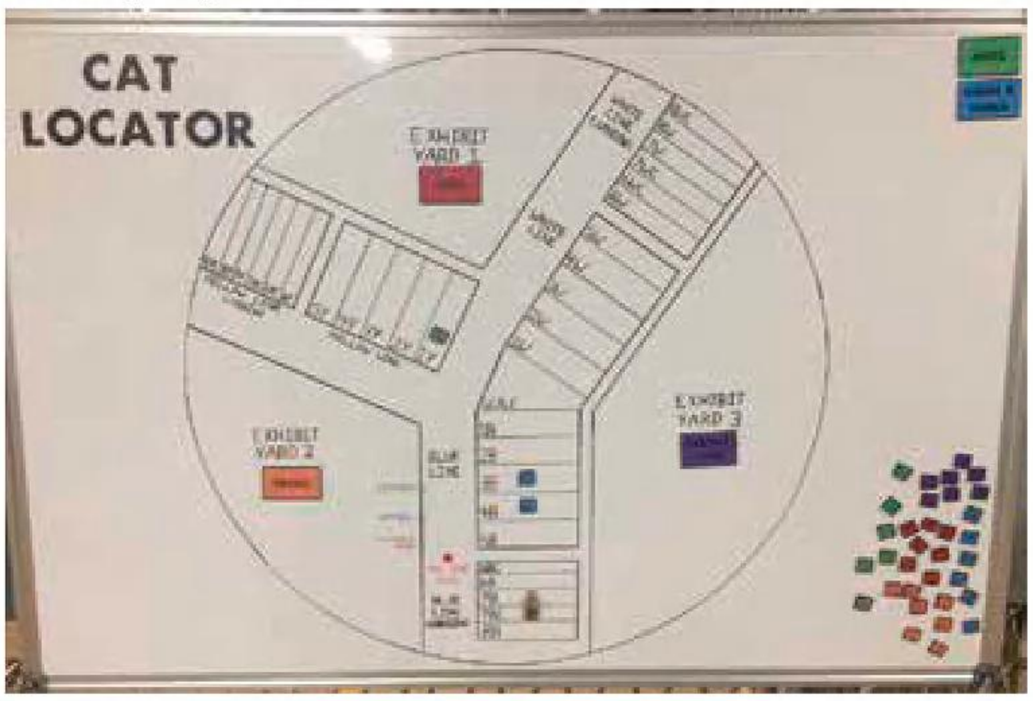
Some common administrative controls when working with dangerous animals include a two-person lock check policy, where a second person must verify that enclosures are secured before an animal is allowed to enter the area. A "head count" protocol requires one or two people to count animals in a group to ensure that an area is free of dangerous animals before a person enters the enclosure. Some zoos may require communication policies before moving dangerous animals, entering specific enclosures or areas, or training certain animals.

Administrative controls can also include tools and techniques used to increase awareness when working around dangerous animals. These can include different ways to highlight if a door is open or closed, including painting doors a different color, labelling door handles, or highlighting the inside of a door frame. Some techniques may highlight where a dangerous animal is located, including maps with moving icons, labels for doors, and signs around dangerous animal holding locations. Mirrors, bright lighting, and indicators to improve visibility are also considered administrative controls. These are only a few examples of administrative controls; many different techniques exist throughout zoos and aquariums in the country.

PPE (Personal Protective Equipment)

The final category of action within the hierarchy of controls is the use of PPE, or Personal Protective Equipment, to protect employees working in dangerous situations. This category of action should always be considered a last resort when using the hierarchy of controls. When working with dangerous animals, PPE is often not a viable answer. There is no PPE that could protect a keeper that enters the same space as a lion, for example. However, there are some tools we can equip ourselves with when physically handling animals, including long leather catch gloves, long pants and shirts, safety goggles or visors,

Example of an administrative control: Map to increase awareness of the location of dangerous animals.



Proper labeling of shift doors is another critical part of working with dangerous animals.

and steel-toed boots. Keepers can also wear bear mace as a last resort when working with large carnivores.

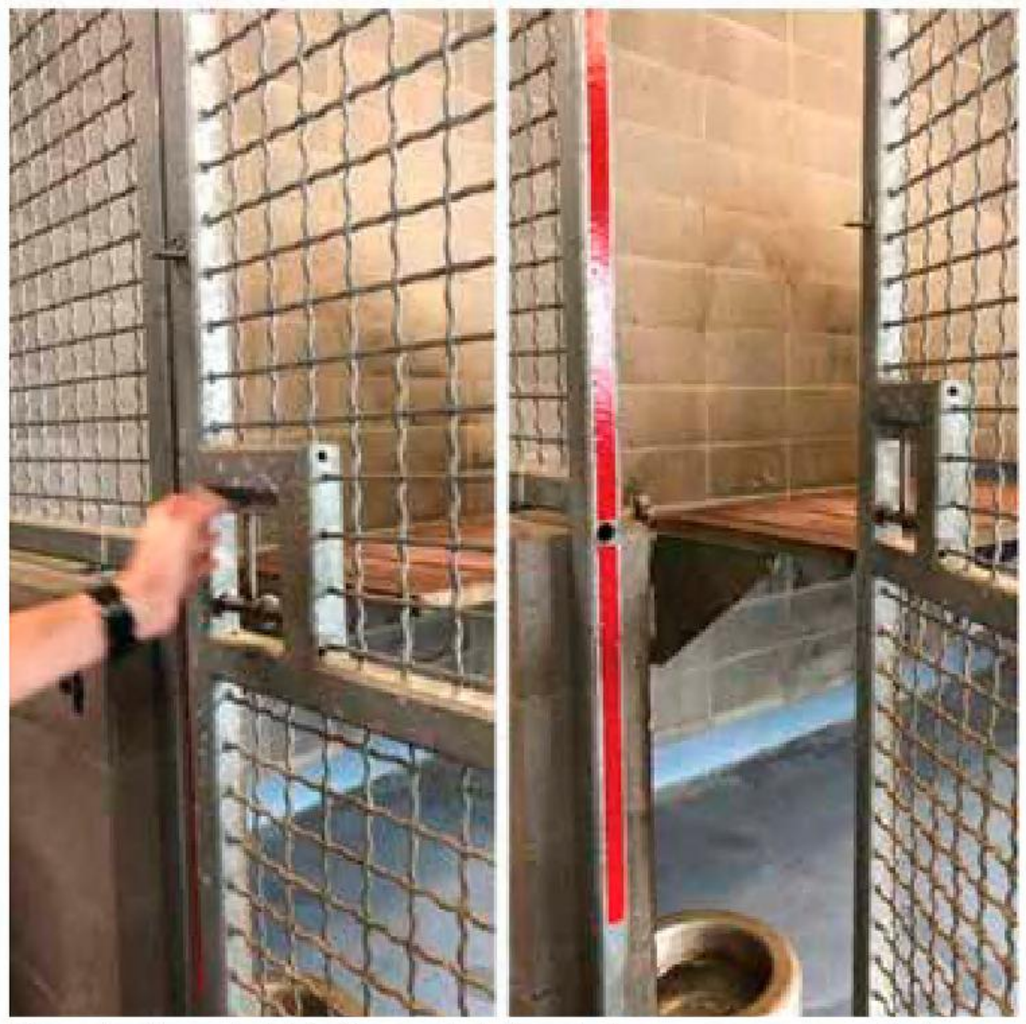
PPE could sometimes be considered useful in independent situations. Theoretically, a hard hat could provide a level of protection against an elephant that likes throwing rocks, and goggles and thick gloves could protect against a gorilla that tries to hit keepers with bamboo. In most cases, there will be many better courses of action to pursue before using PPE.

Applying the Hierarchy of Controls

When applying the hierarchy of safety controls to reduce risk, keepers and supervisors should be creative with possible options and consult each other, other departments, and other zoos. Because complete safety can never be achieved, good reason should always be used. For example, a reasonable decision maker may acknowledge that there will always be a level of risk present when working with large cats and try to balance administrative controls with the keepers' workloads and other concerns.

When applying the hierarchy of controls to a dangerous situation, decision makers should always consider options at the top of the matrix before utilizing options further down. However, because we work with living animals, the earliest possible option may not always be the best option in the zoological field. For example, the ultimate solution for our gorilla, according to the hierarchy of controls, should be to eliminate bamboo or other browse from the gorilla's diet. A reasonable decision maker may consult with their nutrition department and instead decide to install mesh with smaller openings, an engineering control, and continue offering browse to their department.

Finally, it is always important for an individual keeper to take part in their own safety. Any keeper can play a role in assessing risk within their job- they likely should take an active role as they are the individual facing danger. As a keeper, think about different risks within your job and different options that could make your job safer using the hierarchy of controls. Bring up concerns with your supervisor and talk with others in the field. The hierarchy of controls is just one tool that keepers can use to improve their own safety, with others including affecting the safety culture in your department and improving your personal awareness. Ultimately, each keeper must play an active role in their own safety.



Example of an administrative control: Tape to increase awareness of when a door is open or closed.

AAZK Safety Committee

The AAZK Safety Committee was created in 2016 with a mission of developing and exchanging resources for AAZK members in the promotion of safety and health. We coordinate continued education through presentations and workshops at the AAZK National Conference, educational articles in the *Animal Keepers' Forum*, and information shared through the AAZK social media accounts. We are always looking for new members who are also interested in sharing safety information with fellow animal care experts. If you are interested in joining the committee or have any questions, please e-mail safety@aazk.org.