WorkSafe Bulletin

Preventing explosions in shipping containers used outside the shipping industry

Shipping containers used outside the shipping industry can explode with deadly force if they contain common flammable substances that vaporize and combine with a source of heat or ignition. This bulletin explains the hazards and discusses how to reduce the risks.

Shipping containers are designed to be watertight, which means they are well sealed with little or no ventilation. They have a robust structure that can withstand high levels of internal pressure.

These qualities are ideal for shipping purposes, but they present risks when shipping containers are used outside the shipping industry. For example, shipping containers have been used for storage rooms, welding and spray painting operations, electrical rooms, offices, and even living spaces for workers.

What is the explosion risk?

Storing flammable or combustible substances that can vaporize within these closed containers can create an explosive atmosphere. Introducing a source of ignition or extreme heat could result in an explosion.

The ability of a shipping container to withstand high levels of internal pressure increases the risk of explosion. It also means that if a container explodes, it does so with considerable force.

The consequences can be deadly. In one incident, a firefighter was killed when he was struck by a shipping container door that blew off in an explosion during a fire response at a building next to the container. In another incident, a propane leak from a barbecue stored inside a shipping container caused an explosion that blew one of the 113-kilogram doors 40 metres away.

Even a small amount of a flammable substance can lead to a catastrophic result. A leak of just 1 kilogram of propane is enough to cause an explosion that can forcibly rupture a closed shipping container. (By comparison, a typical home barbecue uses a 9-kilogram propane tank.)

Additional risks

Even if you don't store hazardous substances in shipping containers, toxic contaminants may have soaked into the wooden floorboards before you obtained the container.

Since these containers were not designed to accommodate people for lengthy periods of time, the floorboards may have been treated with toxic chemicals to protect them during shipping. Also, pesticides and other chemicals may have spilled onto the floorboards and seeped into the wood.

If the shipping container has not been modified to add ventilation, workers can be overcome by the buildup of vapours from these chemicals.

How to reduce the risks

As an employer or owner, you can reduce the risks by following these safe work practices when using shipping containers outside the shipping industry:

- Determine if any flammable or combustible products are kept inside the shipping container. If so, move them out of the container to a well-ventilated location.
- Modify the container by installing ventilation that allows vapours to dissipate. Installing ventilation will reduce the risk of explosion, but some residual risk will generally remain. Avoid storing flammable or combustible products in shipping containers even if ventilation has been installed.
- Train all your workers and post signage to ensure flammables and combustibles are not stored inside the containers.
- If it's not possible to move the flammable or combustible products, you should do the following:
  - Increase ventilation within the shipping containers.
  - Remove any sources of heat or ignition.
  - Minimize the number of workers going inside or near the shipping containers and the length of time they spend there.
- Find out if the floor is contaminated with toxic materials. If it is, clean or replace the floor. When doing so, take the following precautions to minimize workers' exposure levels:
  - Keep all doors open.
  - Ensure workers wear personal protective equipment such as appropriate respirators.
- List the contents of the containers in your fire safety plan so first responders know what's inside the containers.

Regulation and Code requirements

Requirements related to shipping containers used outside the shipping industry can be found in the Occupational Health and Safety Regulation and its related guidelines (available on worksafebc.com), including in the following sections:

- Section 4.2, Safe buildings and structures (includes temporary structures)
- Sections 4.13–4.17, Emergency preparedness and response
- Sections 5.20–5.26, Containers and storage
- Section 5.27, Ignition sources
- Sections 5.97–5.102, Emergency procedures

Also consult the BC Building Code and the BC Fire Code for employer duties regarding the control of risks related to storing and handling flammable substances.

Resources

The following resources are also available on worksafebc.com or other sites as indicated:

- Reusing shipping containers creates risk of explosion
- Firefighter killed in explosion involving flammable liquids
- Shipping container explodes, killing firefighter
- Shipping container safety (Province of British Columbia)
- The Hazards of Shipping Containers