



## **Shipping Containers**

### Minimum Standards for the use of Shipping Containers as Storage Buildings

#### Issue:

Shipping containers are designed for overseas storage and shipping of material, equipment and hazardous material. These containers are normally poorly vented and are therefore able to build internal pressure. The containers easily behave like a closed vessel.

In January 2013 a BC fire fighter was killed as a result of the catastrophic failure of a shipping container exposed to an external fire. This container contained some minor amounts of flammable liquids (less than 2 litres was involved) and, as designed, had very little venting since the doors were closed and latched. The adjacent fire heated the container and contents, which resulted in a buildup of flammable vapours and pressure inside the container. Ultimately, the shipping container ruptured, tearing one of the top seams of the container and blowing out the latched and locked doors. One of the doors struck a fire fighter standing about 10 m away and the fire fighter sustained fatal injuries.

In Richmond, shipping containers located within/on properties subject to fire inspections will be inspected for compliance. Shipping containers used for storage of any flammable or combustible liquids, or combustible materials and other long term uses, will be considered as permanent buildings and therefore must meet the requirements of the BC Building and Fire Codes as well as City of Richmond Bylaws.

Code Compliance: The container must meet, or exceed as indicated, all relevant requirements of BC Safety Codes such as, but not limited to:

- Division B – Part 3 & Division B – Part 4 of the BC Fire Code will apply in all cases
- There will be no electrical service to the container unless it exceeds all requirements of the BC Building, Fire and Electrical Codes for explosive/moist/wet environments. It must be fully explosion-proof and tested regularly to ensure compliance.



## RICHMOND FIRE – RESCUE

- Dangerous Goods storage shall be restricted to materials that are declared at the permit stages. Any changes to the types of dangerous goods must be approved by Richmond Fire-Rescue.
- No smoking shall be allowed in shipping containers.
- Where flammable liquids and combustible liquids are stored in the container, combustible construction shall be removed, provisions for spill containment installed and the container shall be grounded. The dispensing of flammable liquids and the storage of open containers shall be prohibited in the shipping container.
- Compressed gases shall not be stored in the shipping containers. Limited amounts of aerosols shall be stored in the shipping containers and only when stored in metal cabinets.

Location: The container must be positioned such that:

- There is a minimum separation of 1.5-3m between any non-combustible structure and the container to allow for firefighting access to the exposed structures.
- The shipping container must be located at least 6m from exits, windows or unprotected openings of an exposed building.
- Greater separation distances will be required based upon exposure to any combustible materials or structure.
- The container doors are positioned such that they face away from any other structure.
- The container doors must be positioned such that they face away from any means of road access to the container for fire personnel.
- No combustible materials may be stored near the container.
- Shipping containers shall not be installed under power lines.

Identification: The container must be identified such that:

- UN Placards for all stored Dangerous Goods must be visible on the two container sides most visible to emergency responders.
- The name of the company/person responsible for the storage and an emergency telephone contact number must be marked on the container in lettering visible from 10m.
- The container and contents must be identified in the Fire Safety Plan.

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"To protect and enhance the City's livability through service excellence in prevention, education and emergency response."



Safety Features to be added: The container must have the following safety features in place prior to any use for storage:

- One ventilation opening must be added within 150 mm of the floor in the container door primarily used for opening.
- One ventilation opening must be added within 150 mm from the top of the container on the opposite end from the doors for cross ventilation.
- The high ventilation opening cannot be directly venting toward a structure.
- Neither ventilation opening can be obstructed by stored materials at any time and must be kept clean of internal and external debris.
- The additional ventilation openings must be constructed based upon the following minimums:
  - Two – 0.3 m X 0.3 m openings for containers 6m or less
  - Two – 0.5 m X 0.5 m openings for containers over 6m
  - Both openings will be covered by open grate wire mesh with greater than 50% free area
  - The higher opening will also have a wind vent device, designed to generate a venturi effect during low wind speeds
- Where heavier than air flammable and combustible liquids are stored in the container, a ventilation opening at low level should also be installed at the opposite end from the doors.
- Where 1A flammable liquids in quantities greater than 4 litres are stored in the shipping container, provisions shall be made to comply with the requirements for withstanding an internal explosion, as per the BC Fire Code, BC Building Code and NFPA 68.
- Alternate engineered solutions for ventilation and explosion protection will be considered.

***NOTE: Standard existing environmental vents normally built into shipping containers ARE NOT ACCEPTABLE as ventilation openings for land-based storage applications. These were designed for air movement based upon atmospheric weather changes only and do not provide adequate air flow.***

Reference documents:

*BC Hydro Fire Marshal's Fire Safety Bulletin on Shipping Container Fire Safety - 2013*

*WorkSafe BC Incident Investigation Report #2011 – 1476*

*Office of the Fire Commissioner of BC – Firefighter Fatality Scene Photographs: Enderby, BC Dec. 2011*

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## RICHMOND FIRE – RESCUE

### THE HAZARD

The photo below shows the failure of the shipping container due to explosion in Enderby, BC – January 2013. This explosion fatally injured a firefighter standing 10m away who was hit by a flying door



The photo below shows the folding of one the doors as it blew out of the latches and flew over 10m



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## RICHMOND FIRE – RESCUE

### PART OF THE SOLUTION

Required lower ventilation opening in container door



Suggested upper ventilation opening and wind vent



Photographs courtesy of BC Hydro Fire Marshal's Office

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