

# **PROCEDURE FOR FILLING PAINTBALL PROPELLANT CYLINDERS**

This procedure does not purport to address all of the safety problems, if any, associated with the safe handling and transfilling of small paintball cylinders. It is the responsibility of the fill station operator to establish appropriate safety practices and determine the applicability of regulatory limitations, such as but not limited to DOT and OSHA, prior to use.

## **General Considerations**

- Persons who transfill carbon dioxide (CO<sub>2</sub>) cylinders should be trained in the hazards associated with liquid carbon dioxide. Contact between exposed skin and cold piping or carbon dioxide vapor can cause frost burns.
- Always wear heavy gloves and eye protection while filling cylinders.
- The receiving cylinder (paintball cylinder) must be of a refillable type (i.e. not disposable) and the net weight or volume of gas that it can safely hold marked on the body of the cylinder.
- Supply cylinders must be secured and supported, such as fastened to a wall or similar immovable structure (i.e. not free standing)..
- Appropriate warning signs should be placed at the entrance to confined areas where high concentrations of carbon dioxide gas can accumulate.

## **Cylinder Inspection**

- Conduct a valve twist test to determine if the valve is securely attached to the cylinder. Any cylinders which have valves that can be twisted by hand, or which show signs of the valve having been partially removed, must not be filled. The owners of such cylinders should be warned to have the valve repaired by a trained professional, prior to using the cylinder or attaching it to a marker.
- Visually inspect the cylinder condition before each fill.
  - Cylinders must be marked with a DOT, TC, or appropriate designation.
  - The pressure rating stamped or labeled on the cylinder must be at least 1800 psig.
  - Cylinders should be in good condition: free of stickers, paint, anodizing, dents, scrapes, or gouges.
  - Cylinders should not be buffed or polished.
  - Cylinders having valves without a rupture disk or pressure relief mechanism should not be filled. Pressure relief or rupture disk assembly should be tight, and all pressure relief passages should be clear of obstructions.
  - The valve and external threading must not be damaged, and must be free of foreign material.
  - Damaged valves or components must be cleaned or repaired by a qualified professional, prior to filling the cylinder.

- Cylinders must NOT be filled if any one of the following conditions exists:
  - Composite cylinders are more than 15 years old
  - Empty weight exceeds the stamped tare weight. The presence of contaminants or frozen CO<sub>2</sub> can be mistaken for a higher tare weight.
  - Evidence of internal contamination such as rust or other particles
  - Presence of water or other liquids in the cylinder.
  - External corrosion exceeding .032" in depth, or 25 percent of the surface area.
  - Dents in aluminum bottles that exceed .062" in depth with a diameter less than 2 "
  - Dents in steel bottles that exceed .062" in depth, with a diameter less than 10 times the depth of the dent
  - Scrapes or gouges that decrease the wall thickness of a cylinder by an appreciable amount
  - Visible bulges
  - Cylinders that show evidence of polishing, buffing, welding, grinding, sandblasting, plating, or exposure to high temperature over 350 degrees F.
  - Evidence of de-lamination of a composite cylinder.
  - Cylinders are outside the valid test date range:
    - Requalification period for cylinders is typically five (5) years for aluminum and steel bottles, and three (3) years for composite bottles.
    - Aluminum cylinders not exceeding 2 inch outside diameter and less than 2 feet in length are exempt from hydrostatic retesting
    - Cylinders due for a retest may remain in service but may not be refilled until they are properly retested.

## **CO<sub>2</sub> Fill (Low Pressure) Fill Procedures**

The safety relief device, cylinder wall, and valve body assembly of all cylinders to be transfilled must be inspected as described above. If a questionable condition not described in this procedure is found, and is of concern of the person transfilling the cylinder, the cylinder should not be filled.

- If so equipped, close the valve on the paintball cylinder.
- Attach the CO<sub>2</sub> fill station to the supply cylinder.
- Attach the paintball cylinder to the CO<sub>2</sub> fill station.
- Invert the paintball cylinder, open paintball cylinder valve and the blow-down valve to fully discharge the remaining CO<sub>2</sub> and contaminants.
  - If no venting occurs, pressurize to at least 25 psig and repeat the inversion and depressurization.
  - If venting occurs, conduct a valve twist test again, on the depressurized cylinder, as described above.
- Weigh the empty cylinder. Determine the allowable net weight of CO<sub>2</sub> and add this value to the empty cylinder weight. This provides the gross weight of a full cylinder.
- Fill the cylinder to the proper gross weight.
  - To fill the paintball cylinder, open the valve to the paintball cylinder, close the blow-down valve, and open the supply valve to begin transfer of the CO<sub>2</sub>.
  - To complete the transfilling process, close the supply valve and the valve of the paintball cylinder, and open the blow-down valve to vent the supply line. Check the final weight of the paintball cylinder.
  - If the final weight is below the allowable gross weight of the cylinder, close the transfer valve, open the blow-down valve to relieve some pressure from the paintball cylinder and repeat the venting and filling procedure above.

- If the final weight exceeds the allowable gross weight of the cylinder, vent the excess CO<sub>2</sub>.
- Place full cylinders in a holder or similar manner to prevent damage, and allow them to warm to ambient temperature.

## **High Pressure Fill Procedures**

- The pressure rating stamped or labeled on the cylinder must meet or exceed the intended fill pressure.
- The safety relief device, cylinder wall, and valve body assembly of all cylinders to be refilled must be inspected as described above. If a questionable condition not described in this procedure is found, and is of concern of the person refilling the cylinder, the cylinder should not be filled.
- Attach the fill station to the supply cylinder.
- Attach the paintball cylinder to the fill station.
- Close the blow-down valve and open the valve to the paintball cylinder.
- Open the supply valve and fill the cylinder to the designated fill pressure.
- Close the supply valve and paintball cylinder valve, and open the blow-down valve to relieve the pressure in the transfer line.
- Remove the cylinder from the fill station.