

# HAZARD ALERT

## BATTERY EXPLOSION INJURES WORKER

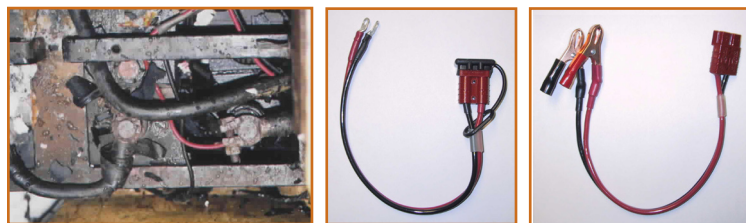
*A 51-year-old woodworker sustained facial and eye injuries when struck by plastic fragments and acid from an exploding battery. At the time of the incident, he was removing a booster cable after boosting the battery. The investigation revealed that cold weather, a discharged battery, and the boosting procedure were contributing factors.*

In cold weather, powered mobile equipment batteries are especially prone to discharge due to frequent idling and many starts and stops. When a battery charge drops below 12.4 volts, the acid (60%) and water (40%) mixture, known as an electrolyte, in the battery separates. The battery acid then reacts with lead plates inside the battery, creating a highly explosive hydrogen gas. As pressure inside the battery increases, the gas is vented to the outside through ventilation openings. In cold weather, the water can also freeze and expand, placing pressure on the battery.

This leads to three possible explanations:

1. Gas created cannot be vented fast enough and the battery cover blows off or the battery explodes.
2. Gas is vented properly and an external spark ignites the fumes released from the battery, which can then back draft and ignite fumes inside the battery, causing it to explode.
3. An internal spark ignites fumes inside the battery, leading to an explosion.

Sparks are common when placing and removing booster cables and can provide the ignition that would begin the reaction leading to an explosion.



### Recommended Preventive Action

1. Remove batteries at the end of the day, store indoors, and reinstall the next morning. They could be recharged at this time, if required.
2. When it is very cold and the units cannot be stored inside, check the state of the battery at the end of the day and recharge, if necessary (less than 12.4 volts).
3. Avoid boosting or charging a frozen battery. For batteries with removable caps, check for signs of freezing by removing the filler plugs situated on top of the cells and looking inside for signs of frozen electrolyte. For those batteries that may not have removable caps, check for signs of bulging or cracking.
4. Follow proper jump starting procedure:
  - a. Connect the "+" clamp of the red booster cable to the "+" terminal of the discharged battery
  - b. Connect the clamp at the other end of the red cable to the "+" terminal on the booster battery
  - c. Connect the "-" clamp of the black cable to the "-" terminal of the booster battery
  - d. Connect the clamp at the other end of the black cable to a solid, unpainted metallic surface located away from the battery and its associated fumes
  - e. Once started, disconnect the cable clamps in reverse order (d, c, b, a)
6. When boosting is done regularly, install and use a vehicle battery harness, as shown in the pictures.