Risk Control Engineering's regular ongoing bulletin on construction, fire protection, equipment hazards and all things risk management.

E-BIKES AND BATTERY ASSISTED MOBILITY DEVICES

E-bikes, and other battery powered mobility devices such as e-scooters, have become extremely popular in recent years. As users move to find more environmentally friendly means of transportation or save on fuel costs, the use of these devices is only going to increase. Storage and recharging of batteries on the bikes has featured prominently in many news stories lately, given the frequency at which some of these devices appear to catch fire causing property damage, serious injury and in many cases even fatalities.

Typical budget e-bike, note battery pack on bike frame.

Batteries

The principal issue that arises with these systems is the use of lithium-ion (Li-ion) batteries. Li-ion batteries have incredible energy density, making them ideal for these applications. Unfortunatley they can suffer from a phenonmenon called thermal runaway where an internal reaction produces so much heat that a violent fire can occur. Batteries of poor or uncertified construction have been shown to be responsible for many of these fires. Internal construction of battery packs is made up of a collection of smaller cells. Often, these are the cheaper pouch cells that can be more prone to internal problems if manufacturing standards are low.

Battery powered bikes (e-bikes) use lithium ion battery packs. These battery systems can present a severe fire hazard if not properly certified, maintained and stored.

Purchasing an e-Bike

Finding a safe and reliable bike begins with ensuring the device is certified to current safety standards. The newly developed CAN/UL 2849 standard is designed to give consumers confidence that the bike they are purchasing will be free of these hazards and defects. This standard is not currently required by Provincial or Federal legislation and the market is flooded with poor quality, knock off devices and batteries or chargers of unknown quality.

UL certification sticker on bike frame.

Buyers must be cautious with these product lines and always look for a UL certified sticker on the bike, charger and battery pack. The image above shows what a typical label would look like on an e-bike. This certification cannot be purchased by manufacturers and has to be earned by submitting their products for laboratory testing. Ask the salesperson about testing and safety standards before buying any product.

Charging and Use

The majority of fires involving e-bikes have occurred during the charging process or during periods of high intensity use of the device. Owners and operators of these bikes should be aware of the following precautions when using and charging these devices:

Li-ion bike fire during use.
http://i.imgur.com/QexArU9.jpg

- The modification of a bike's battery system, control system or charger system is never advisable and is in many cases illegal.
- Only the charger supplied with the bike should be used. Never use after market "rapid" chargers or other devices with your battery system.
- Use only batteries or battery packs listed for your particular bike. After market "high capacity" batteries may not meet current safety regulations for your bike.
- Visually inspect the battery pack for signs of damage prior to riding. Vandalism, hard impacts or other damage on the pack could significantly increase your risk for a thermal battery event.
- Never leave the battery charging in an unattended area or overnight.
- Never attempt to open or service a battery pack. Contact local authorities to find a safe location to dispose of damaged or inoperable batteries.
- Discontinue use and dismount any bike system that is heating excessively or producing smoke.

Storage

Storage precautions for owners is relatively simple and should include the following general practices:

- Bikes and batteries should never be stored in general purpose storage lockers, on wooden frame balconies or near general combustible materials such as trash cans.
- If possible, store your bike in a location that is protected by smoke detection or automatic sprinkler systems.
- Bikes and batteries should be stored in a cool, dry location with good access and ventilation. Do not chain up bikes blocking emergency exit doors or other exits.
- Bike batteries should not be stored for the winter or long periods with a full charge. Discharge the battery before storing for the offseason. A metal storage cabinet is an ideal place for long term battery storage.

Emergency Response

In the event you notice the battery system producing smoke or significant heat, discontinue use immediately and notify the fire department. If a thermal runaway fire develops involving a lithium ion battery, it is not likely to be extinguishable due to the heat involved. Toxic gases are produced in the fire and users are cautioned to keep their distance. Contact emergency responders as soon as possible. A regular ABC extinguisher can be used to extinguish fire spread to adjacent areas or materials.

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