8.0 General Packaging and Materials

8.1 Packaging

To ensure that the individual cells and the components within a battery pack are not damaged or blemished, an outer covering or packaging is used as a protective barrier between the battery and the outside elements. Batteries are most commonly packaged in either a lightweight PVC shrink-wrap or hard plastics.

8.1.1 Shrink Wrap

When routine battery removal is not necessary, shrink-wrap is the recommended protective packaging for battery packs. Shrink-wrap would be used for a battery pack that is assembled into a device, charged and discharge within the device, and only removed in the event of being replaced. Shrink-wrap, because it covers the battery with a thin layer (typically 6 mils) of plastic PVC, allows heat to dissipate effectively in the event of overcharge, over discharge, or short-circuit fault.

In addition to being an effective material for non-portable battery packs, shrink-wrap is a cost effective means of covering and protecting a battery pack. Shrink-wrap is available in a wide range of widths, thickness, and colors at competitive prices with no tooling or engineering costs.

8.1.2 Hard Plastics

Hard plastic cases are recommended for applications requiring the end-user to frequently handle the battery pack. Hard plastics offer greater protection against damage from shock, vibration, and abrasion often experienced in the handling of batteries. This is especially true when the device and charger are two separate units. Hard plastics are typically made up of two halves that are closed either mechanically with screws or by ultrasonic welding. The latter, even with moderate tooling charges, is a fast, clean, efficient, and a repeatable process that produces strong, integral bonds. Since no solvents, adhesives, mechanical fasteners, or external heat is required, ultrasonic welding has become the preferred method of closing hard plastics.

Ultrasonic welding technology involves many details such as
- Material selection (ABS is preferred)
- Additives (colorants, flame retardants, etc.),
- Proper design of nested parts and energy directors.

It is recommended that all new ultrasonic welded plastic cases be designed by plastic injection molders with extensive ultrasonic welding experience to avoid lengthy and costly delays that may occur due to revisions in design and construction.

With the increased use of ultrasonic welding, a variety of hard plastic cases have been designed, and are available as standard cases. Many battery packs can be made to fit within existing hard plastic cases for a cost effective design. Please consult the Harding Energy sales department for a range of styles available.

[1] Contact Harding for listing of current items in stock

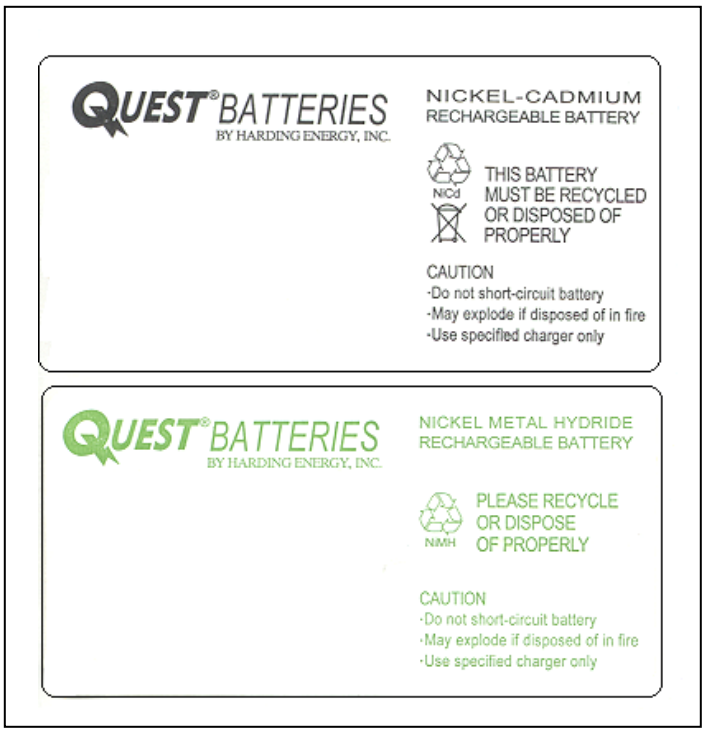
8.2 Labeling

Labels are typically applied onto the outer surface of a battery pack in order to:

- Identify -A part number or model name most commonly identifies a battery pack.
- Track -The date code printed on the battery label tracks the date of assembly to material lots.
- Cautions or benefits
  IE: No memory, long-lasting, high capacity, etc. or "properly dispose of"
- Inform

The items discussed above can be seen on the standard Quest® battery label (Figure. 8.2.1 Standard Quest® Battery Label for NiMH and NiCd) that is commonly used when a custom label is not desired.

Figure 8.2.1 Standard Quest® Battery Label for NiMH and NiCd



8.3 Standard Materials

8.3.1 Nickel Tabs

Nickel or nickel-plated steel are the primary metals used for both the cell construction and battery pack construction. Nickel has the benefits of good conductivity, resistance to corrosion, and cost effectiveness.

There are several nickel tab connection methods used in the construction of battery packs. Nickel weld tabs are strips of nickel (typically Ni201) tab as shown in Figure 7.2.1 Basic Battery Pack Components. These weld tabs are used to connect the individual cells to one another to create the accumulative electrical characteristics of a battery pack. This is done by spot welding the positive and negative terminals of each cell using special resistance welders.

[1] Contact Harding for listing of current items in stock

8.3.2 Solder Tabs

Stamped pieces of nickel material with a hole at one end (also shown in Figures 7.2.1 Basic Battery Pack Components), are used as a means of connecting hook-up wire to the positive and negative terminals of the battery pack.

8.3.3 Weld Cups

Used to make the cell sticks, see Section 7.2.1.1, Battery Pack Configuration. Cell sticks are made by welding a weld cup to the positive terminal of one cell and then to the negative terminal of the adjoining cell.

8.3.4 Solder Pins

Pins with one end flattened are welded to the positive and negative terminals of a cell. The pins extend off to the side of the cell that is then attached to a printed circuit board.

8.3.5 Hook-up Wire

Standard hook-up wire used in most battery pack assemblies ranges from 26 to 18 AWG. This wire is typically stranded, but can be solid or fused. The insulation style most commonly used is 1565 (105ºC), 0.016" thick PVC insulation. Wire with extruded TFE Teflon insulation has also been used when flame and chemical resistance is desired.

8.3.6 Insulating Materials

Shrink tubing, fishpaper, electrical tapes, and foam tapes are standard means of insulating and protecting electrical connections.

8.3.6.1 Polyolefin Shrink tubing

This should not to be confused with PVC shrink-wrap, (See Section 8.1 Packaging), and is most often used for covering welded and soldered electrical connections between wires, tabs, and electronic components.

8.3.6.2 Fish paper

This rigid, high-density paper has excellent insulating properties. It is easy to cut into almost any profile to cover the ends of battery packs that would otherwise be left exposed. See Figure 7.2.2 Insulative Battery Materials.

8.3.6.3 Various Tapes

It is essential to insulate and hold parts of a battery pack assembly into place. Many battery packs use electrical tape to cover exposed weld tabs and electrical components, as well as holding wires into place before the outer shrink wrap is applied (see Figure 7.2.2 Insulative Battery Materials and Figure 7.2.3 Shrink wrap

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Packaging Material). Double-coated foam tapes are also used as a means of mounting a battery pack within hard plastics or device compartment. Foam tapes also provide an excellent means of extra protection in battery packs that may be subjected to shock, vibration, and/or abrasion.

8.3.7 Adhesive Materials

Instant adhesives of various speeds and viscosities, Hot melt glue, epoxy, potting compound, ABS Cement, and spray adhesives all have their place in pack building.

8.3.7.1 Instant Adhesive

Ninety five percent of all the adhesives used by Harding lay in three general purpose clear Cyanoacrylates. All have a temperature range of –65°F to 200°F.

8.3.7.2 Hot Melt Glue

There are myriads of hot melt glues on the market. Harding will select the hot melt glue that best meets the requirements of the customer's application.

8.3.7.3 Other materials

A large variety of materials such as epoxy, potting compound ABS cement and spray adhesives can be used to build packs and Harding has the experience to select and apply whichever is best suited to your application.

[1] Contact Harding for listing of current items in stock