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BLIND FREDDY ELECTRIC BIKES

RISK MANAGEMENT PROCESS – BATTERY MANAGEMENT

1. INTRODUCTION

This risk management plan defines how Blind Freddy Electric Bikes handles the risks associated with the management of Lithium-ion (Li-ion) batteries in the business supply chain and for customers.

2. ORGANISATION

Blind Freddy Electric Bikes is a small business currently owned by Bruce and Jennifer Tucker.
The business is currently managed by Bruce Tucker. No other permanent or part-time employees are employed. Contract staff are employed on a casual basis to provide specific functions.
Bruce Tucker has worked with electric bikes and the batteries used to power bikes for over 10 years.
Richard and Andrea Herklots are planning to purchase the business in November 2019. Richard has a Bachelor of Electrical Engineering Degree (UNSW) and Andrea has a Bachelor of Science (Hons) in Combined Science (Computer Studies and Geography) and a Master of Science in Remote Sensing (U London). Richard will take on the role as the technical lead for the business while Andrea will become the general manager, including sales, marketing and customer relations. Bruce will be involved in the transition of the business and it is planned to retain him and the current casual bike mechanic for their technical expertise including battery management.
The manager of the business takes on the sole responsibility for managing all risks associated with the business. This risk management plan forms one of the documented plans for the organisation and will be supported by procedural checklists for inventory management, new sales and after sales.

3. RISK MANAGEMENT PROCESS

Blind Freddy Electric Bikes adopts the standard risk management process of identification, analysis, ranking, treating and monitoring risks.

3.1. IDENTIFY THE RISK

Blind Freddy Electric Bikes is a small business operating from one retail store and with one off-site storage location. Suppliers transport goods from source in China via sea-freight. Wholesalers supply goods from within Australia. The business also provides wholesale customers with goods within Australia. Most customers are located within Australia and are supplied with goods via post, courier or direct delivery.
Electricity sourced from batteries is potentially hazardous. Equipment that uses electrical energy should be compliant with standards and installed according to applicable electrical codes to mitigate safety risks. Li-ion batteries are classified as a dangerous good (Class 9). Batteries must be packaged and transported in accordance with the Australian Dangerous Goods Code (ADG).
Li-ion batteries use a cathode based on metal oxides of cobalt, nickel, iron, aluminium or manganese. The anode component is carbon. The electrolyte medium is a lithium salt in a solvent such as organic, solid ceramic, ionic fluid, composites or other types of solvent.
Risks are identified but not currently rated. Rating can be conducted by adopting the risk rating system described in Section 4.

3.2. MITIGATE

Li-ion batteries have a failure rate that is less than one in a million. Failure rate of a quality Li-ion cell is better than 1 in 10 million (source: Battery University, 2019).
Mitigation is a core function of the business. This is done through a controlled product acquisition and management process:

1. Only purchasing batteries which comply with International Standards UN38.3
2. Purchasing batteries from suppliers renowned for manufacturing high quality batteries and name brand batteries
3. Batteries are only sold with approved battery chargers which comply with AS/NZS60335.2.29
4. Following manufacturer's guidelines for the safe storage of batteries
5. Checking battery voltages when they are received to determine if the voltage is the correct level for storage
6. Rotate all batteries through a structured and time-based program of full discharge and re charge every 3 months to maintain optimum battery life.

Manufacturer's guidelines are supplied and followed for safe handling and storage. Customers are provided with copies of the manufacturer's guidelines upon purchase. Customers are also given verbal instructions on how to store and use batteries safely. Customers are also provided with written guidelines on how to store batteries to optimise battery life. Long-term storage by customers should follow these principles:

- Discharge energy from battery if possible and safe
- Store out of reach of children
- Report any defects or changes to the battery casing to the company

3.3. ANALYSE, EVALUATE AND TREAT THE RISK

The metal in Li-ion batteries itself is very reactive and are therefore potentially volatile. A failing Li-ion battery begins to hiss, bulge and leak electrolyte.

3.3.1. Risk of fire

Sparks can be generated if terminals connect. Battery casing is used to prevent the exposure of terminals on electric mobility devices.

Risk preparation for risk of fire:

1. Keep fire extinguisher, fire blanket and tub for water immersion onsite.
2. Retain clear egress to outside via rear door.

Risk mitigation strategies for risk of fire:

1. Store batteries according to manufacturer's instructions in a cool, dry, ventilated space
2. Only use certified batteries for correct use
3. Store batteries at partial charge where possible (heat and full charge increases risk)

Risk treatment if exposed to fire:

1. Call 000 and seek urgent medical advice
2. If safe to do so,
    a. Move battery away from other flammable materials and place on a non-combustible surface
    b. If possible, use a fire blanket to smother, remove the battery and place it outdoors to burn out
    c. If not possible to move safely, use an appropriate fire extinguisher or water to put out the fire.
        i. Extinguisher – you can use a foam, CO2, ABE dry chemical or water extinguisher.
        ii. Water can also be used as Li-ion batteries contain very little lithium metal which reacts with water. Water also cools the adjacent area and prevents the fire frm spreading.
    d. Place burned-out battery packs in a safe, outdoor location and monitor to ensure cell propagation has consumed all cells.

3.3.2 Risk of thermal burns from contact with hot surfaces

Volatility can cause the battery to rapidly lose energy which could generate enough heat to burn skin. The outside casing of failing batteries could produce a thermal burn if it comes into contact with skin.

Risk preparation for risk of thermal burns:

1. Keep burn ointment in first aid cabinet

Risk mitigation strategies for risk of thermal burns:

1. Store batteries according to manufacturer's instructions in a cool, dry, ventilated space

2. Wear hand protection when handling batteries
3. Have burn ointment on hand in case of emergency

Risk treatment if exposed to corrosive electrolyte:

1. Call 000 and seek urgent medical advice
2. Apply burn ointment if recommended by emergency services personnel

3.3.3 Risk of chemical burns from contact with corrosive substances

The electrolyte contained in batteries can be corrosive if it comes into contact with skin, eyes, clothes, concrete, plastic, metal, wood or the environment. Battery shells are designed to safely contain the electrolyte. Only if casing fails would corrosive substances become exposed.

Risk preparation for risk of corrosion:

2. Keep rubber gloves, eye protection and protective clothing onsite
3. Keep eye wash in easily accessible location.

Risk mitigation strategies for risk of corrosion:

4. Store batteries according to manufacturer's instructions in a cool, dry, ventilated space
5. Use old clothes or a rubber apron when handling batteries
6. Wear rubber gloves
7. Wear eye protection
8. Have eye wash on hand in case of emergency

Risk treatment if exposed to corrosive electrolyte:

3. Call 000 and seek urgent medical advice
4. Wash eyes with eye wash
5. Wash skin with clear, running water

3.3.4 Risk of electric shock

Most batteries have very low voltage and so there is no risk of electric shock, but it is important not to be complacent about batteries, especially those that contain higher voltages. Batteries supplied or installed on electric bikes are 48 volts or less.

Risk preparation:

1. Stock tape in workshop for covering terminals

Risk mitigation strategies:

1. Store batteries according to manufacturer's instructions in a cool, dry, ventilated space
2. Do not receive batteries from unknown source into retail outlet or storage units
3. Discharge batteries fully before disposing of them
4. Cover terminals with tape before disposal
5. Where possible, recycle batteries in accordance with recycler's instructions

Risk treatment If exposed to electric shock:

1. Call 000 and seek immediate medical advice

3.3.5 Risk of swallowing

Batteries used for electric bikes or other mobility devices are too large to be swallowed, so there is no risk of swallowing.

Risk preparation for swallowing: Not applicable.

Risk mitigation for swallowing: Not applicable.

Risk treatment If batteries swallowed: Not applicable.

3.3.6 Risk of injuries/lacerations from moving parts

Batteries on electric bikes are contained within sealed units. Batteries are less than 10kg in weight. There are no moving parts within the batteries.

Risk of injury would be limited to impact from a battery falling items onto a person.

Risk preparation for lacerations:

1. Store first-aid cabinet containing products suitable for treating minor injuries

Risk mitigation for lacerations:

1. Avoid disassembly of batteries from mobility devices with customers present unless safe to do so.
2. Move devices away from retail outlet into workshop before adjusting position of batteries.
3. Train all staff including casual workers on safe process to remove and replace batteries.

Risk treatment for lacerations:

1. Conduct high-level triage on severity of injury
2. If minor
    a. Call 000 and seek immediate medical advice
3. If moderate
    a. Advised injured party to seek assistance from local medical centre
4. If high
    a. Call 000 and seek immediate medical advice

3.3.7 Risk of loss of critical function

No evidence can be found of instances where battery failure has caused loss of critical function.

3.4. MONITOR AND REVIEW THE RISK

Risks will be monitored and reviewed on quarterly basis or upon occurrence. Where a risk arises, the likelihood of reoccurrence will be assessed.
Any risks are documented in the risk register, a copy of the format is provided below (Error! Reference source not found.).

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Example Risk register for Blind Freddy Electric Bikes – Battery Management

Table 1: Sample risk register format

Risk ID	Date submitted	Status	Risk event	Risk probability	Risk impact	Risk score	Cost of risk	Timeframe
	Risk owner	Agreed response		Quantification comments				
		Avoidance Transference Mitigation Acceptable		Cost basis: Schedule basis:				
Description:								
Assessment:								
Response plan:								
Lessons learned:								