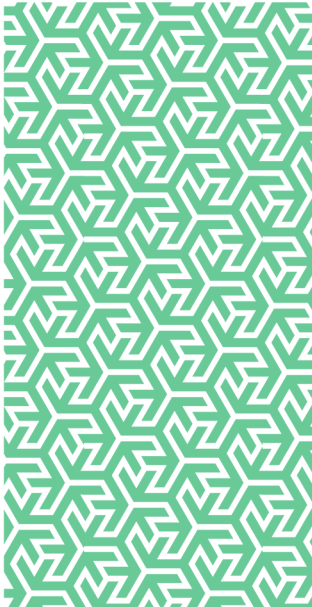


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Risk control E-Cargo Bikes



In partnership with



E-Cargo Bikes

Introduction

Cargo bikes are designed to carry various cargo through busy streets. E-Cargo bikes are appearing in our towns and cities providing valuable last mile delivery options. E-cargo bikes are taking the place of traditional vans which contributes to reductions in pollution and congestion.

With E-Cargo bikes offering agile solutions for delivers and with zero-emissions companies, Councils and Universities can all benefit from the use of these vehicles.

As well as the logistical benefits, E-Cargo bikes offer users health advantages by providing manageable exercise.

E-Cargo Bikes

Electrically-assisted cargo bikes can be divided into two types, those with power output less than 250W, that are subject to the same regulations as bicycles; and those with power output greater than 250W, which need a licence, insurance and safety equipment. E-cargo bikes come in a variety of shapes and sizes broadly falling into two categories in relation to capacity of load:

- Two-wheeled e-cargo bike can carry up to 70kg
- Three / four-wheeled e-cargo bike can carry up to 250kg

Key Considerations

Once it has established that E-Cargo bikes are the solution that is going to be introduced, there are a few things that an organisation will need to consider.

E-Cargo bikes must meet the Electrically Assisted Pedal Cycle (EAPC) Regulations¹. To meet the requirements of these regulations, the electric motor must have a maximum output of 250W. The electric motor stops providing assistance if the rider stops pedalling, applies the brakes or reaches a speed of 15.5mph. If the E-Cargo bike doesn't meet these requirements then it is classed as a motorcycle, moped or powered light vehicle and needs to be registered, taxed, insured and the user must have a drivers licence.

If the E-Cargo bike meets the requirements of EAPC then users of E-Cargo bikes do not need a driving licence or safety equipment to meet the requirements of traffic legislation. However, from an occupational health and safety perspective E-Cargo bikes should be seen as work equipment and the relevant processes followed.

Risk Assessment / Fire Risk Assessment

Occupational health and safety law requires that a suitable and sufficient risk assessment is completed prior to the purchasing of any equipment to establish if this a safe solution for their needs. The assessment will identify all associated hazards with the E-Cargo bike use, maintenance and storage. Doing this will ensure that all the right control measures and support are in place before the E-Cargo bike is put into service.

A fire risk assessment should also be undertaken for areas where E-Cargo bikes or their Lithium-ion batteries are being charged or stored.

Use of E-Cargo Bikes

Riding E-Cargo bikes is similar to riding a traditional push bike. However, it would be advantageous for organisations to identify suitable training to enhance the skills of their users. Providing users with cycling safety tips and information on the Highway Code - Rules for Cyclists will ensure a good level of knowledge. The safe operation of E-Cargo bikes relies heavily on the behaviours of the users, having robust expectations of conduct and a suitable level of monitoring of behaviours will ensure good health and safety practices are consistently followed.

Concerns have been raised by the London Metropolitan Police² force regarding the safety of the loading of cargo on to the E-Cargo bikes. It is essential that users of E-Cargo bikes receive adequate training for the loading of goods to ensure that overloading and unbalanced loads are not carried as they may increase the risk of incidents. The manufacturer of the E-Cargo bike should be able to assist with the provision of loading plans.

Ensuring that E-Cargo bikes are securely loaded will ensure that the users vision is not compromised allowing for full appreciation of the traffic and pedestrians in the areas that they are operating.

Loading and unloading operations may pose manual handling risks to users, so organisations must ensure that all necessary assessments and training are in place to control these risks.

Secure overnight storage for these bikes must be considered. When seeking to protect bikes and goods (cargo) whilst in use, consideration should be given to effective security measures such as locks, immobilisers and trackers.

E-Cargo bikes provide electrically powered assistance for the user. However, users should be assessed for suitability to operate these bikes. For example, are there any health factors, such as poor eyesight, that may put the user in jeopardy?

Using the risk assessment approach will identify suitable lengths of time that E-Cargo bikes should be operated before users will require rest.

It is likely that E-Cargo bikes will be used in all weathers, so arrangements should be identified to ensure the safety of the users across the full spectrum of conditions. Organisations should consider implementing an Adverse Weather Policy encompassing the requirements for E-Cargo bike users.

Control measures for operating the E-Cargo bike in warm weather will be substantially different to operating in the winter months. Some E-Cargo bikes have enclosed cabins with windshields. In these circumstances it is essential that there is an effective method for ensuring the screen remain clear at all times to maintain good visibility.

The use of appropriate personal protective equipment should be identified. It is recommended that helmets and hi-visibility clothing are worn to ensure the safety of users.

Maintaining E-Cargo Bikes

E-Cargo bikes will require regular maintenance, so taking a proactive approach to this will potentially reduce the risk of expensive repairs. E-Cargo bikes require specialist servicing and the availability of spare parts may be problematic.

Organisations should always follow manufacturer's advice regarding the servicing of the E-Cargo bikes.

As with all work equipment, all servicing and maintenance should be recorded and kept for a reasonable period of time, but not shorter than the lifespan of the Cargo Bike's operation.

Battery Management

Lithium-ion batteries, sometimes referred to as Li-ion cells, are widely used and can be found powering anything from mobile phones and laptops to E-Cargo bikes, E-Scooters and electric vehicles.

Lithium-ion batteries can be very volatile due to their high energy density and many combustible components utilised in their construction. If they are overloaded, damaged or treated incorrectly they can explode and / or cause serious fires.

Lithium-ion Battery Failures

— Initiation Abuse Factor

This can be electrical, thermal or mechanical abuse that causes the battery to start failing.

— Off-gas Generation

As the battery begins to fail, electrolytes break down and generate gas that is released from the cell in an off-gas event. This stage occurs immediately before thermal runaway; a situation where an increase in temperature changes the conditions in a way that causes a further increase in temperature and is typically the last thing to happen before a fire occurs.

— Smoke Generation

This is an indication that the cell has reached the stage of thermal runaway and that the cell can experience rapid disassembly at any moment. The smoke is produced inside the cell and, if the cell has already experienced a vent or rupture from the off-gas event, the smoke is able to escape the battery and is detectable by smoke detectors. Following smoke generation, there is usually very little time before the cell catches fire.

— Fire Generation

Once smoke generation occurs, the battery is in an extremely vulnerable state and can catch fire or explode at any moment.

Common Failure Causes

Some common causes of Lithium-ion battery failures include³:

— Manufacturing Defects

The manufacturing process for Lithium-ion batteries is extremely demanding and hard-to-detect defects can be created. The batteries have to undergo a series of processes such as charging and discharging after the assembly is completed. These processes are accompanied by physical processes such as vibration and heat generation which may exacerbate any manufacturing defects and eventually cause a short circuit.

The influx of low cost / low quality products into the Lithium-ion battery market is likely to increase the risk of fires and explosions due to an increased likelihood of manufacturing defects due to the use of cheaper materials and manufacturing processes.

— **Mechanical Damage**

Mechanical damage can be caused to the batteries during transportation, storage, product assembly and use. Events such as squeezing or acupuncture may lead to a short circuit in the battery and subsequently fire and /or explosion.

— **Poor Storage**

If Lithium-ion batteries or the products they are contained within are stored in harsh environments such as high temperatures then the risk of fire is increased.

— **Overcharge and Over-Discharge**

Overcharging and discharging the lithium-ion battery during use may cause the metal crystals in the battery to become larger, which may pierce the diaphragm, causing an internal short circuit in the battery, thermal runaway and fire.

— **Incompatible Chargers**

E-Cargo bikes chargers are designed to recharge the battery of an E-Cargo bike at a specific output voltage and current. It is crucial to ensure that the charger and the battery are compatible; using an incompatible charger can result in serious damage to the battery and potentially cause a fire or explosion.

— **Electrical Modifications and Conversation Kits**

The dangers can be increased through a number of risky practices, including DIY modifications being made to an E-Cargo bike's electrical systems such as the fitting of additional battery packs to enhance speed and range.

Warning Signs

Signs that a Lithium-ion battery may be failing can include⁴.

Heat – It's a completely normal performance characteristic for batteries to generate some heat when charging or in use. However, if a Lithium-ion battery becomes very hot to the touch, there is a significant chance that it's defective and increasingly at risk of starting a fire.

Swelling – When a Lithium-ion battery is failing, swelling or degradation of its physical structure (including the appearance of lumps, bulges and leaking) may be observed.

Noise – There have been reports that failing Lithium-ion batteries can make hissing or cracking sounds when failing.

Odour – If a strong or unusual odour is being omitted from the battery or associated equipment that is an indicator that the battery may be failing.

Smoke – Perhaps one of the most obvious signs. If the battery or associated equipment is emitting smoke, then it is probable that a fire is being initiated or had already begun.

If an E-Cargo bike is displaying any of the above warning signs then the following steps should be taken:

— Immediately turn off the E-Cargo bike and unplug it from any power source

— Carefully move the E-Cargo bike to a safe area away from any people, flammable materials or substances. Use protective gloves to avoid touching the equipment directly.

If the above actions have led to a cessation in warning signs being emitted, then the following actions should be undertaken:

— Do not return the battery or E-Cargo bike into use

— Contact the manufacturer or retailer for further instructions

If the above actions have not led to a cessation in warning signs being emitted, and there is concern that thermal runaway and fire is likely or has already been initiated, then the following action should be taken:

— Immediately contact the local Fire and Rescue Service via 999

— Implement local arrangement as identified in the risk assessment or associated fire risk assessment.

Safety Tips

The London Fire Brigade^{5, 6} offer some essential advice for maintaining battery and charger safety:

— Batteries generate heat during their use. Allow them to cool down before attempting to re-charge

— Batteries should always be charged on hard flat surfaces where heat can dissipate

— Always follow manufacturers' instructions when charging

— Always use the original charger that was supplied with the E-Cargo bike

— If a replacement battery or charger is required, always ensure compliance with any recommendations or specifications provided by the manufacturer

— Avoid using, storing, or charging batteries at high or low temperatures

— Protect batteries against being damaged (crushed, punctured or immersed in water)

— Take any damaged batteries or chargers out of use immediately, even on suspicion alone

— Don't leave items on charge after the charge cycle is complete. For example, don't leave items unnecessarily on charge overnight

— Never cover chargers or charging devices

- Never block escape routes with E-Cargo bikes
- Store and charge E-Cargo bikes away from a main through route or exit
- Make sure an escape plan is in place in the event of a fire. Always call 999, never try to fight the fire

It is always worthwhile considering where E-Cargo bikes are being charged, with care being taken to ensure that a trip hazard has not been created by the charging cable.

Battery Disposal

Lithium-ion batteries are potentially dangerous and damaging to the environment. They can pose a significant fire risk. As such, they should be segregated from general waste and recycling pathways.

There are specialist accredited recycling companies that will safely collect and dispose of any redundant or failed Lithium-ion batteries.

If in doubt, contact the manufacturer or supplier of the E-Cargo bike or the local authority with responsibility for waste collection.

Potential Opportunities

The use of E-cargo bikes is growing rapidly as they provide a convenient and cost effective solution for organisations.

Some applications for the use of E-cargo bikers are:

- Food deliveries
- Courier services – last or first mile
- Postal deliveries
- Service vehicles – plumbers / electricians etc.

Conclusion

E-cargo bikes offer an exciting alternative to traditional logistic methods, providing an agile solution which offer additional benefits such as zero emissions and a contribution to the reduction of urban congestion.

However, just as with other logistic methods, E-Cargo bikes present their own management challenges from a compliance and health and safety point view. Ensuring measures are in place to manage risk associated with E-Cargo bike will allow organisation to realise benefits presented.

References

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Further information

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