PAS 7061:2020

Batteries for vehicle propulsion electrification – Safe and environmentally-conscious handling of battery packs and modules – Code of practice

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Foreword

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Acknowledgement is also given to the members of a wider review panel who were consulted in the development of this PAS.

This PAS is not to be regarded as a British Standard. It will be withdrawn upon publication of its content in, or as, a British Standard.

The PAS process enables a code of practice to be rapidly developed in order to fulfil an immediate need in industry. A PAS can be considered for further development as a British Standard, or constitute part of the UK input into the development of a European or International Standard.

Relationship with other publications

- PAS 7060, *Electric vehicles – Safe and environmentally-conscious design and use of batteries – Guide.*[1]
- PAS 7062, *Electric vehicle battery cells – Health and safety, environmental and quality management considerations in cell manufacturing and finished cell – Code of practice.*[2]

These PAS publications and PAS 7061 are structured to cover the different systems levels for electrically-propelled vehicles and battery systems, from vehicle level design (PAS 7060), to battery modules and pack assembly (PAS 7061), to battery cells (PAS 7062).

The relationship between the three PASs is described in more detail in the Introduction to this PAS (see **0.1**).

Information about this document

Product certification/inspection/testing. Users of PAS 7061 are advised to consider the desirability of third-party certification/inspection/testing of product conformity to this PAS. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Assessed capability. Users of this PAS are advised to consider the desirability of quality system assessment and registration against the appropriate standard in the BS EN ISO 9000 series by an accredited third-party certification body.

[1] In preparation.
[2] In preparation.

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at bsigroup.com/standards, or by contacting the Customer Services team.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

As a code of practice, this PAS takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this PAS is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this PAS that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this PAS are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

The word "should" is used to express recommendations of this PAS. The word "may" is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word "can" is used to express possibility, e.g. a consequence of an action or an event.

Notes are provided throughout the text of this PAS. Notes give references and additional information that are important but do not form part of the recommendations.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

Contractual and legal considerations

This PAS does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

This PAS is not to be regarded as a British Standard. It will be withdrawn upon publication of its content in, or as, a British Standard.

Compliance with a PAS cannot confer immunity from legal obligations.

In particular, attention is drawn to the following specific regulations:

- United Nations Economic Commission For Europe (UNECE). "Recommendations on the Transport of Dangerous Goods, Part III, Classification Procedures, Tests Methods and Criteria, Relating to Class 2, Class 3, Class 4, Division 5.1, Class 8 and Class 9 [1].
- United Nations Economic Commission For Europe (UNECE). Vehicle Regulation 100 [2].

0 Introduction

0.1 General

The increasing electrification of transport applications has led to a significant increase in the number of batteries being made and incorporated into electric vehicles. The manufacture, transportation, service and end-of-life disposal of batteries for electrically-propelled vehicles (EVs) is an emerging industry in the UK and Europe, which has historically been dominated by the Far East and United States. The UK is investing in innovation to improve not only the performance and cost of batteries, but also how the UK manufactures, services and disposes of batteries safely and in an environmentally-friendly way.

Battery packs are comprised of many individual cells aggregated together to form the battery. The cell contains many raw and processed materials and components which are assembled into a cell device. All parties involved in the manufacturing of cells, modules and batteries for electric vehicles might have an interest in the quality, environmental impact and health and safety of the sourcing, processing, integration, control and recycling of the materials and devices at the beginning and end of the battery life.

0.2 Battery supply chain and manufacturing process

The supply chain and manufacturing process of batteries is a complex and global system. As UK capability progresses within different sectors of the system, capturing and codifying good practice will save time, wasted effort and resources and build a UK knowledge base that reduces significant risks in this new manufacturing sector. The intention is to ensure the UK can continue to influence and manufacture exports, delivering EV battery products to international standards.

0.3 Battery supply chain and manufacturing process system boundaries

Due to the complexity of the battery supply chain and manufacturing process system, the system has been divided into three sub-systems, which are each covered by three separate PASs:

- PAS 7060, *Electric vehicles – Safe and environmentally-conscious design and use of batteries – Guide* [3], covering vehicle design.
- PAS 7061, *Batteries for vehicle propulsion electrification – Safe and environmentally-conscious handling of battery packs and modules – Code of practice,* covering pack and module.
- PAS 7062, *Electric vehicle battery cells – Health and safety, environmental and quality management considerations in cell manufacturing and finished cell – Code of practice*,[4] covering electrode and cell.

A diagram to illustrate the system boundaries that are covered by each of these PASs is shown in Figure 1.

[3)] In preparation.
[4)] In preparation.

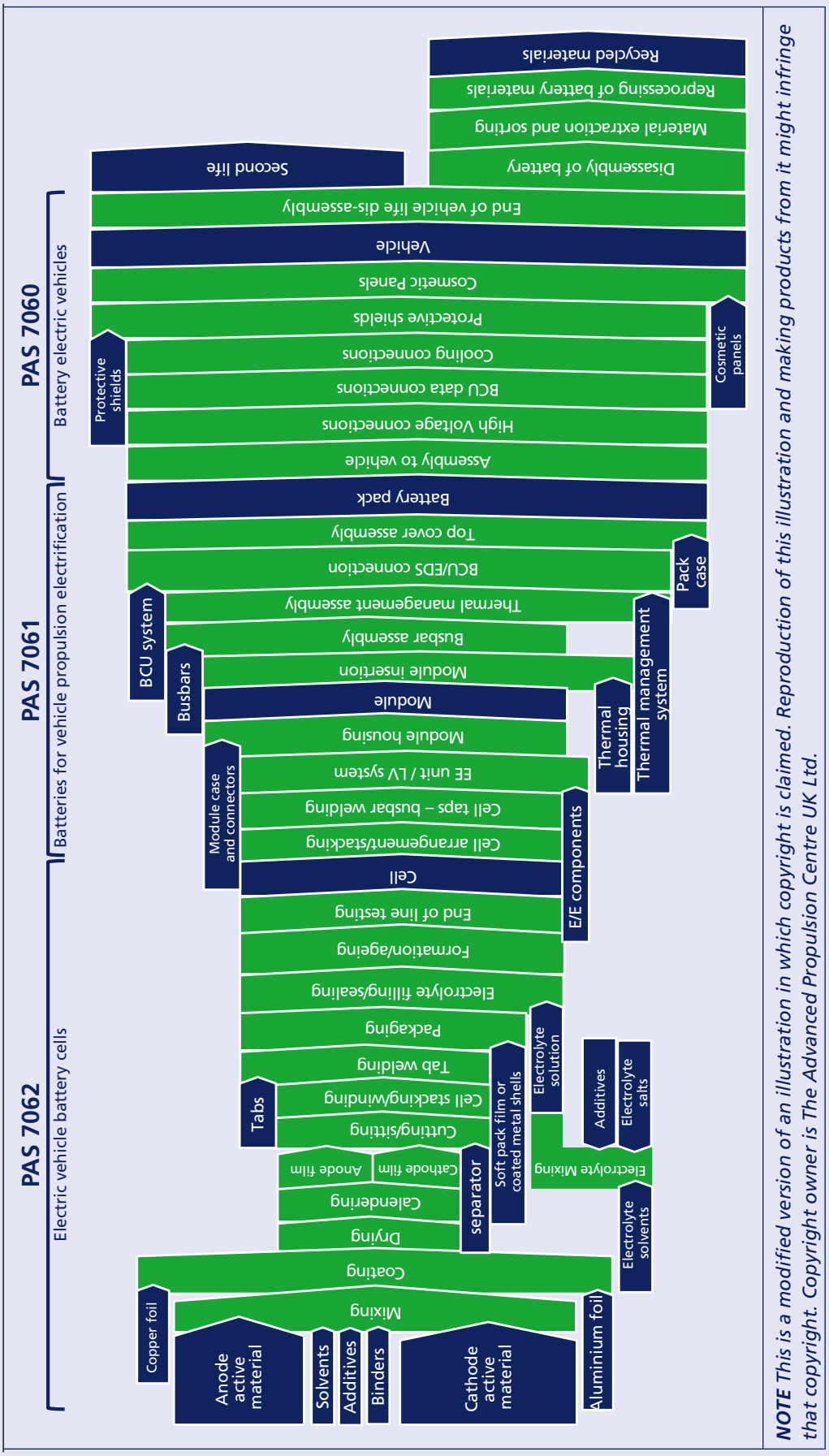

Figure 1 – Generic boundary diagram of supply chain and manufacturing process

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0.4 The approach taken for this PAS

Initial development of this PAS was undertaken using a combination of "top down" and "bottom-up" approaches.

The top-down approach started from considering the existing business frameworks which drive a common approach in the management of business activities. The principal areas being quality, environmental and safety systems, with the recommendations of the PAS being structured around these systems.

The bottom-up approach started from the existing sets of legislation, regulation and guidance in existence across these systems that have been produced for generic application, cross-sector application of lithium ion batteries and automotive-specific application.

The PAS includes the following Annexes:

a) Annex A: Alternative battery chemistries.

b) Annex B: Reference material.

c) Annex C: Examples of fire incidents.

0.5 Review process

In this new, emerging and quickly-growing field, it is important that all organizations review and update their documentation as to what is current good practice. Good practice is learnt from world-wide incidents, events and newly-developed protocols.

1 Scope

This PAS covers batteries for electrically propelled vehicles, including electric vehicles, hybrid electric vehicles, plug-in hybrid electric vehicles and fuel cell hybrid electric vehicles.

The PAS gives recommendations for the safe and environmentally-conscious handling and management of packs and modules of batteries throughout the life cycle of the battery (from sourcing of material, through to manufacturing, battery use and battery second life/ disposal).

This PAS gives guidance based on lithium ion battery chemistries, with alternatives chemistries covered in Annex A.

This PAS provides guidance for the following vehicle categories:

a) motorcycles:
   1) L1e;
   2) L2e;
   3) L3e;
   4) L4e;
   5) L5e;
   6) L6e;
   7) L7e;
b) passenger cars:
   1) M1;
   2) M2; and
c) light goods vehicles: N1.

NOTE *Attention is drawn to the European Directives 2002/24/EC [3] and 2007/46/EC [4] for the definition of these vehicle categories.*

This PAS aims to provide an overview of good practice, that can help industry save time and resources, and build UK knowledge to manage risk in a new manufacturing sector to ensure the UK can continue to influence and manufacture exports to international markets.

The PAS covers:

a) failure;
b) detection;
c) venting;
d) fumes;
e) disposal;
f) hazards;
g) fire management;
h) handling;
i) lifting;
j) storage;
k) service; and
l) competency levels.

It does not cover the pack being assembled into a vehicle, or cell and pack design and dimension commonization. It also does not cover vehicle-in-use accident management.

This PAS is for use by manufacturers of pack and module batteries. It is also for use by logistics organizations who move pack and modules, vehicle manufacturers, vehicle dealerships and vehicle end-of-life/recycling organizations.

This PAS is also of interest to commercial vehicle (M3, N2 and N3 categories), off-highway vehicle and rail vehicle traction battery manufacturers, Government, regulators, insurance companies, local authorities, shipping, fire, supply chain and reclamation companies.