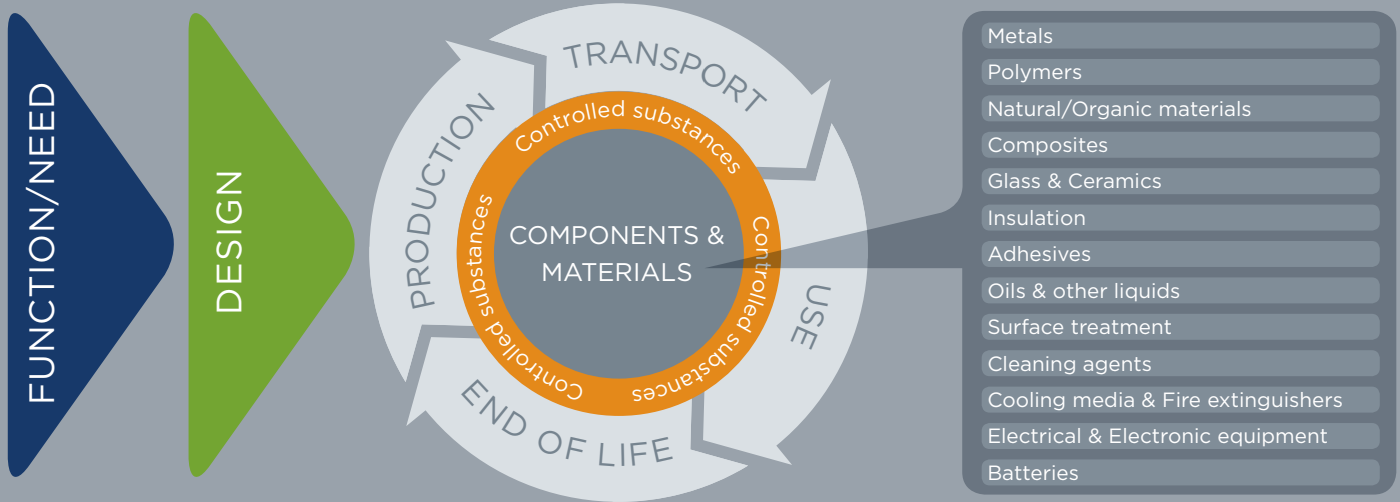


ECODESIGN GUIDELINES



Bombardier Transportation, as a company committed to continuous improvement of environmental performance, has a high level of ambition regarding EcoDesign.

In order to stay competitive and to meet upcoming legal and customer requirements designers have a key role in the work to continuously develop and environmentally adapt our products. The main objective of EcoDesign is to develop products that contribute to a sustainable society. This is achieved by minimising the environmental impact during the whole life cycle already at the development phase. The EcoDesign guidelines will help engineers accomplish this during the design process.

During the design of a product, the entire life cycle shall be considered. The following pages present the fundamental principles and provide some general guidelines to be applied when designing products and services with minimal environmental impact.

The EcoDesign guidelines are organized in a structured and pedagogic way. Users can easily find the applicable guidelines within their area of competence and use the EcoDesign guidelines as a check list during the design process.

For further support, please contact:

- Your division EcoDesign contact (information available on the EcoDesign eBoK)
- Center of Competence EcoDesign (CoC EcoDesign) at: ecodesign@transport.bombardier.com

Note that more specific guidelines and detailed information can be found on the EcoDesign eBoK accessible via Expressnet or directly at: ebok.bombardier.com/DE/DE500043.NSF

EcoDesign Guidelines



CONSIDER THE FUNCTION

- Create maximum function with minimum environmental impact
- Consider what function to create, not which product



CONTROL MATERIALS AND SUBSTANCES

Avoid using controlled substances and ensure safe handling for any that must be used

- Identify the material composition of the product
- Ensure controlled substances in the product are managed in compliance with the standard on Controlled Substances, Doc ID-number 000014
- Try to find solutions involving non controlled substances
- If a controlled substance cannot be substituted make sure it is easy to identify and can be safely managed at end of life

See "Controlled substances in a nutshell" on the back page



SAVE ENERGY

Reduce energy consumption and reuse energy whenever possible

- Facilitate energy efficient driving e.g. install cruise control, display energy consumption
- Optimize the regenerative braking system
- Optimize thermal insulation and air flow according to the passenger load
- Choose energy efficient products and select solutions from the Bombardier Transportation eco4 portfolio
- Install stand-by functions where applicable
- Switch off unnecessary functions e.g. smart stabling
- Make use of losses from e.g. traction equipment
- Reduce aerodynamic drag



OPTIMIZE WEIGHT

Use innovative structural features and high strength materials to minimize weight

- Minimize the quantity of materials
- Use light weight materials
- Find an optimal solution balancing light weight while maintaining the required material properties



ENHANCE HOUSE-KEEPING

Minimize energy and resource consumption in the production phase

- Reuse parts and components if they still can guarantee the same quality
- Optimize packaging e.g. adapt size and shape to ensure it fits standard containers
- Reduce the use of consumables



SIMPLIFY STRUCTURE

Use as few joining elements as possible to facilitate repair and recycling

- Reduce the number of fasteners and separation points
- Avoid glueing whenever possible
- Standardize separation points and incorporate instructions for easy disassembly
- Facilitate reuse of parts with structures that allow non-destructive disassembly



ENHANCE UPGRADE

Promote easy repairability and upgrade

- Make sure that parts planned for upgrade are easy to identify, separate, repair or replace
- Use a modularized design to allow for easy repairability or upgrade
- Incorporate instructions for replacement or upgrade directly in the module design



ENSURE PROTECTION

Invest in strong and resistant materials and suitable surface treatments

- Choose corrosion-resistant materials to avoid diffuse emissions
- Reduce particulate emissions from tear and wear
- Isolate parts containing controlled substances and chemicals, e.g. oil and lubricants, to ensure minimal leakage and corrosion



AVOID MIXES

Promote upgrade, repair and recycling by using few, simple and recycled materials

- Use as few different materials as possible
- Choose homogeneous materials whenever possible
- Do not use paint and surface treatments if not absolutely needed
- Select recyclable and renewable materials whenever possible



EXTEND LIFETIME

Optimize the design for the estimated lifetime

- Optimize maintenance intervals
- Design for flexibility and modularization
- Design for easy refurbishing
- Strive to increase durability for long-life parts



PROVIDE INFORMATION

Ensure transparency for controlled substances and label parts and materials for easy identification

- Enhance recycling, repair and upgrade by labelling of parts and materials for easy identification e.g. plastics according to ISO11469 and batteries according to Directive 2006/66/EC
- Communicate presence of controlled substances, ensure they are easy to identify and provide the required documentation
- Make sure recycling descriptions are included in maintenance manuals

Controlled substances in a nutshell

CONTROLLED SUBSTANCES

Our list of controlled substances enables product designers to screen out certain substances by identifying them throughout the supply chain and actively working towards eliminating them from our products.

The standard on Controlled Substances, Doc ID-number 000014, fully implements the Railway Industry Substance List within Bombardier Transportation. This list is commonly agreed among the major Railway Industry companies and defines certain substances that are to be controlled.

Controlled substances are classified as either **Prohibited** or **Declarable**. A **Prohibited** substance shall not be used in a product. A **Declarable** substance shall not be used unless approval has been granted. All **Declarable** substances shall be declared, using the UNIFE Material declaration template, UNI-CR-001, or other format as specified by Bombardier Transportation.

PRIORITY PHASE-OUT SUBSTANCES

Certain Declarable substances have been identified by Bombardier Transportation as **Priority phase-out** substances. These substances have a high priority for elimination and require additional phase-out information to be provided using the Derogation request template, Doc ID-number 000016, or other format as specified by Bombardier Transportation. The **Priority phase-out** substances are identified in the standard on Controlled Substances, Doc ID-number 000014.

It shall be noted that there may be stricter controls or additional substances defined by Bombardier Transportation based on specific legal, customer or local requirements.

Further information is available in the EcoDesign eBoK: ebok.bombardier.com/DE/DE500043.NSF

Supporting Bombardier Transportation documents are available at:

- www.transportation.bombardier.com/suppliers
- www.csr.bombardier.com/en/media-centre/reports-and-publications/transportation

Supporting UNIFE documents, the Railway Industry Substance List and the UNIFE Material declaration template, UNI-CR-001, are available at:

- www.unife-database.org

