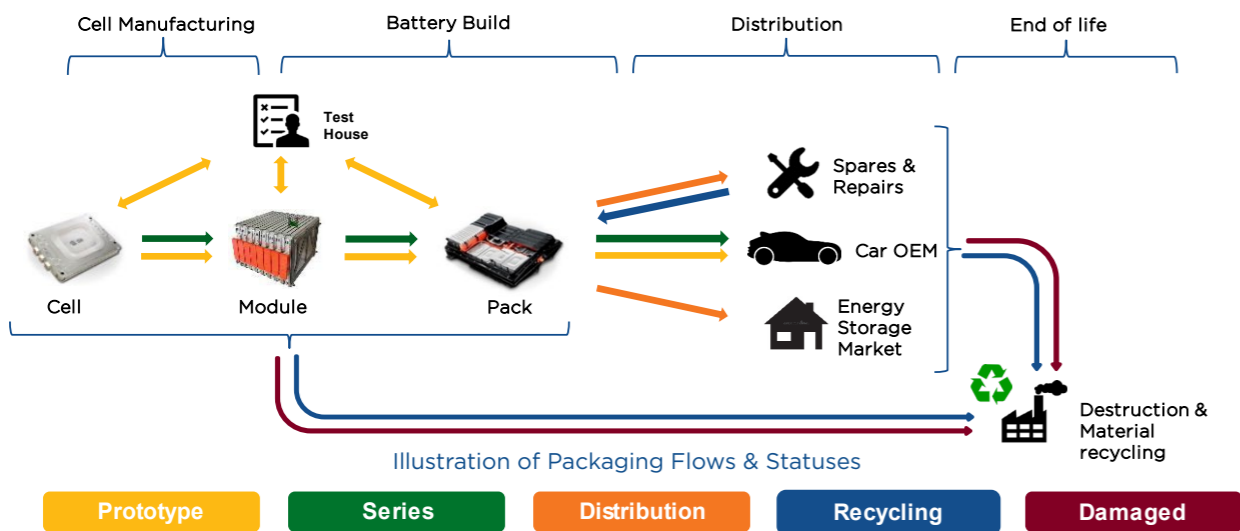


NEFAB LITHIUM BATTERY TRANSPORT PACKAGING



700 UN Certified Packaging Solutions 


LITHIUM BATTERY SOLUTIONS FOR ALL NEEDS



→ Dangerous Goods is a designation for substances and products that have such dangerous characteristics that they can cause harm to humans, animals, environment or property if they are not handled correctly during transport or storage. Lithium Batteries are classified as Dangerous Goods, Class 9 by the United Nations.

The basic purpose for dangerous goods packaging is to fully contain the dangerous goods, even if the box is being put under great stress.

Nefab can provide both existing solutions that are already certified for packing lithium batteries, as well as new solutions that we design, test and validate according to your specific needs. We have the engineering capability and knowledge to provide complete, multi-material packaging solutions for all statuses and flows. This allows us to be a reliable partner for your packaging needs, from the outer packaging itself to every accessory in between, such as absorbents, labels and tapes.

United Nations Packaging Symbol	Packaging Identification Code	Gross Mass In Kilograms (kg)	Year of Manufacture	Certification Mark / Manufacturer's Symbol
	4D / Y 171 / S /	YR / S /	SP-11 75 88	
	Packing Group Level Equivalent	Solid or Inner Packagings	Country of Approval	

UN Marking

 4D/Y171/S/YR/S/SP-11 75 88





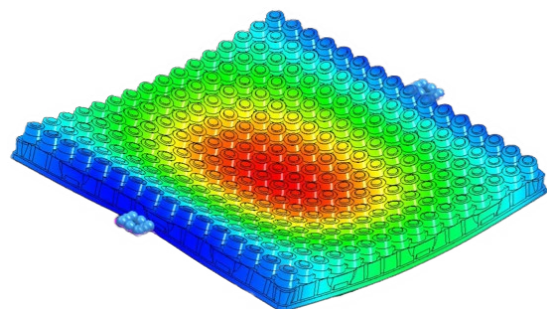
200 Packaging
Engineers

ENGINEERING CAPABILITIES

With Nefab's worldwide engineering resources, which include several ISTA certified test labs, we can provide you with complete packaging solutions on a global scale.

DESIGN CAPABILITIES

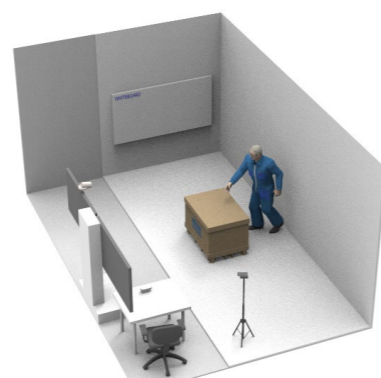
Providing engineered, multi-material packaging solutions worldwide calls for extra consideration in the design process. Our engineers use the latest 3D-CAD software and applications during the design process. Nefab has access to several tools to aid in the design process as well, such as Finite Element Analysis to measure stresses and strains and Load Optimization to enhance transportation efficiency.



FEA - Thermoform Tray Solution for a Cell

SAMPLES PRESENTED VIRTUALLY

Nefab's Lithium Battery studio gives the opportunity to showcase solutions live, with no need of traveling and by short notice. In the studio we can display a wide range of engineered lithium battery solutions and samples. With the studio we can reduce lead times and improve transparency in our engineering process.



Lithium Battery Studio



Nefab Test Lab

INTERNAL PRE-CERTIFICATION TESTING

Just as designing our packaging does, testing packaging also requires a very structured approach; each product and industry require different methods and knowledge when it comes to testing and test standards. At Nefab, our engineers understand the importance of this and have experience adhering to the strict testing requirements for various types of goods.

Nefab has the ability to simulate various conditions that packaging can be exposed to in the different stages of its lifecycle. Between our five ISTA certified test labs, our engineers are able to utilize numerous types of testing equipment, allowing for a wide breadth of test scenarios to help us design the most effective packaging for each individual case.

Below are examples of key machines we employ in our test labs:

- Vibration Tables
- Compression Testers
- Climate Chambers
- Drop Testers
- Incline Tables
- Shock Recorders

**5 ISTA
Test Labs**

As our customer, you are always welcome to join our engineers in the test lab. Open communication in this regard gives us the flexibility needed to accommodate for improvements or changes in design during the testing process.

REGULATION EXPERTISE SECURE COMPLIANCE

International Agreements



UN Recommendations



Air - IATA/ICAO



Sea - IMDG



Europe - ADR & RID



PRE-APPROVED PACKAGING, REDUCE LEAD-TIME

Nefab has a multitude of certificates for Lithium Batteries, covering over 700 different boxes. In order to reduce lead time and costs, it can be beneficial to use a pre-approved solution. To determine if our approved solutions can be used with your product, we will first investigate the status and method of transportation. Then, we will calculate the gross weight of the shipment and see if we have an approved dangerous goods certificate that matches your product.

A few of the National Regulations



USA - CFR 49



Canada - SOR/2001-286



China - JT/T 617 2018



Australia - ADGC

CREATING NEW PACKAGING

Due to the stringent requirements stipulated by the UN, the developed solution must go through a type approval test before it can be used to ship these goods. International agreements for the carriage of Lithium Batteries require packaging to be of a design-type, certified by a national competent authority. This involves testing the packaging with the appropriate UN specifications to ensure its suitability for the carriage. Our engineers have the skillset and experience to take new Lithium Batteries packaging through this process.

ENGINEERED SOLUTIONS

→ As a Complete Packaging Solution provider, you can trust Nefab as a partner for all your packaging needs – from packaging design to supply and other related services. This allows you to cut costs in several ways. There is no need for in-house design capability, and purchasing is more effectively managed by Nefab's global supply and service platform.

We also have the ability to offer logistics services such as warehouse management, packing and warehousing services, which reduce tied-up capital and space. Our engineers follow a certain set of steps in order to fully optimize your Lithium Battery packaging solution, as shown below:

1. NEEDS ANALYSIS



The first step is to understand the product characteristics and your logistical flows, in order to understand which regulation the product falls under.

2. DESIGN & TESTING



A new, complete packaging solution is developed based on the needs analysis. Samples are produced according to requirements, and validation is performed through physical tests, trial packaging, and/or simulations. The type approval test includes drop tests, stacking tests, and sometimes handling tests, as well as ensuring that the packaging has been properly identified and measured. Nefab will arrange the certification of newly developed packaging together with a national competent authority.

4. IMPLEMENTATION & FOLLOW-UP



Packaging solutions are delivered and implemented into your logistical flow. Nefab will contribute with continued support and coordination during the implementation phase.

3. SELECTION OF PRODUCTS AND SERVICES



The right products and materials are selected according to previous analyses and tests. During this step, decisions to implement additional services that can reduce your packaging costs are made as well.

More than **50 sites**,
in over 30 countries

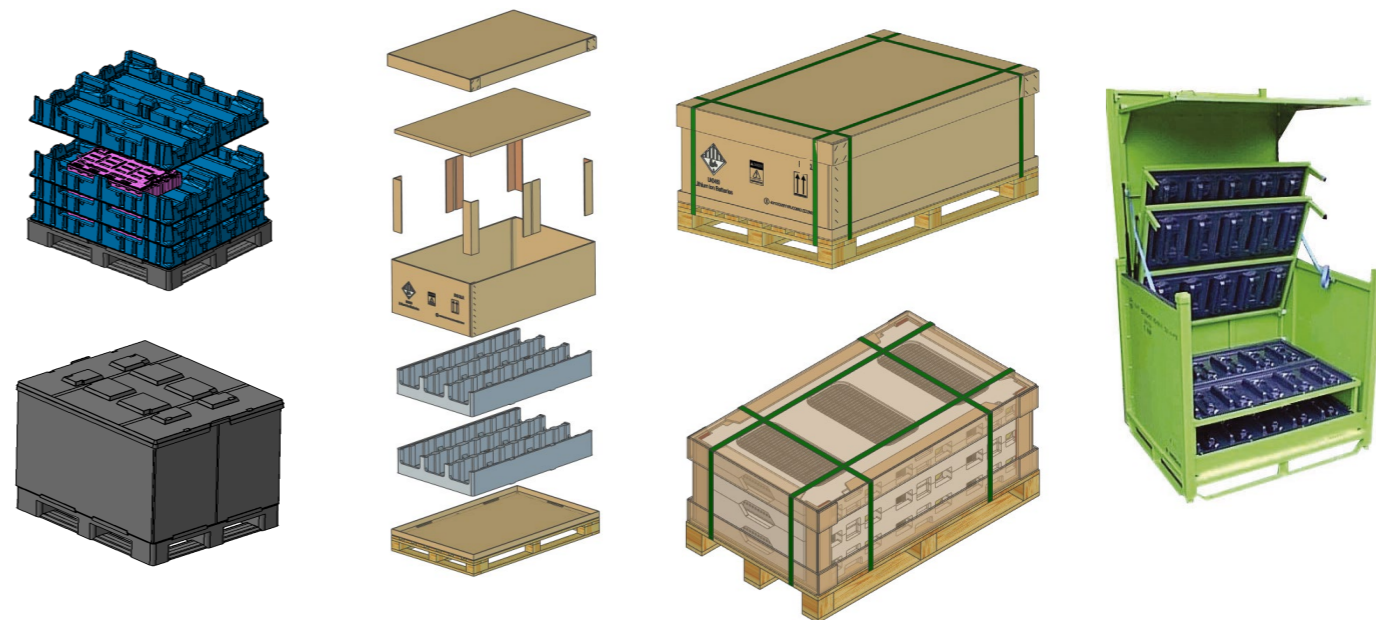
UN CERTIFIED SOLUTIONS BY APPLICATION

With Nefab's worldwide engineering resources, capabilities and experience we can provide you with complete LiB packaging solutions for all situations.

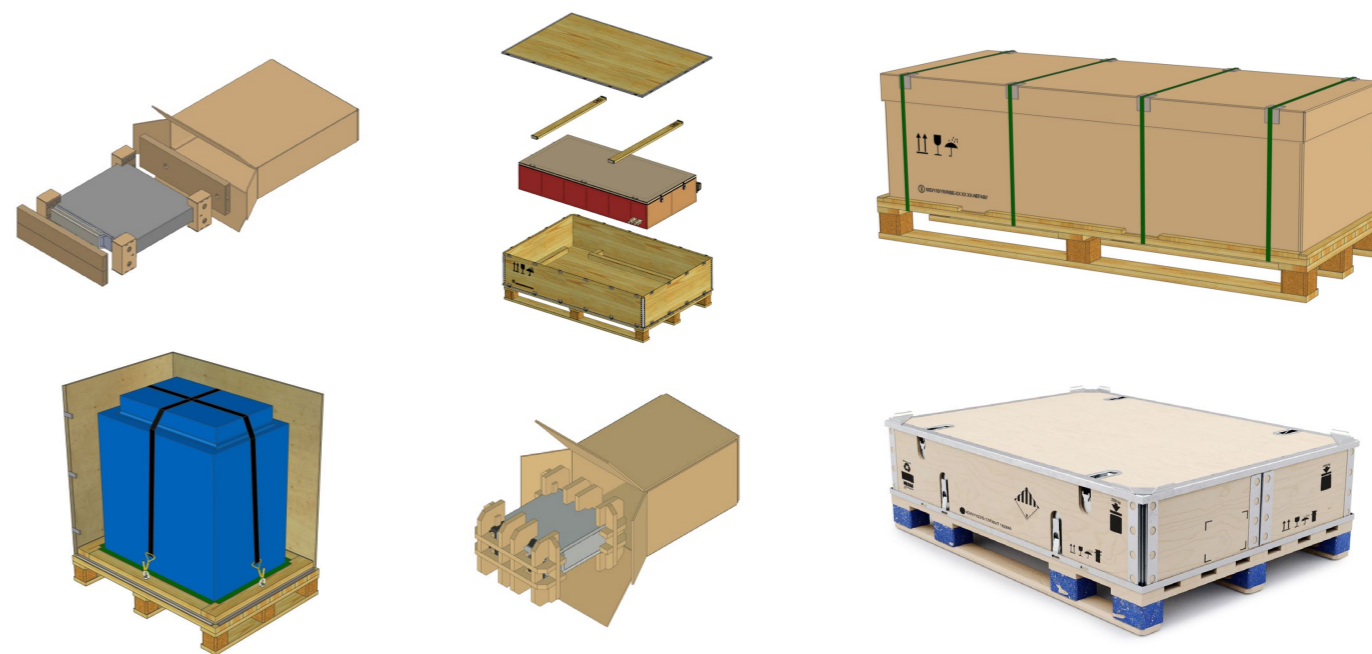
CELL SOLUTIONS



MODULE SOLUTIONS



PACK SOLUTIONS

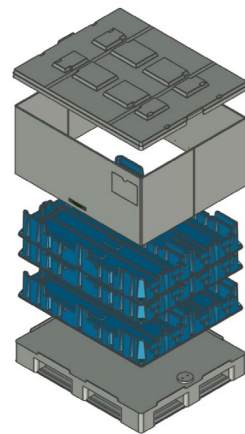
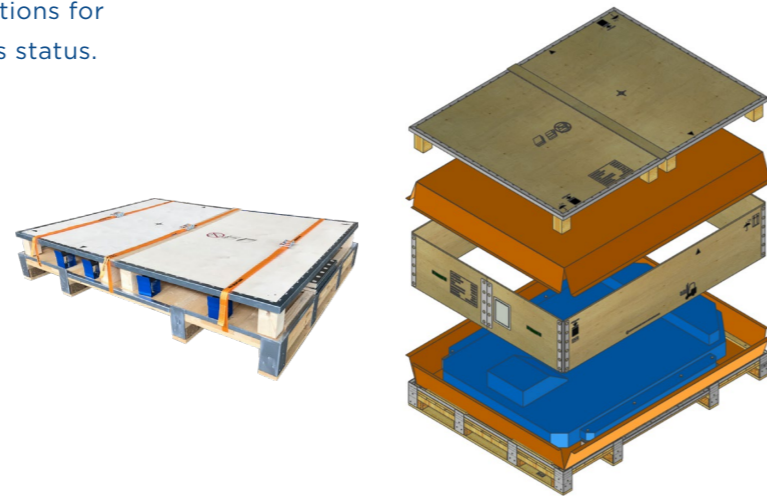


SOLUTIONS BY BATTERY STATUS

While Nefab can provide complete packaging solutions for all batteries, the type of solution will depend on its status.

PROTOTYPE

A prototype LiB hasn't been tested and qualified in accordance with the UN's 38.3. The prototype regulations also apply to a low series production of untested batteries. The solution to the right is a returnable packaging for packs with a LiB Blanket.



SERIES

No matter if your status is series for production, distribution or recycling, Nefab can provide the right solution. The solution to the left is a fully plastic, returnable load unit for modules. The unit load consists of thermoformed trays, pallet, lid and frame. The solution can bear a load weight of up to 400 kg and packing/unpacking is robotized at the customer site.



DAMAGED, DEFECTIVE CRITICAL

Our boxes for defective critical batteries are state of the art packaging. A potential electrolyte leakage will be captured by the box, and due to its rigid construction, it is protected against the escape of flames or ejection of projectiles during an emergency event.

SOLUTIONS BY FLOW

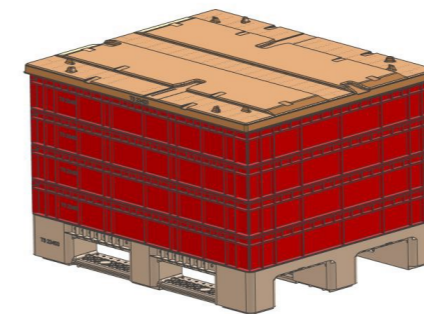
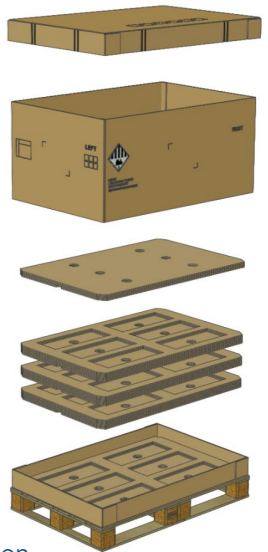
Nefab has the tools and expertise to advise if a One-way or Returnable flow suits the situation best from a cost and environmental perspective.

RETURNABLE OR EXPENDABLE

Returnable and reusable packaging are a cost-effective and environmentally friendly alternatives for customers who have an extensive flow of goods with a limited number of distribution points. However, for export shipments or long domestic flows, expendable (One-way) packaging may be the preferred choice.



Expendable Solution



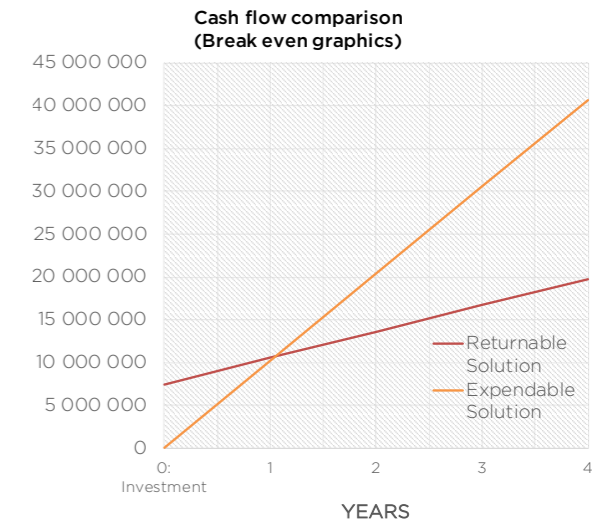
Returnable Solution

SCIENTIFIC METHOD

With Nefab's internal developed tools, we can calculate the most cost efficient solution for your situation. Our tool GreenCalc, which is externally certified, quantifies improvements in the reduction of Global Warming Potential (CO2).

CUSTOMER CASE

With large volumes of modules and a shipping distance under 1500 km, a company in Europe faced the challenge to improve their environmental impact. By changing from their initial expendable solution to a plastic returnable solution, the customer was able to reduce their carbon footprint and total cost.



Returnable vs. Expendable (SEK)

Global LiB Team



REDUCING YOUR CARBON FOOTPRINT STARTS WITH US

SUSTAINABILITY IN FOCUS

Nefab has a unique position when it comes to how we choose to approach and manage sustainability. By and large, this comes down to two primary reasons. The first is our global footprint: today, Nefab is active in over 30 countries, which gives what we do, both on an operational and a strategic level, importance in the many industries and communities we serve around the world. The second is rooted in the nature of our core business offering, which enables us to influence those we interact with in all levels of their supply chain.

LIFE CYCLE ANALYSIS

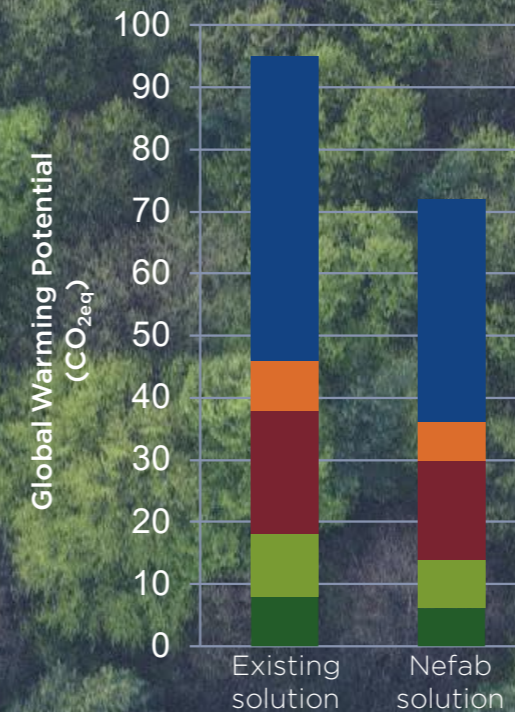
To provide you with a transparent and complete analysis of the environmental impact of your packaging and logistics flows, Nefab have internally developed GreenCalc. Which is an environmental analysis tool. You can read more about how we use use GreenCalc on the following page.

Visit our global website to learn more how Nefab work with sustainability. Also, make sure to read our UN Global Compact report that we publish annually.

HOW WE MINIMIZE YOUR ENVIRONMENTAL IMPACT

GREENCALC

- Analysis of multiple impact categories, such as Global Warming Potential (GWP), water and energy consumption.
- Integrated with the databases of SIMA Pro, the world's leading life cycle analysis software for impact calculations.
- Developed in a partnership with the French environmental consultancy company EVEA.
- Audited and approved by the Bureau Veritas Certification and compliant with ISO 14040 and ISO 14044.



Figures will vary depending on situation

YOUR VALUE

- With the help of GreenCALC, we can support your green initiative by:
- Evaluating environmental impact of current and potential packaging solutions.
 - Identifying areas of improvements, which can be used in the development of a new packaging design.
 - Quantifying a large range of climate affecting metrics across a detailed, multicriteria analysis.
 - Implementing engineered, complete packaging solutions that are optimized in terms of total cost and environmental impact.



GreenCalc Certification

IMPROVING BUSINESS. IN YOUR WORLD



With our **LITHIUM BATTERY PRODUCT PORTFOLIO**, we can serve all statuses and flows.



REGULATION COMPETENCE, Nefab has certificates for Lithium Batteries covering over 700 different boxes.



In addition, our **GLOBAL SUPPLY & SERVICE** capabilities ensure that we are there to provide local support and global coordination.



Beyond this, our **SUSTAINABILITY WORK** enable reduction of environmental impact.

Questions? Please feel free to contact us at dg@nefab.com

We save environmental and financial resources by optimizing supply chains. It's about innovating together to create smarter packaging and logistics solutions while always respecting people and ethical standards. This contributes to a better tomorrow for our customers, for society and for the environment.