

Ciclul de viata si economia circulara

Studiu de caz pentru elemente zincate termic care au aplicatii in infrastructura

Vasile Rus

Manager – Technical and Standards

European General Galvanizers Association

Federatia Asociatiilor Nationale ale Industriei de Zincare Termica din Europa



14 Asociatii
21 Tari

www.egga.com



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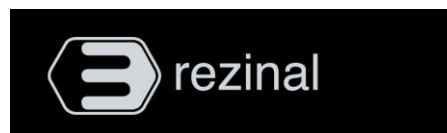
UK & IRELAND

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Membrii asociati

Principalii furnizori
ai industriei...



**Pentru ca EU sa devina
neutra din punct de vedere
climatic pana in 2050...**

**...sectorul constructiilor
trebuie sa adreseze impactul
pe intreg ciclul de viata**



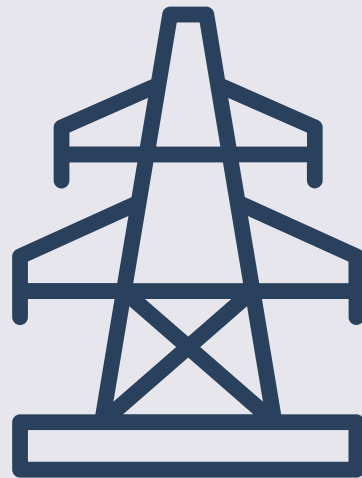
Construcțiile în Economia Circulară

Considerând întreg ciclul de viață al unei clădiri, sectorul construcțiilor este responsabil pentru:



50%

din toate
materialele
extrase



50%

din totalul
consumului de
energie



33%

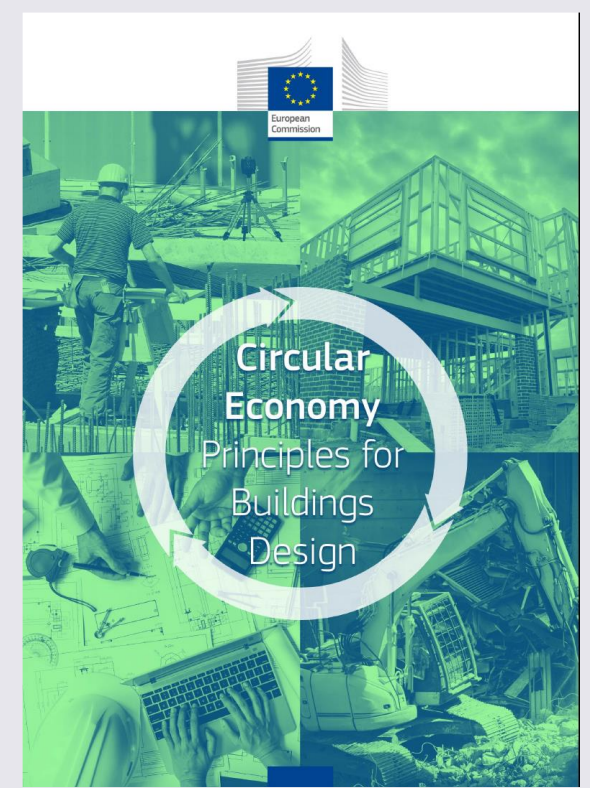
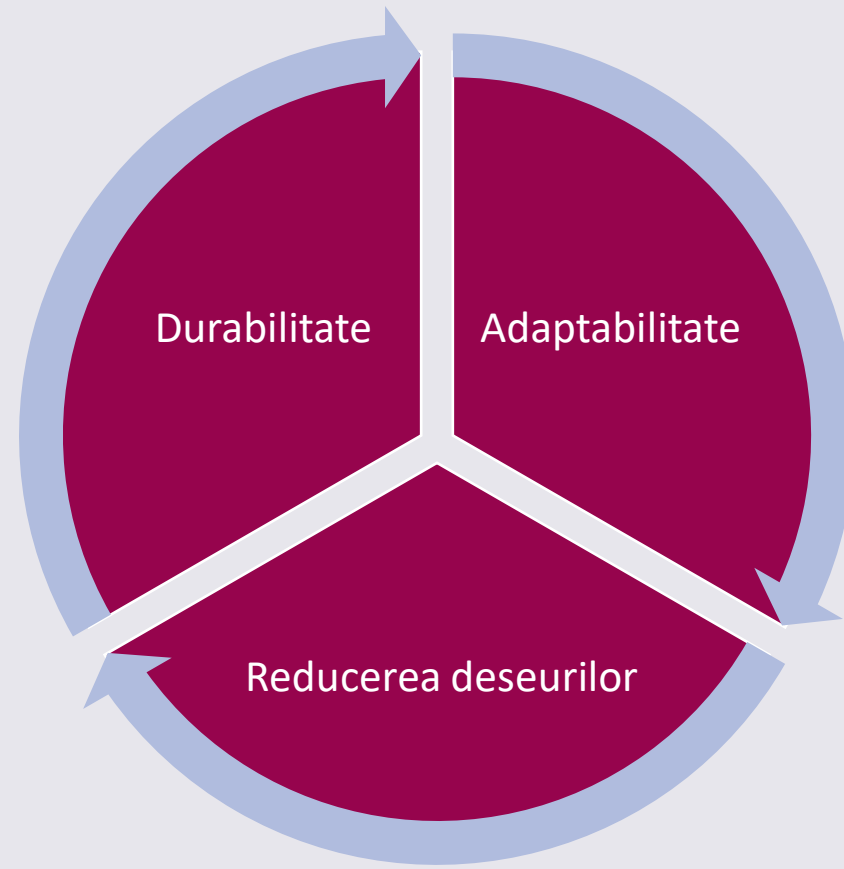
din consumul de
apa



35%

din generarea
deseurilor

Circular Economy Principles for Building Design (CE, 2020)





EUROPEAN
COMMISSION

Ecodesign for Sustainable Products Regulation

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

establishing a framework for setting ecodesign requirements for sustainable products
and repealing Directive 2009/125/EC

- product **durability**, **reliability**, **reusability**, upgradability, reparability, ease of maintenance and refurbishment;
- restrictions on the presence of substances that inhibit the circularity of products and materials;
- energy use or energy efficiency of products;
- resource use or resource efficiency of products;
- minimum recycled content in products;
- ease of disassembly, remanufacturing and recycling of products and materials;
- life-cycle environmental impact of products, including their carbon and environmental footprints;
- preventing and reducing waste, including packaging waste.



EUROPEAN
COMMISSION

Construction Products Regulation

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

laying down harmonised conditions for the marketing of construction products,
amending Regulation (EU) 2019/1020 and repealing Regulation (EU) 305/2011

The structure and structural elements of construction works shall be designed, manufactured, constructed, maintained and demolished in such a way that they meet the following requirements:

- (a) **be durable for their intended life span (durability requirement);**
- (b) be able to sustain all actions and influences likely to occur during construction, use and demolition with an appropriate degree of reliability and in a cost-effective way (structural resistance requirement). They shall not:
 - (i) collapse,
 - (ii) deform to an inadmissible degree,
 - (iii) damage other parts of the construction works, fittings or installed equipment as a result of major deformation of the load-bearing construction;
- (c) remain within their specified service requirements during the intended life span with appropriate degrees of reliability and in an economic way (serviceability requirement);
- (d) maintain appropriately their integrity in adverse events, including earthquake, explosion, fire, impact or consequences of human errors, to an extent disproportionate to the original cause (robustness requirement).



Part B. Requirements for drafting harmonised standards listed in Table 1, 2 and 3 of Annex I

1. Requirements for all standards

The methods and the criteria for assessing the performance shall be developed based on the working life for an intended use of 50 years when installed in the works. The harmonised standard shall not limit the possibility for the manufacturer to declare a longer working life, but the harmonised standard shall provide guidance on how to assess the performance. The reference service life for the assessment of the environmental performance shall be coherent with the working life indicated.

CEN/TC 135

Date: 2023-07-13

PrCEN/TS WI 00135033:2023

Secretariat: **SN**

Execution of steel structures and aluminium structures — Steel structures — Part xxx: Reuse of structural steel

Ausführung von Stahltragwerken und Aluminiumtragwerken — Stahltragwerken — Teil xxx: Wiederverwendung von Baustahl

Exécution des structures en acier et des structures en aluminium — Structures en acier — Partie xxx : Réutilisation des aciers de construction

Recommen

B.5 Batch galvanized products

inspected to
ilitation shall
nsured.

B.1 Use of tl

This informativ
systems in addi

Reclaimed structural components that have been batch galvanized may be assessed according to the requirements for visual appearance and coating thickness in accordance with EN ISO 1461. The test units given in 5.3.4.2 may be used for this assessment as an alternative to the control sample given in EN ISO 1461.

using a mild
h regulatory

B.2 Scope an

This informativ
systems.

Suitability for the corrosion protection requirements of the reuse application may be determined by galvanized coating thickness measurements and reference to EN ISO 14713-1 and/or ISO 9224.

B.3 Protecti

When reusing s
considered:

NOTE: The predicted life of a galvanized coating is directly proportional to its thickness in a certain environment.

Any necessary repairs, e.g., arising from removal of components for reuse from a steel structure, should be carried out according to EN ISO 1461, 6.3.

ording to the
The test units
zen in EN ISO

- a) Existing
- b) Existing current
- c) The orig the reus

If the extent of necessary repairs exceeds that recommended by EN ISO 1461 or the coating thickness assessment indicates that a thicker coating is required for the corrosion protection system of the reuse application, the products shall be stripped and re-galvanized according to EN ISO 1461. When regalvanizing is required, information on the chemical composition of the products (see 6.1.2 and 6.2.4) should be provided to the galvanizer (see EN ISO 14713-2).

etermined by
224.
it.
cture, should

B.3.1 Evaluat

For the evaluati

If galvanized steel components are selected for hardness testing (see 6.1.1), the galvanized coating, including the iron-zinc alloy layers, must be completely removed by grinding or an equivalent method. The measurement area that is created for hardness testing should be kept as small as possible. The test area shall be repaired according to EN ISO 1461. Where required, the size of the repaired test area may exceed the maximum permitted by EN ISO 1461 for uncoated areas.

ing thickness
1 of the reuse
1461. When
1.2 and 6.2.4)

B.3.2 Hazard

The chemical co
fluorescence te:
Coatings contain
regulatory requ

alized coating,
alent method.
ible. The test
test area may

NOTE: Coatings with a bright colour from the 1970s are likely based on a lead pigment.

Paint that contains lead carbonate and lead sulphate can be encapsulated with other paint.

Encapsulated hazardous substances shall be declared in the inspection and test record.

B.3.3 Over coating

Over coating is defined as spot cleaning and priming degraded areas, cleaning intact paint, and applying a lead-free system over existing paint.



Infraestructura rutiera

Reutilizarea parapetilor de drum

- Practica comuna in Olanda intre 1985-2004
- 3 categorii:
 - Reutilizare directa
 - Renovare
 - Deseu



Reciclarea parapetilor de drum

- 2004: de la reutilizare la reciclare
- Motive:
 - “Piata”
 - Disponibilitatea drumurilor
 - Din 2011: Marcajul CE obligatoriu
(Construction Products Regulation)



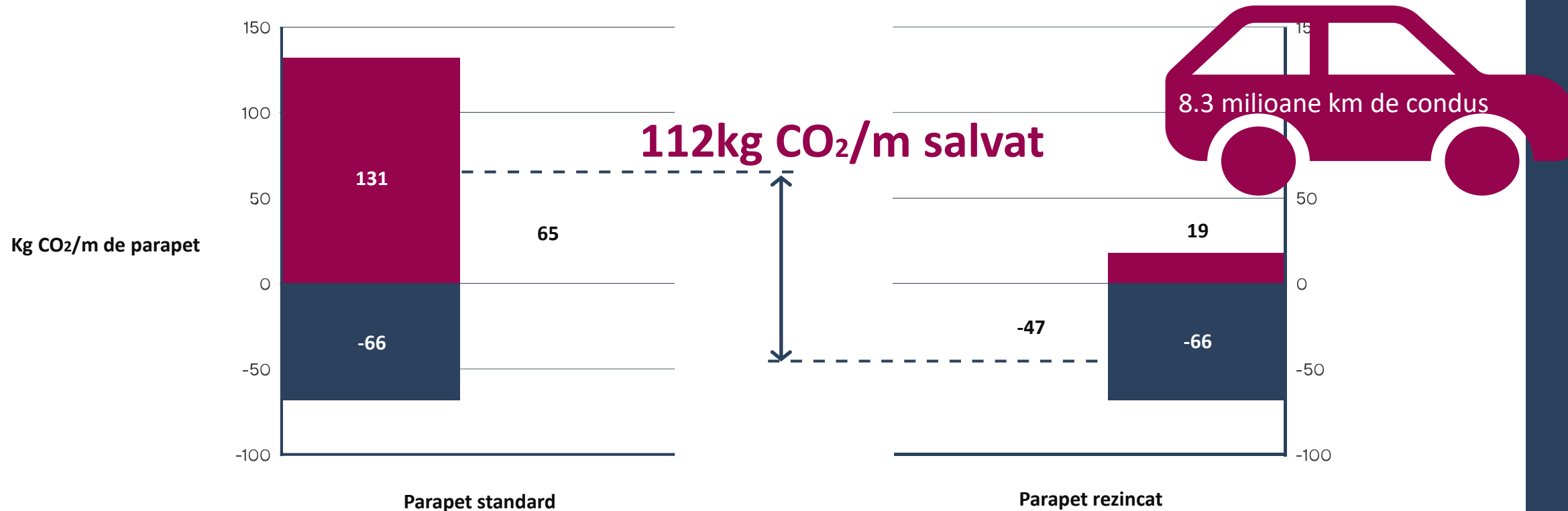


Adesea înlocuite din
cauza întreținerii și
renovărilor rutiere

Studiul CE Delft (2017,
Olanda) a indicat că 67%
sunt potrivite pentru
reutilizarea directă sau
rezincare

Beneficiile rezincarii parapet

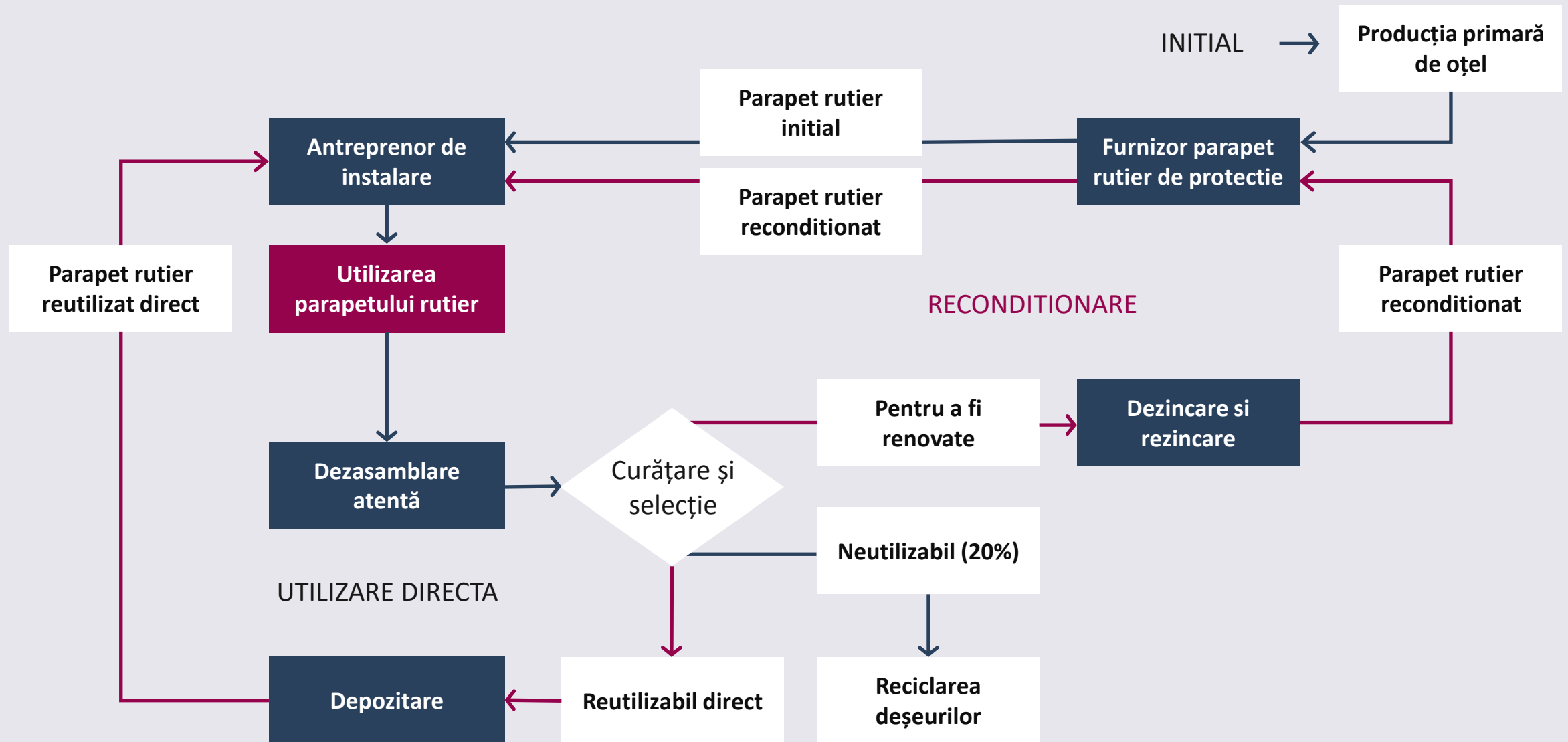
26,000t CO₂
salvat



CE Delft study (2017), Netherlands

Producție și utilizare Reciclare* Total

Rijkswaterstaat – sistem pilot pentru parapet rutier de protecție pentru drumuri și autostrăzi, 2020



Direcția Generală Lucrări Publice și Gospodărirea Apelor din Țările de Jos (Rijkswaterstaat) a examinat lanțul de aprovizionare pentru parapetii de protecție pentru drumuri și autostrăzi respectiv potențialul de îmbunătățire a circularității, menținând în același timp siguranța rutieră...

70% reducerea emisiilor de CO₂

40% reducerea costurilor de mediu

10% reducerea costurilor operaționale

Reintroducerea reutilizarii parapetilor de drum

- 2012 Green Deal Parapet de drum sustenabil
- 2014 Proiect pilot
- 2016 Primul program national de economie circulara
- 2019/2020 Cercetare
 - Posibil tehnic
 - Fezabil financiar: acelasi pret pentru renovat sau nou
 - Mai putin daunator mediului: 40% mai putine costuri de mediu, 70% mai putin CO₂
- 2021 Validarea proiectului pilot de cercetare: Inlocuirea a 10 km > rezultate pozitive



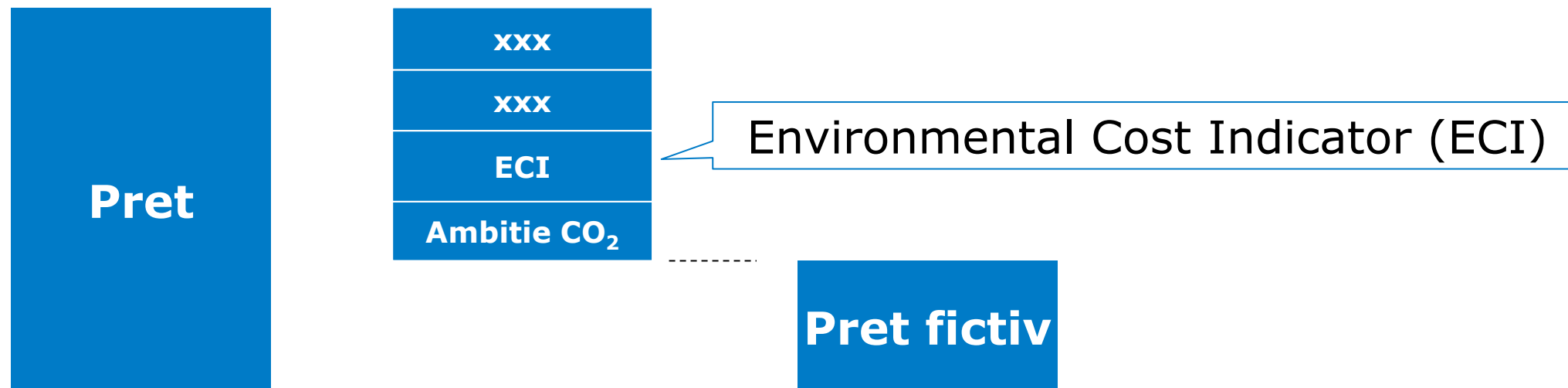
Implementare reutilizare parapet de drum

- Cum se organizează reutilizarea?
 - Piata sau Autoritate Rutiera Nationala? > Piata
 - Monitorizare
- Cum sa stimulezi piata?
 1. Cerinta in contract: dezasamblarea tuturor elementelor reutilizabile ale parapetelor de drum astfel incat acestea sa poata fi reutilizate
 2. Achizitii bazate pe pret si valoare



Valoare pentru bani

- Trei criterii de calitate + ambitia CO₂
- ECI este cel puțin 25% din calitate.
- ECI: 19 categorii de impact de mediu combinate într-o singură valoare bazată pe analiza ciclului de viață.





Environmental Cost Indicator Parapet de drum

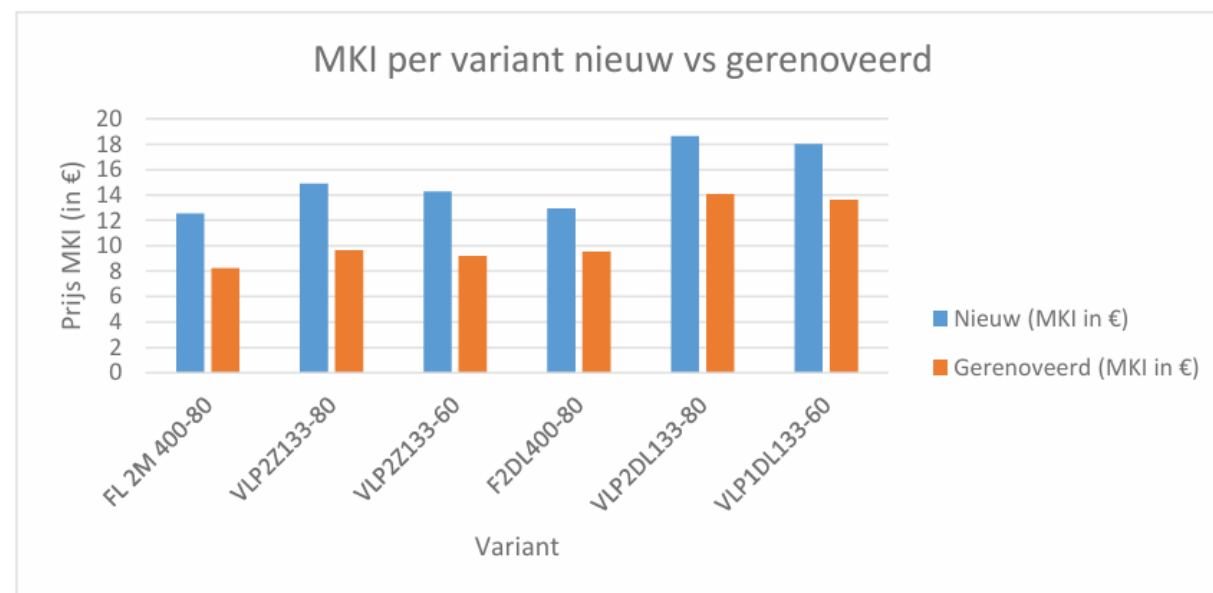
€ ECI/m Parapet de drum VLP 2Z133-80:

- Nou (*otel la prima utilizare*): 15,14 € ECI/m
- Reutilizare directa: 3,52 € ECI/m*
- Renovat: 9,97 € ECI/m
- Renovat - *viitor*: ca. 5 € ECI/m

Sursa: Dutch Environmental Database

* Durata de viata de 16 ani in loc de 44 de ani

Afbeelding 1. MKI per variant geleiderails nieuw versus gerenoveerd³.





Rezultate pana acum

- 2021 Validarea proiectului pilot de cercetare:
Inlocuirea a 10 km > rezultate pozitive
- Incepand cu 2023: 7 proiecte au reutilizat
parapet de drum
- In total: 88 km renovati
- Este nevoie de 3 ori mai mult timp
pentru a dezasambla in loc de taiere





Probleme in timpul implementarii

- Disponibilitate/inchiderea drumului
- Marcajul CE
 - Doar 1 furnizor cu marcaj CE pentru parapet de drum renovat
 - Teste initiale de coliziune scumpe
 - Timp de 2 ani a fost permisa amplasarea parapetului de drum renovat fara marcaj CE
 - Produsul nu este plasat pe piata. Autoritatea Rutiera Nationala ramane proprietarul produsului. Este furnizat un serviciu.
 - Pana la 1 Ianuarie 2025 marcajul CE va fi necesar. Probabil 3 furnizori.
- Date
 - dezasamblarea la timp a parapetului de drum



Concluzii

- Suntem pe drumul spre o economie circulara la nivel de infrastructura
- Suntem buni la reciclare dar dorim sa urcam mai sus pe scara R
- Circularitatea este viitorul. Este posibil. Incepeti acum!
- Lucrati impreuna. Implicati intregul sector. Furnizori, contractori, autoritati guvernamentale, etc.



Viata lunga si previzibila bazata pe....

Standarde internaționale – EN ISO 14713-1 si ISO 9224

‘Studii de caz’ ample in multiple aplicatii





Utilizarea acoperirilor de zinc mai subtiri are riscurile sale

Acoperire subtire continua zincata pe structura solara dupa < 2 ani



Design guide for reusing galvanized steel-framed structures

R J Pimentel MEng, MSc, CEng, MICE, MASCE

M R Sansom BEng, PhD, CEng, MICE

Version: 04

Date:

cutting it off means that 20 to 30% of the rafter's length is sent to recycling and not reused. In terms of tonnage, the recycled percentage would be 27% to 39% of the rafter (assuming the same cross-section for the hunch and rafter).

An alternative detail for an eaves connection is shown in Figure 5.1, in which a bolted haunch is used to avoid welding. Both the rafter and bolted haunch have a welded end plate similar to that of a typically welded haunch. The connection between the rafter and the haunch should be made using preloaded bolts, ensuring that both rafter and haunch work together and that the forces on the bottom flange of the rafter can be efficiently transferred to the haunch. The end of the haunch, towards the apex, should be torsionally restrained and may require vertical stiffeners. For the typical 10 to 15% haunched segments, this solution would increase the weight of the rafter by 9 to 13%, but provides the benefit of allowing the complete reuse of the rafter steelwork after deconstruction. After deconstruction, the haunch segments may be welded to provide longer structural elements with more opportunities for being reused. This solution is attractive for the reuse business model of a stock of individual reclaimed components as well as for the scenario of reusing the entire structure in the same configuration.

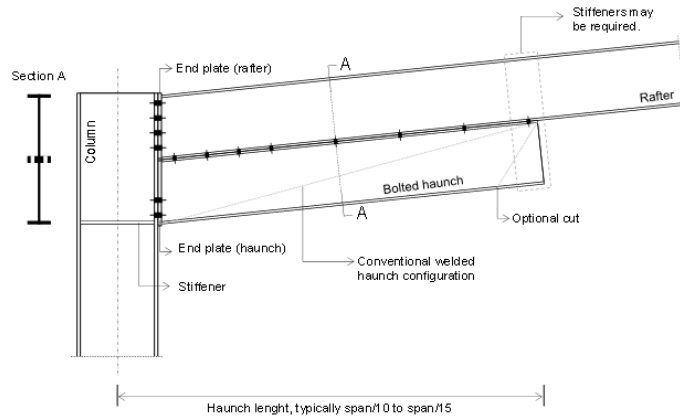
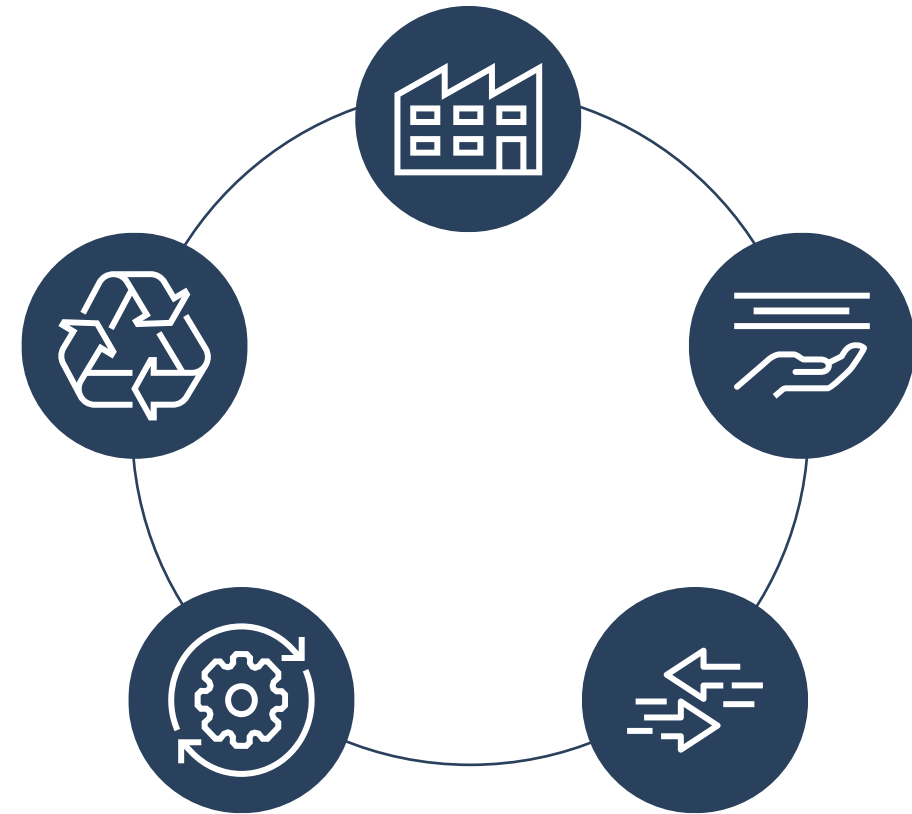


Figure 5.1 – Bolted haunch detail

In addition to enhancing the reusability of the rafter, using a bolted haunch has the benefit of simplifying the fabrication process (the eaves connection is the most complex detail of a portal frame), and reducing significantly the amount of welding (most of the welding is normally done at the haunch). Reducing the amount of welding also yields health and safety benefits to the fabrication process. Despite the extra steel tonnage required for a bolted haunch, the fact that all of the steelwork can be reclaimed and reused offers benefits in terms of sustainability,

The haunch may be bolted in the workshop after galvanizing or on site before erection. The solution may also offer benefits in terms of optimizing loads for transportation if the





Contribuțiile pe care oțelul zincat termic le poate aduce la atingerea economiei circulare... sintetizate în acest nou ghid . www.galvanizingeurope.org

GALVANIZED STEEL AND SUSTAINABLE CONSTRUCTION

SOLUTIONS FOR A CIRCULAR ECONOMY

ACIER GALVANISÉ CONSTRUCTIF

SOLUTIONS POUR
ÉCONOMIE CIRCULAIRE



7 million tonnes of zinc

EL ACERO GALVANIZADO CONSTRUCCIÓN

SOLUCIONES PARA
ECONOMÍA CIRCULAR



VERZINKT STAAL EN DUURZAAM BOUWEN

OPLOSSINGEN VOOR EEN
CIRCULAIRE ECONOMIE



The building is designed as a disassemblable structure. Not only the roof, but also the walls and the interior structure are made of galvanized steel. The building is designed to be dismantled and the steel can be unbolted.

project. In the design phase, you also need to think about the reuse of the building materials that have been used. When the building is finally dismantled, the fully galvanized steel structure can be unbolted."

wherever possible. The galvanized steel was assembled like meccano, the floor and façades are filled with timber frame elements and the ceiling consists of perforated profiles.

Right

The centre was built with circularity at the forefront of its design and choice of materials

Circular Economy –Communication Tools



VOORBEELDEN

INFORMATIEPUNT - KLAAR VOOR VERPLAATSING EN HERBESTEMMING

De wijk Les Glòries in het oostelijke gedeelte van Barcelona is één van de belangrijkste stadsvernieuwingsprojecten. Tijdens de herontwikkeling van het gebied wilde de stad Barcelona een informatiezone voor de lokale bewoners dat tegelijk dienst kon doen als informatiepunt voor toeristen.

Een gesloten competitie, gewonnen door de lokale architecten Peris + Toral, ging uit van een tijdelijke constructie die naar een andere plaats zou kunnen worden overgebracht na de geplande 4 jaar durende functie als informatiepunt.

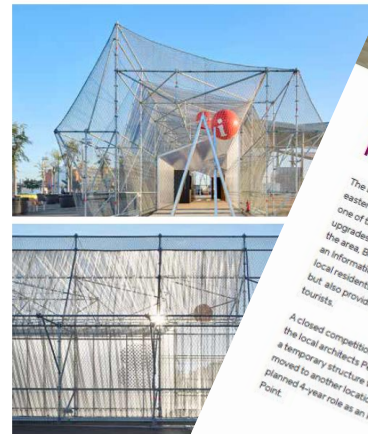
Na nauwgezet onderzoek van de beoogde materialen werd gekozen voor een constructie met verzinkt stalen buizen voor het buitenste frame.

gecombineerd met een doorzichtige polycarbonaat huid en prefab houten binnen-modules. Deze modules dienen als informatiebalie en fietsverhuurpunt. Dit alles werd gerealiseerd binnen een budget van € 170.000.

Nadat het paviljoen sinds 2015 dienst deed als infopunt, kreeg Peris + Toral onlangs van de Stad Barcelona de opdracht het bouwwerk te herbestemmen als jeugdcentrum (casal de joves in het Catalaans) in de wijk St Martí.

Bovent
Het bouwwerk kan gemakkelijk worden gedemonteerd en kan met minimale impact op de locatie worden verplaatst en hergebruikt

Onder
De constructie is zowel informatiepunt als fietsverhuurlocatie voor elektrische fietsen



Meer informatie over thermisch verzinkt staal en de circulaire economie

De verzinkindustrie ontwikkelt zich verder en houdt verzinkt staal in de kopgroep van oplossingen om klimaatverandering tegen te gaan en de circulaire economie te realiseren.

Thermisch verzinkt staal kan innovatieve oplossingen bieden die de duurzaamheid optimaliseren en de circulariteit van stalen constructies en onderdelen vergemakkelijken. Deze oplossingen kunnen makkelijk worden uitgevoerd met behulp van deze bewezen en eenvoudige methode om staal te beschermen.

Meer informatie op www.galvanizingeurope.org

CASE STUDY INFORMATION POINT – READY FOR RELOCATION AND REPURPOSE

The Les Glòries development on the eastern flank of Barcelona has been one of the city's most significant urban upgrades. During the regeneration of the area, Barcelona City Hall wanted an information point that would inform local residents about the development but also provide information for tourists.

A closed competition was won by the local architects Peris + Toral for a temporary structure that could be moved to another location after its planned 4-year role as an information point.

After careful research of their intended materials, a structure that uses galvanized steel tubes for the external frame combined with a translucent polycarbonate skin and prefabricated timber internal modules was chosen. These modules serve as information desks and a bicycle rental point. All this was delivered within a budget of €170,000.

After serving its function gracefully since 2015, Peris + Toral have recently been tasked by Barcelona City Hall to repurpose the structure as a youth centre (casal de joves in Catalan) in the city's St Martí neighbourhood.

Above:
The structure is easily demountable and can be relocated and reused with minimal impact on the site

Below:
The structure is both an information point and rental location for electric bicycles



Icon stand was molition thanks to im and decisiveness in summer 2011. Harry former board member sbergen, heard that their s from Hooeven would i new sports park.

id condition of the main tand caught his eye so he bought 7,000 including the cost of sembly. The stand was originally 1970. Back then, the board of reeven awarded the construction s to today's value, that is –€163,000.

Within two years, a wonderful 32 metre long stand arose from the ground.

Eventually, the stand only cost €35,000 while a new building would have at least cost €200,000. Everything was reused, apart from the bolts, nuts and the old wooden boards.

The boards were replaced by new seats. The only decorative paintwork that had to be done was on the inside of the roof.

The excellent state of the galvanized steel was confirmed during disassembly. The outer structure had spent 40 years exposed to the weather, condition and did not need to be regalvanized. The remaining galvanized coating is more than 100µm thick and the stand will last for many more decades.

Top:
The new grandstand at SV Gramsbergen had already seen decades of use at another nearby club

Bottom:
After decades of service, the galvanized steel was ready for direct reuse in the new location



GALVANIZED STEEL AND SUSTAINABLE CONSTRUCTION SOLUTIONS FOR A CIRCULAR ECONOMY



GRANDSTAND AT GRAMSBERGEN BIRTH AFTER 40 YEARS



galvanizingeurope.org



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CASE STUDY

RIVIERE COCHON GRAS BRIDGE

The Riviere Cochon Gras Bridge demonstrates the resilience and longevity of galvanized structures. Originally part of the Fore River Bridge, built by Acrow Corporation, it served for 15 years, connecting North Weymouth and Quincy Point, Massachusetts, while withstanding harsh New England winters and heavy traffic. After it was decommissioned, a 25 metre section of the bridge was transferred to Perches, Haiti, by the Cashman Family Foundation in collaboration with Tighe & Bond and Engineers Without Borders.

The river, Riviere Cochon Gras, had been a dangerous obstacle for local residents, frequently flooding and preventing safe passage to medical care and essential services. Tragically,

many people had drowned while attempting to cross it. The repurposed bridge now provides a crucial, life-saving link for the community, enabling safe travel year-round.

One of the project's greatest benefits is the low life-cycle cost. Hot-dip galvanizing preserved the bridge section in excellent condition, with no signs of corrosion or need for repair, eliminating future maintenance expenses. Additionally, reusing the steel bridge avoids the environmental costs of manufacturing new materials, showcasing the sustainability of galvanized steel structures while offering a transformative solution for the people of Perches.

Top

The Fore River Bridge in Massachusetts before a section of it was recycled and shipped to Haiti to serve a local community

Bottom

The centre structure of the bridge before dismantling



Left

Birds eye view of the Riviere Cochon Gras Bridge- highlighting the effect of this project on the community by connecting two sides of the river



Left

The reuse of the bridge section has removed a dangerous obstacle for a local community in Haiti

Learn more about galvanized steel and the circular economy

The galvanizing industry is moving forwards - keeping galvanized steel at the forefront of solutions for tackling climate change and delivering the circular economy.

Galvanized steel can provide innovative solutions that optimise durability and facilitate circularity of steel structures and components. These solutions can be easily implemented using this well-established and simple method of protecting steel.

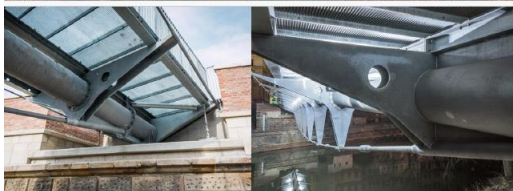
Learn more at www.galvanizingeurope.org

Noua initiativa EGGA – Steel Bridges *in colaborare cu ECCS Bridge Committee*

Short-Medium Span Galvanized Steel Bridge Interest Group



 Interested?
Join us today



Modular & Innovative

The Comenius Footbridge in Jaromer, Czech Republic was designed by baum & baris architekten and installed by Excon AS with a high level of modularity for ease of installation and to take advantage of the extensive maintenance-free durability of galvanizing to EN ISO 1461.

Circular

The Riviere Cochon Gras Bridge helps the community of Perches in Haiti and is adapted from a reused 25 metre section of the temporary Fore River Bridge which carried people over the river between North Weymouth and Quincy Point, Massachusetts, USA for 15 years.



Durable

Having started life as a temporary galvanized steel bridge, the Callender-Hamilton bridge at Lydlinch, UK is still in good condition 82 years after it was erected in 1942 in preparation for transporting military equipment for D Day.



Short-Medium Span Galvanized Steel Bridge Interest Group

Galvanized steel bridges are ideal solutions for short-medium spans that require innovative or bespoke solutions, modular installation and optimal durability.

The future use of galvanized steel bridges is important to create a circular, sustainable, climate-resilient and cost-effective infrastructure for Europe.

EGGA-Galvanizing Europe is launching a new cross-sector collaboration to advance the use of galvanized steel bridges across Europe. The 'Short-Medium Span Galvanized Steel Bridge Interest Group' will examine:

- Best practice in design and modular concepts
- Sustainability information and approaches
- Durability estimation and corrosion specifications
- Future research needs

Membership is free to those with a genuine interest in the objectives of the group.

To join ...scan the QR and complete the online form.



Interested?
Join us today

11-12 Septembrie 2024





Assembly 2025

Dublin, 10-13th June



Conference Venue -Aviva Stadium





Assembly 2025

Dublin, 10-13th June



Sandymount Hotel & Herbert Park Hotel



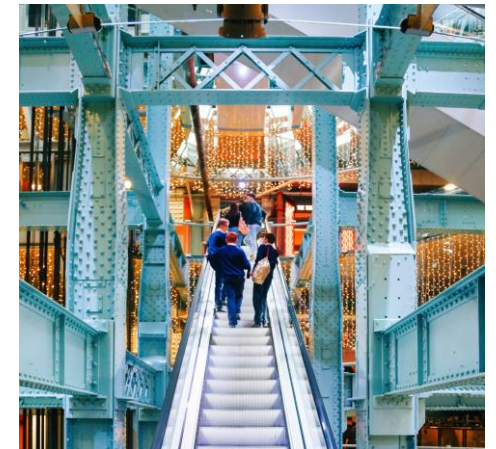


Assembly 2025

Dublin, 10-13th June



Dinner at the Guinness Storehouse





www.galvanizingeurope.org