

Structural Stainless Steels

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18 June 2026



Structural Stainless Steels; Agenda

- Introduction
- Problems with Structures
- Structural Stainless Steels; An Introduction
- Structural Stainless Steels; Technical Advantages
- Maintenance Minimization or Avoidance & Emissions Reduction
- Resilient Materials
- Summary

Introduction

Global building and infrastructure market consumes >900mt steels pa …. around 1.4% of this consumption are stainless steels ie; 13mt

Why are more structural stainless steels not consumed in the B&I sector?

- Lack of **understanding** of stainless steels and poor knowledge of what is available
- The **cost** of stainless steel discourages selection without understanding …. up-front cost focus dominates this sector rather than a life-cycle cost focus
- **Fear** of working with stainless steels
- **Maintenance** is seen a lucrative; resilient materials reduce maintenance



mt = million tonnes

Problems with Structures

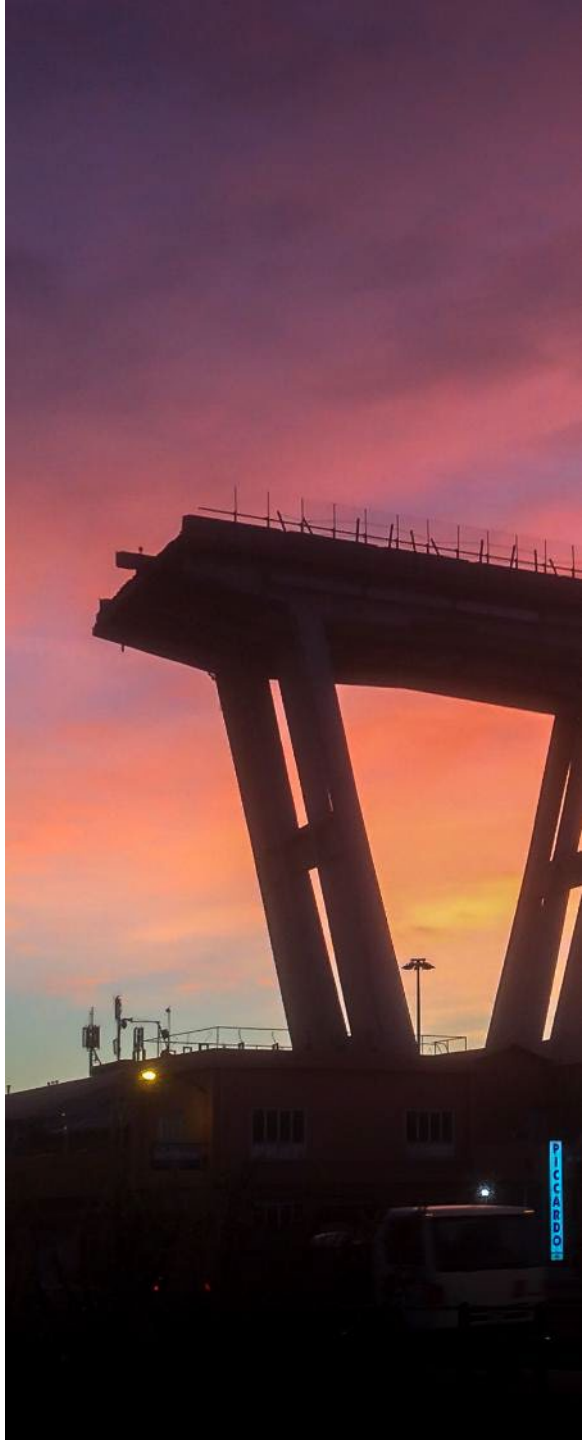


Picture courtesy of Elina Volkova via Pexels

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Problems with Structures; Bridges

- One our most critical infrastructure items
- A window to understanding current problems with structures
- At a global level the structural state of many bridges is concerning, eg;
  - USA; 500k road bridges, 222k (44%) need major repairs, 76k (15%) need replacing
  - France; 12k major highway bridges, 4k (33%) need major repairs
- Most vulnerable & expensive assets of transportation networks: Failures hinder movements in a region for months or even years
- Economic losses of bridge failures amounts to millions USD per day



Data Source; ARTBA Bridge Report 2025, Nature 629 2024; pictured: collapsed bridge in Genova, Italy

Problems with Bridges; Why?

- Increasing traffic and vehicle weights: **progressive material fatigue**
- **Material corrosion and degradation**: eg; Chloride-induced corrosion, ie in marine locations and where de-icing salts are routinely used
- **Sub-optimal designs**, eg; design for complete drainage not fully considered
- **Delayed maintenance routines** creating huge repair backlogs
- **Poor materials choice** for the operating environment: lack of education
- **Maintenance failures**: 30% of reinforcement repairs fail within 5 years
- **Increasing extreme events**, particularly weather-related events

Data Source; ARTBA Bridge Report 2025, Nature 629 2024



Problems with Structures; What can we do differently?

Different Materials Choices

Think about our materials choices differently

Break free from traditions

Break with Tradition

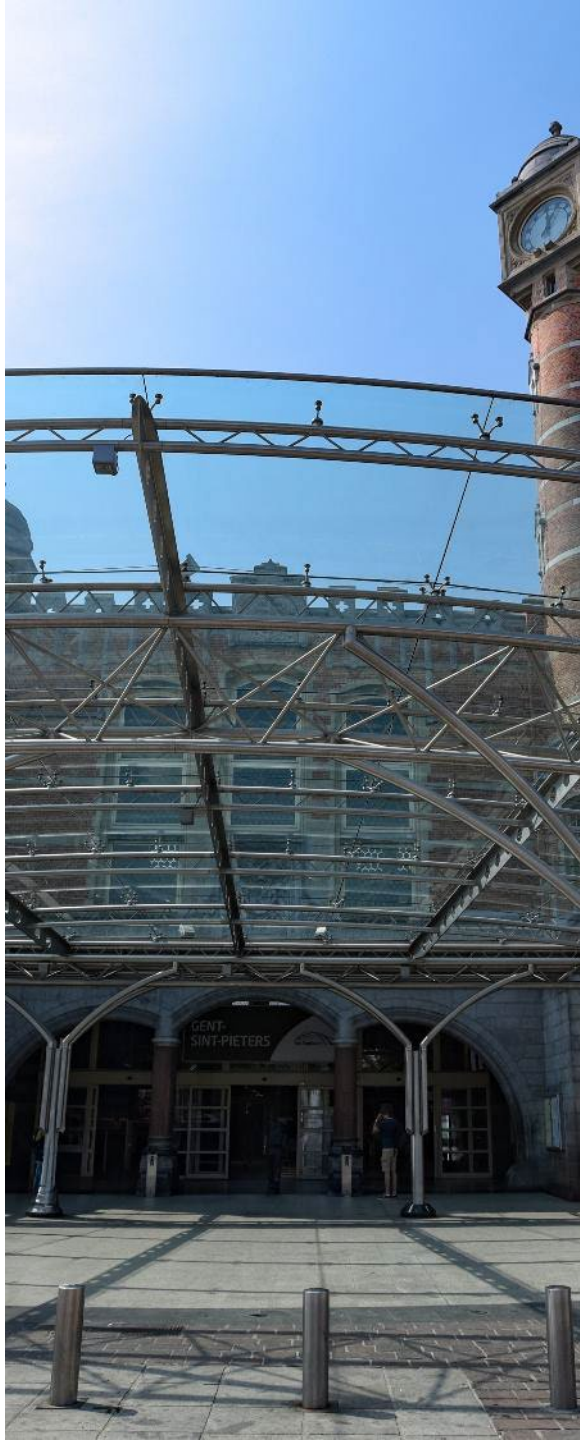
Break away from traditional approaches

Select Resilient Materials

Select more resilient materials without total materials replacement and understand where resilient materials offer real and long-lasting benefits

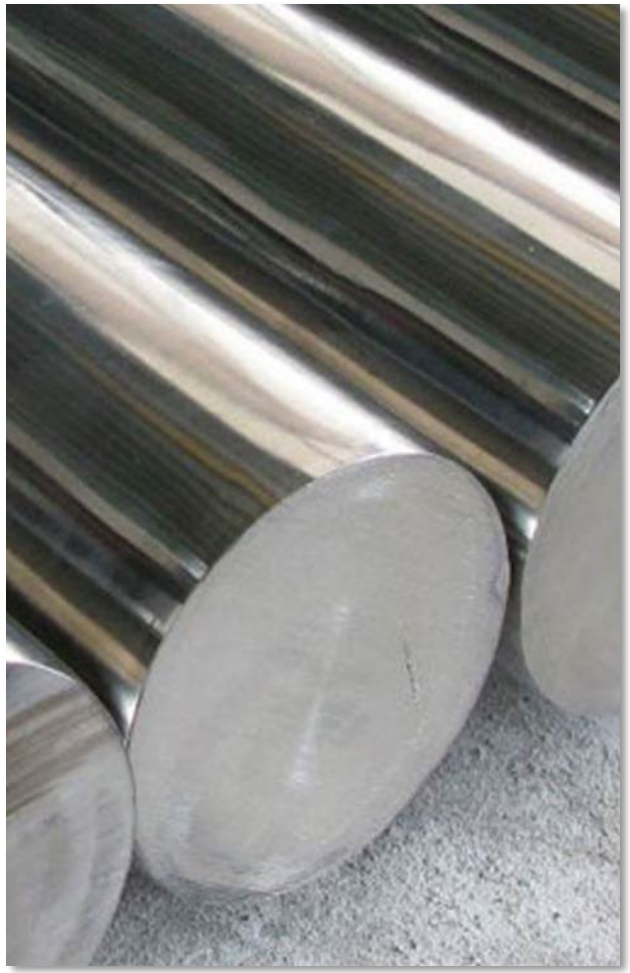
Learn from Failures

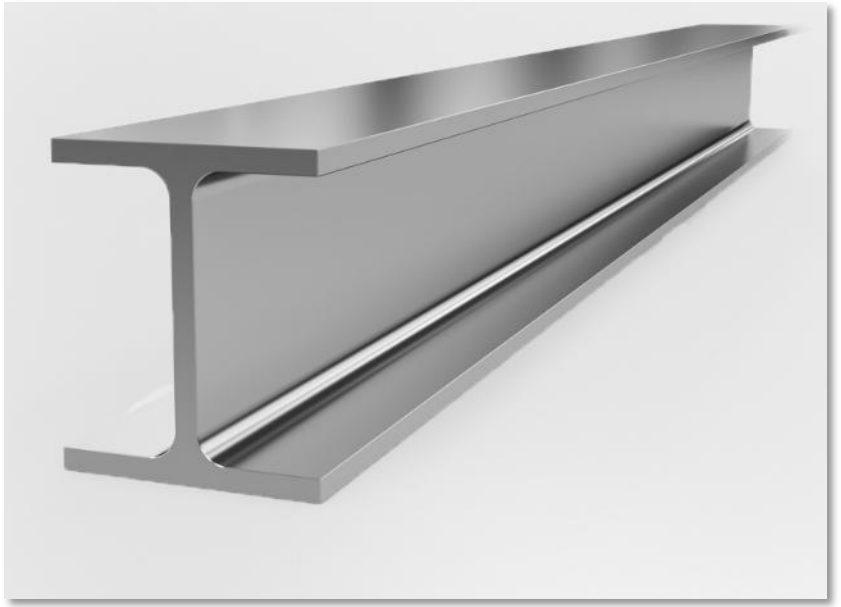
Learn from historical failures about where such failures commonly occur

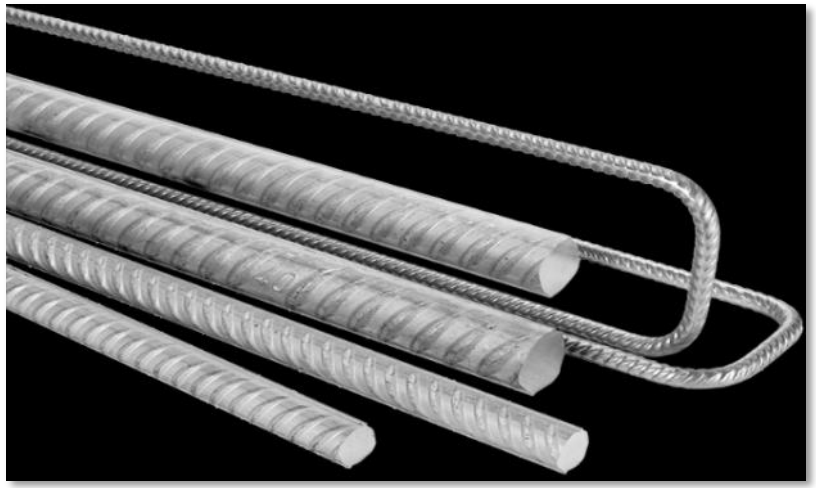


Structural Stainless Steels; Introduction











Structural Stainless Steels; Introduction

Structural stainless steels are available in many product forms: beams, bars, rebar, fixings, tubes, plates & sheets

Structural components easily made from flat products: particularly for modular structural units

Structural stainless steel grade selection is important

- ✓ Duplex grades; Lean & standard duplexes
- ✓ High Nitrogen Austenitic grades



Image; Modular Stainless Steel Bridge Stair Top / Landing Structural Side, Network Rail, UK, 2024

Structural Stainless Steels; Introduction



Many national and international specifications exist

- ✓ Product standards
- ✓ Design standards
- ✓ Fabrications standards

Standards for structural stainless steels are continually being updated in-line with planned new release programs

Structural Stainless Steels; The Technical Advantages









Images; Cala Galdana Bridge, Menorca, Spain

The first stainless steel road bridge in Europe
Span 55m, Width 13m
Offers >100 years of operating life with minimal maintenance
Life cycle cost 25% lower compared to using traditional materials
For this application, Chloride corrosion would primarily occur below the deck if inappropriate materials were selected

Installed in 2005 using Duplex stainless steel EN1.4462 for the arches and beams. No evidence of corrosion in 2026

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Structural Stainless Steels;
The Technical Advantages

High strength (particularly Duplex and Nitrogen-doped grades)

Formable and weldable materials

Remain ductile at low temperatures (Ni-containing grades)

Resistance to many different forms of corrosion

High levels of energy absorption

Protection of co-materials; thereby offering cost-efficient solutions

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Core Properties

The welding rules for Duplex stainless steels are outlined in the accompanying appendices

Steel Grade	Grade Name	%Cr / %Ni / %Mo	0.2% YS	PREN	Ductility	Weldable?	Comparative Energy Abs
EN 1.0045	Structural Steel S355	0.30x / 0.40x / 0.01x	355 MPa	6	18%	Readily	1,0
EN1.4311	304LN Austenitic SS	18.20 / 8.60 / 0.01x	350 MPa	21	48%	Readily with 308L filler metal	1,3
EN 1.4404	316L Austenitic SS	17.0 / 10.5 / 2.1	240 MPa	25	40%	Readily with 316L filler metal	1,3
EN 1.4162	2101 Lean Duplex SS	21.5 / 1.5 / 0.2	530 MPa	26	30%	Readily but with special rules	1,4
EN 1.4362	2304 Lean Duplex SS	23.0 / 4.0 / 0.3	460 MPa	26	20%	Readily but with special rules	1,5
EN 1.4462	2205 Duplex SS	22.0 / 4.8 / 2.6	500 MPa	35	25%	Readily but with special rules	1,6

PREN = Pitting Resistance Equivalent Number: indicates the resistance to pitting corrosion caused by Chlorides

Data Source; worldstainless 2024

Chloride Corrosion Resistance 1/2

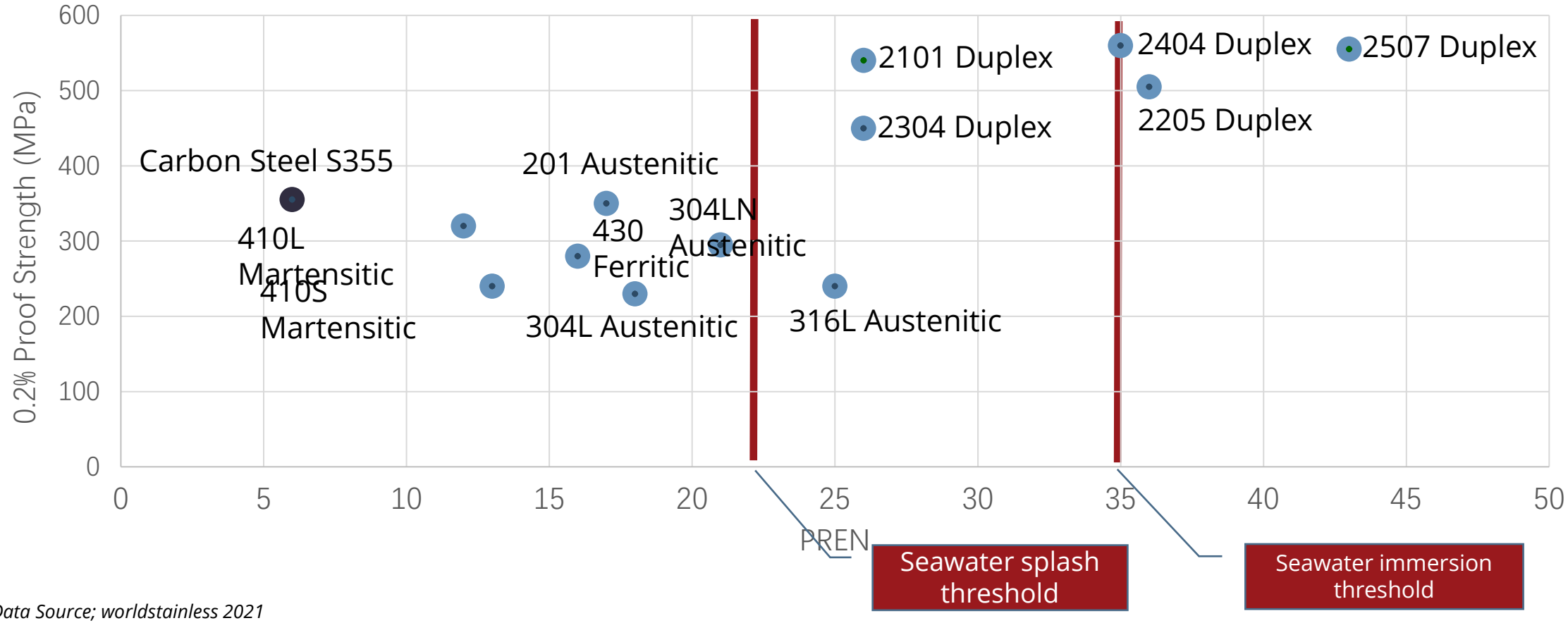
Steel Grade	Grade Name	%Cr / %Ni / %Mo	PREN	Marine Atmosphere	Marine Splash Zone	Marine Tidal Zone	Marine Immersed
EN 1.0045	Structural Steel S355	0.30x / 0.40x / NA	6				
EN 1.4311	304LN Austentic SS	18.20 / 8.60 / 0.01x	21				
EN 1.4404	316L Austenitic SS	17.0 / 10.5 / 2.1	25				
EN 1.4162	2101 Lean Duplex SS	21.5 / 1.5 / 0.2	26				
EN 1.4362	2304 Lean Duplex SS	23.0 / 4.0 / 0.3	26				
EN 1.4462	2205 Duplex SS	22.0 / 4.8 / 2.6	35				

Note; Material finish and surface roughness will impact on corrosion resistance, particularly where atmospheric, splash and tidal contact with Chloride-containing media occurs

PREN = %Cr + 3.3 x %Mo + 16 x %N

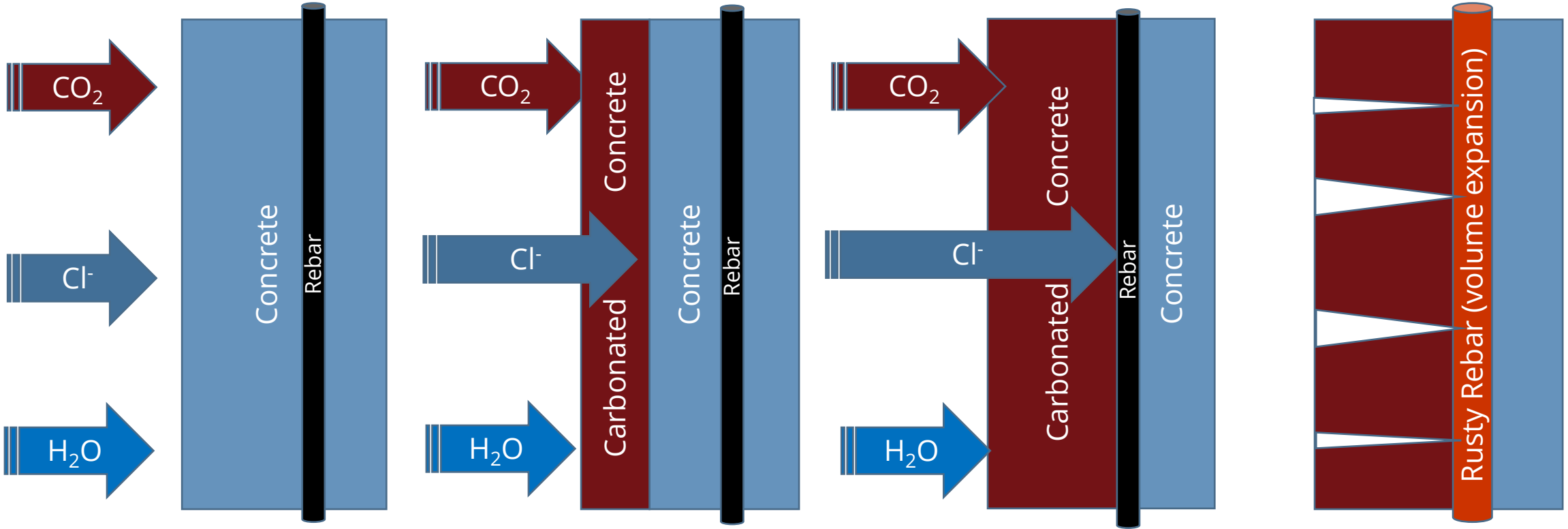
Data Source; worldstainless 2024

Chloride Corrosion Resistance 2/2



Data Source; worldstainless 2021

Chloride Corrosion of Structural Reinforcement



1. Robust Reinforced Concrete (no diffusion of corrosion initiators)

2. Partially Carbonated Reinforced Concrete (CO_2 & Cl^- diffusion into concrete)

3. Majorily Carbonated Reinforced Concrete (CO_2 & Cl^- diffusion into concrete)

4. Corroded Reinforcement & Spalled Concrete

Data Sources; The Constructor 2022, worldstainless 2023

Preventing Chloride Corrosion of Reinforcement

(Marine & Near-Marine Environments and where de-icing salts are used)

- Global use of steel reinforcement is >300 million tonnes per annum
- Structural stainless steel rebar currently <1%
- Selective use of stainless rebar is the solution, particularly where Chlorides are present
- Understanding how Chlorides diffuse is key
- Maintenance of rebar corrosion is a lost cause

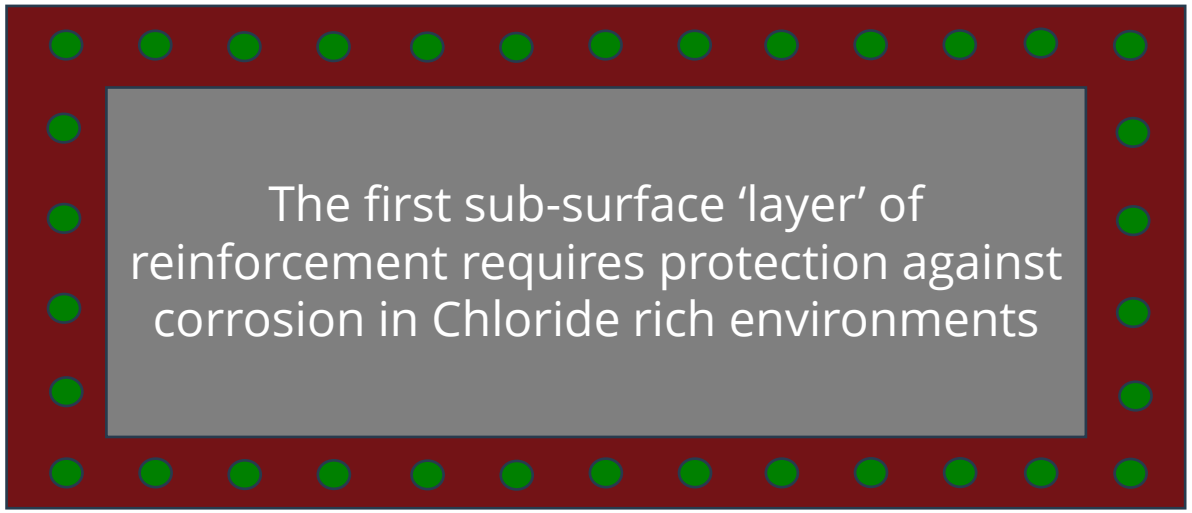


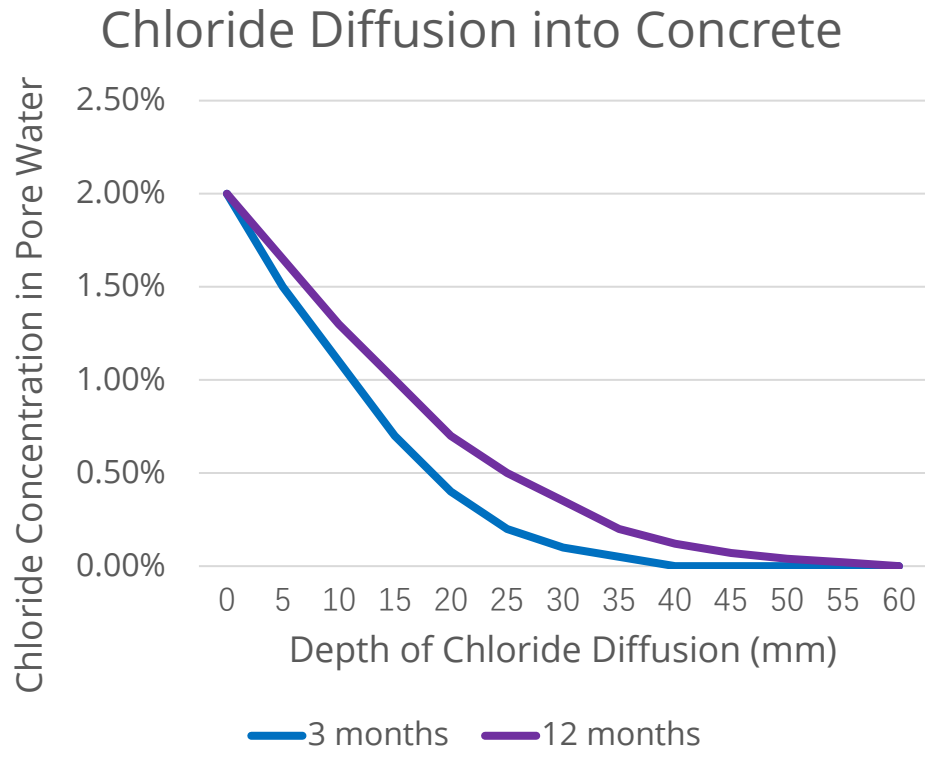
Data Source; constructsteel 2024, worldstainless 2025

Preventing Chloride Corrosion of Reinforcement

(Marine & Near-Marine Environments and where de-icing salts are used)

Chloride ions in the atmosphere can easily travel between 2km and 20km away from coastlines depending on prevailing wind strengths





Data Source; Chloride Diffusion Model for Concrete in Marine Environments, Li, D. et al 2019, Further assessed by Song, Y 2023

Preventing Chloride Corrosion of Reinforcement

(Marine & Near-Marine Environments and where de-icing salts are used)



Galvanized and epoxy-coated steel reinforcement exists are these products effective choices?



They are lower cost (vs stainless) however they have a tendency to fail

Galvanized and epoxy coatings often get damaged during handling / transport



Once a small damaged section exists, corrosive media will attack the substrate



Zinc also has a weak galvanic potential which means that any contact with a more noble metal will result in Zinc corrosion

NB; When an electrolyte is present and concrete contains ‘pore water’

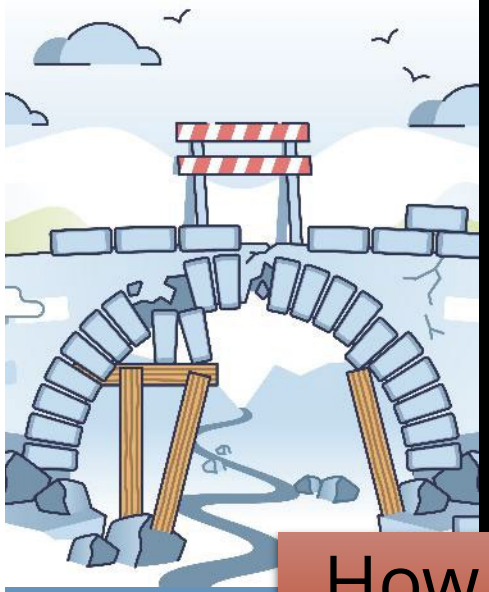
Data Source; worldstainless 2023

Maintenance Minimization or Avoidance



Picture courtesy of Lucia Barreiros Silva via Pexels

Maintenance Minimization or Avoidance



Lucrative?



Avoidable?

How do we perceive maintenance?

Normal?



Essential?



Maintenance Minimization or Avoidance

If we compare two similar assets that perform the same function

One version has 200 primary moving components

The second version has just 20 primary moving components

Do we think one will need less maintenance compared to the other?

ICE vehicle; 200 moving components



Electric vehicle; 20 moving components



Images; Carwow & Independent.co.uk

Maintenance Minimization or Avoidance



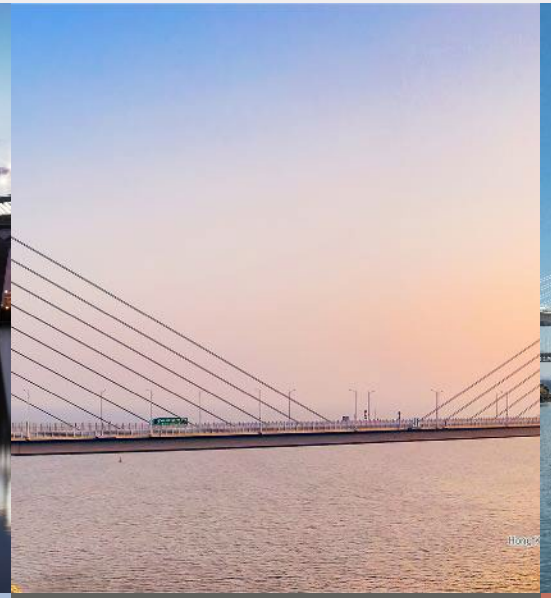
Schaffhausen bridge

Switzerland, single transport route



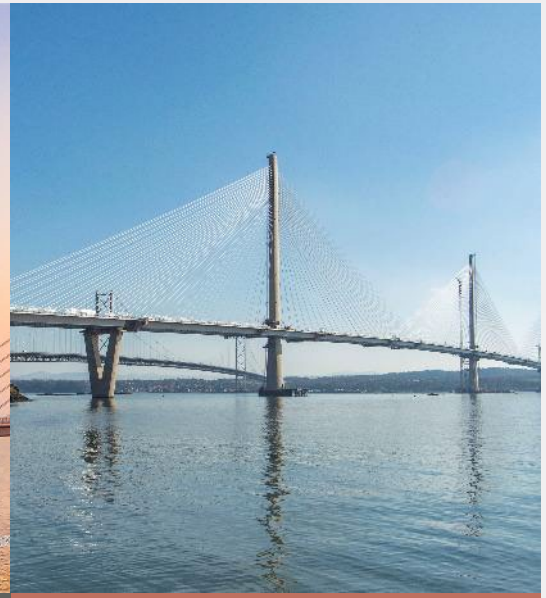
Champlain bridge

Canada, important trade route



Hong Kong – Zhuhai – Macau causeway

China, offers trade connectivity



Queensferry Crossing

Scotland, key commuter corridor

Built with a proportion of resilient and long-life materials, i.e. 'selective use' of structural stainless steels; predominantly but not exclusively, **duplex stainless steels**

Selective use? Broadly means replacing around **10%** of structural steels with structural stainless steels

Maintenance Minimization or Avoidance

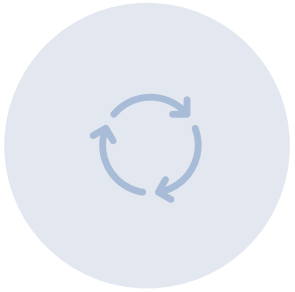
Benefits of the selective use of structural stainless steels in structures;



Reduction in maintenance needs → primarily major maintenance needs



Extension of the life of co-materials → from 40-60 years to 100+ years

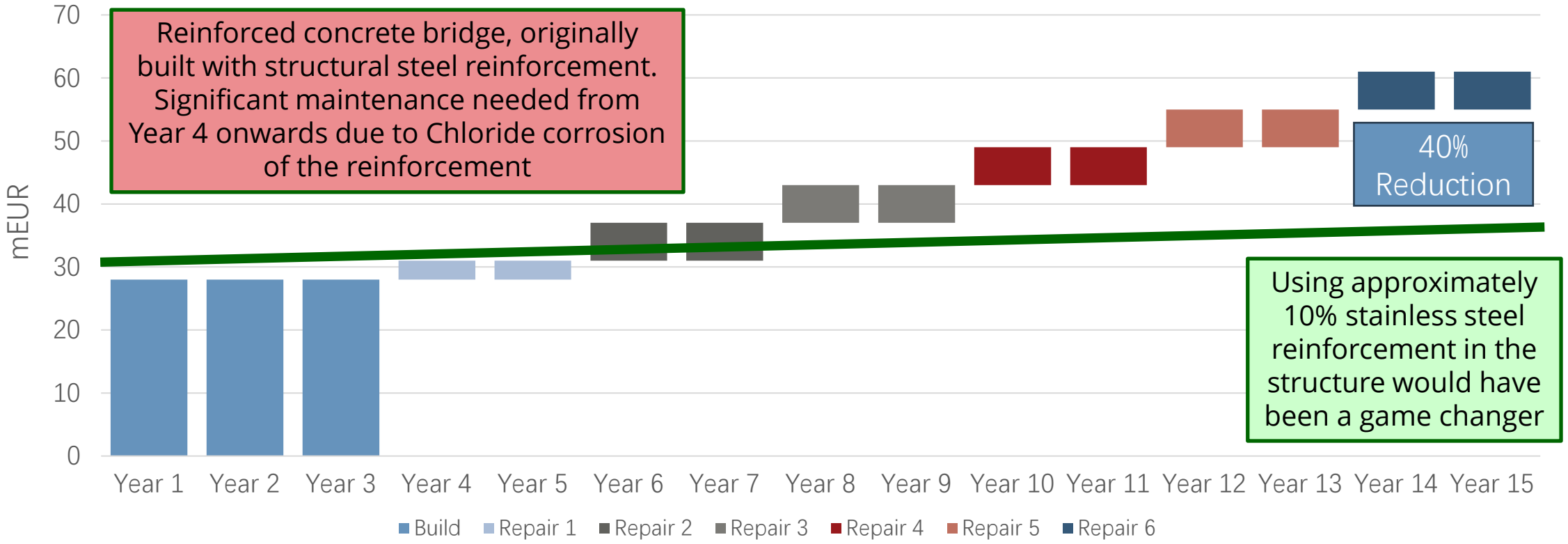


Reduction in life cycle costs → typically between 10% and 30% lower



Reduction in life-cycle emissions → typically between 20% and 50% lower

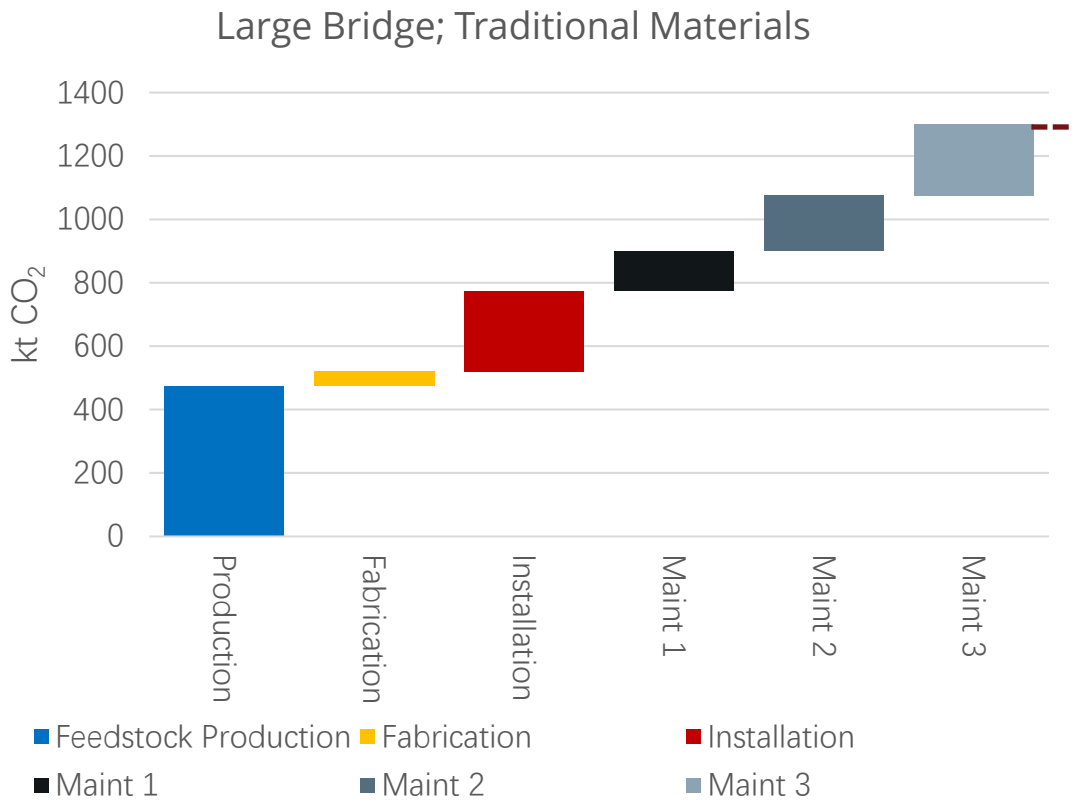
Maintenance Minimization or Avoidance
Impact on Life Cycle Costs, Road Bridge UK

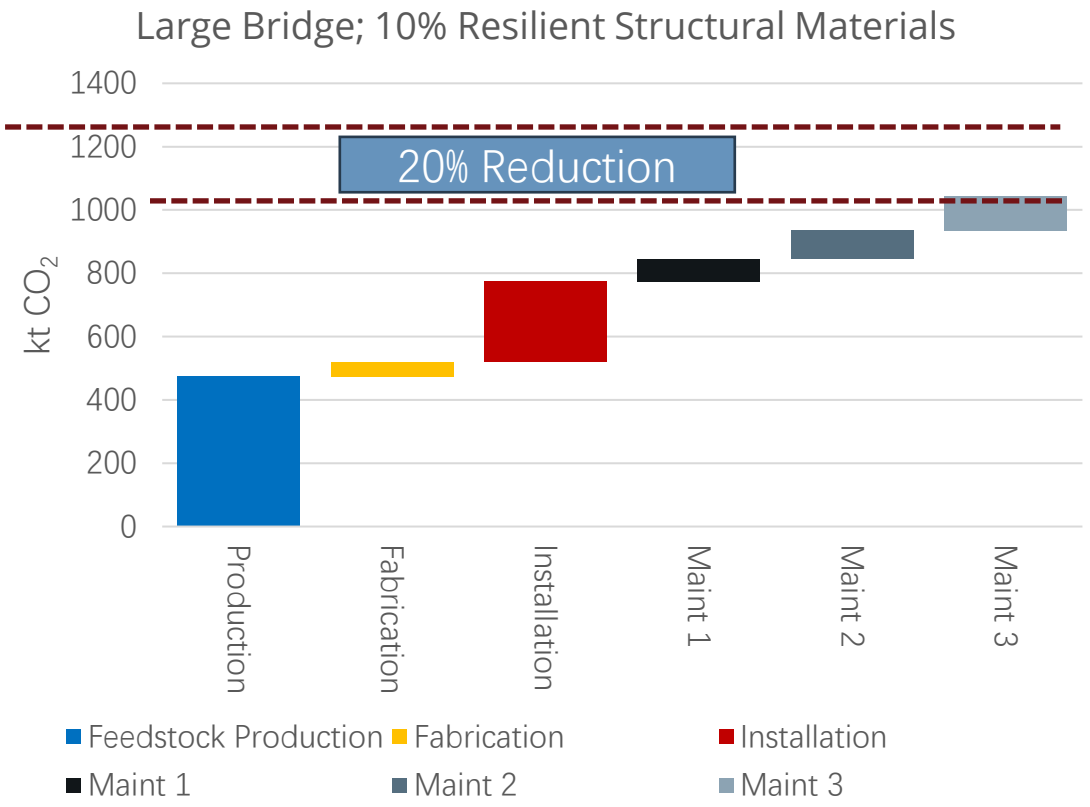


Data Source; Midlands Link Motorway Viaducts, Development of Repair Strategies, Sharifi, A. 2010

The selective use of structural stainless steel doesn't completely eliminate maintenance. It reduces the maintenance need.

Maintenance Minimization or Avoidance
Impact on Life Cycle Emissions over 75 Years





Data Source; worldstainless Sustainable Materials Model 2024

The reality is that the bridge was actually built with 11% duplex structural stainless steel

Maintenance Minimization or Avoidance: Asset Design

Designing assets to avoid or minimize maintenance requires different thinking, centered around **preventing materials degradation**

Critical guidance: ISO EN 1993-1-4; 2015-10 / Eurocode 3, Annex A

Eurocodes 1-4 provides a procedure for selecting an appropriate grade of stainless steel for the service environment of structural components which is applicable to:

- Load bearing components within outdoor structures
- Environments that do not normally involve frequent immersion in sea water
- Environments with a pH between 4 and 10
- Environments with no exposure to chemical process flow streams



Maintenance Minimization or Avoidance
Selecting Appropriate Stainless Steels for Structures

Operating environment assessed by a Corrosion Resistance Factor (CRF), made up of 3 components:

- F1 rates the risk of exposure to Chlorides from salt water / salty atmospheres / deicing salts
- F2 rates the risk of exposure to Sulphur dioxide
- F3 rates the cleaning regime or exposure to washing by rain

A table indicates for a given CRF the corresponding CRC class

- CRC = The Corrosion Resistance Class of suitable stainless steel grades

Stainless steel grades are placed in five CRCs numbered I to V

Data Source; DIN EN 1993-1-4;2015-10/Eurocode 3, Annex A

F1; Risk from Exposure to Cl^- ions

Score	Environment	Examples	M (dist from sea)	S (dist from de-icing)
1	Internally controlled environment		NA	NA
0	Low risk of exposure		>10km	>0.1km
-3	Medium risk of exposure		1km to 10km	0.01km to 0.1km
-7	High risk of exposure	eg; Cl^- ions in marine & near-marine atmospheres including wind carried Cl^- (20km)	0.25km to 1km	<0.01km
-10	Very high risk of exposure	Road tunnels where de-icing salts are used or are carried in the tunnels by winds		
-10	Very high risk of exposure	North sea coast off DE, Mediterranean coast All Baltic coastal areas	<0.25km	
-15	Extremely high risk of exposure	Atlantic coast of FR, PT & SP All coastal areas of BE, DK, FR, NL, NO, IRE, Southern SE & all UK	<0.25km	

F2; Risk from Exposure to SO_2 and F3; Impact of a Cleaning Regime or Exposure to Rain Washing

F2 Score	Exposure Description	Examples	Average Deposition
0	Low risk of exposure	European coastal environments	<10 micrograms / m^3
-5	Medium risk of exposure	Inland non-industrial locations	10-90 micrograms / m^3
-10	High risk of exposure	Heavy / concentrated industrial locations Road tunnels	90-250 micrograms / m^3

F3 Score	Cleaning / Washing Regime
0	Fully exposed to washing by rain
-2	Specified regular cleaning regime in place
-7	No washing by rain and no specified regular cleaning regime

Determining the Corrosion Resistance Class (CRC)

Corrosion Resistance Factor (CRF)	Corrosion Resistance Class (CRC)	Suitable Stainless Steels Grades
1	I	EN 1.4003, EN 1,4016, EN 1.4512
0 to -7	II	EN 1.4301, EN 1.4307, EN 1.4311, EN 1.4306, EN 1.4541 EN 1.4318, EN 1.4567, EN 1.4482
-8 to -15	III	EN 1.4401, EN 1.4404, EN 1.4435, EN 1.4571, EN 1.4429 EN 1.4432, EN 1.4578, 445J2 EN 1.4662, EN 1.4362, EN 1.4062, EN 1.4162
-16 to -20	IV	EN 1.4439, EN 1.4539, EN 1.4462
< -20	V	EN 1,4565, EN 1.4529, EN 1.4547 EN 1.4410, EN 1.4501, EN 1.4507

CRC; A Simple Worked Example

Defined Environment; External building, Asian location, relatively dry area, 20km from the sea, strong prevailing winds carry Cl- ions 20km inland

Corrosion Resistance Factor	Environment Description	CRF Score
F1; Risk of Cl^- ions exposure	Cl^- ions carried by winds; high risk zone	-7
F2; Risk of exposure to SO_2	Non-industrial area; low risk zone	0
F3; Impact of cleaning / rain washing	No regular rain washing. No planned cleaning regime	-7
Total CRF		**-14**

Determining the CRC; Worked Example

Corrosion Resistance Factor (CRF)	Corrosion Resistance Class (CRC)	Suitable Stainless Steels Grades
1	I	EN 1.4003, EN 1,4016, EN 1.4512
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-8 to -15 -14	III	EN 1.4401, EN 1.4404, EN 1.4435, EN 1.4571, EN 1.4429 EN 1.4432, EN 1.4578, EN 1.4662, EN 1.4362, EN 1.4062, EN 1.4162, 445J2 22%Cr, 2%Mo Ferritic Grade
-16 to -20	IV	EN 1.4439, EN 1.4539, EN 1.4462
< -20	V	EN 1,4565, EN 1.4529, EN 1.4547 EN 1.4410, EN 1.4501, EN 1.4507

Maintenance Minimization or Avoidance; Asset Design

Which grade?

- If reinforced concrete will be exposed to corrosive media the design is simple: first subsurface reinforcing layers in exposed locations
- If other planned structural steelwork will be exposed to corrosive media: the selected stainless steel grade should be used in the exposed areas



Maintenance Minimization or Avoidance; Asset Design



Cala Galdana Road Bridge, Menorca, Spain:
*no significant rain washing of the underside of the bridge but hot and humid during the summer

CRF = -17, CRC = IV

Mediterranean coast *

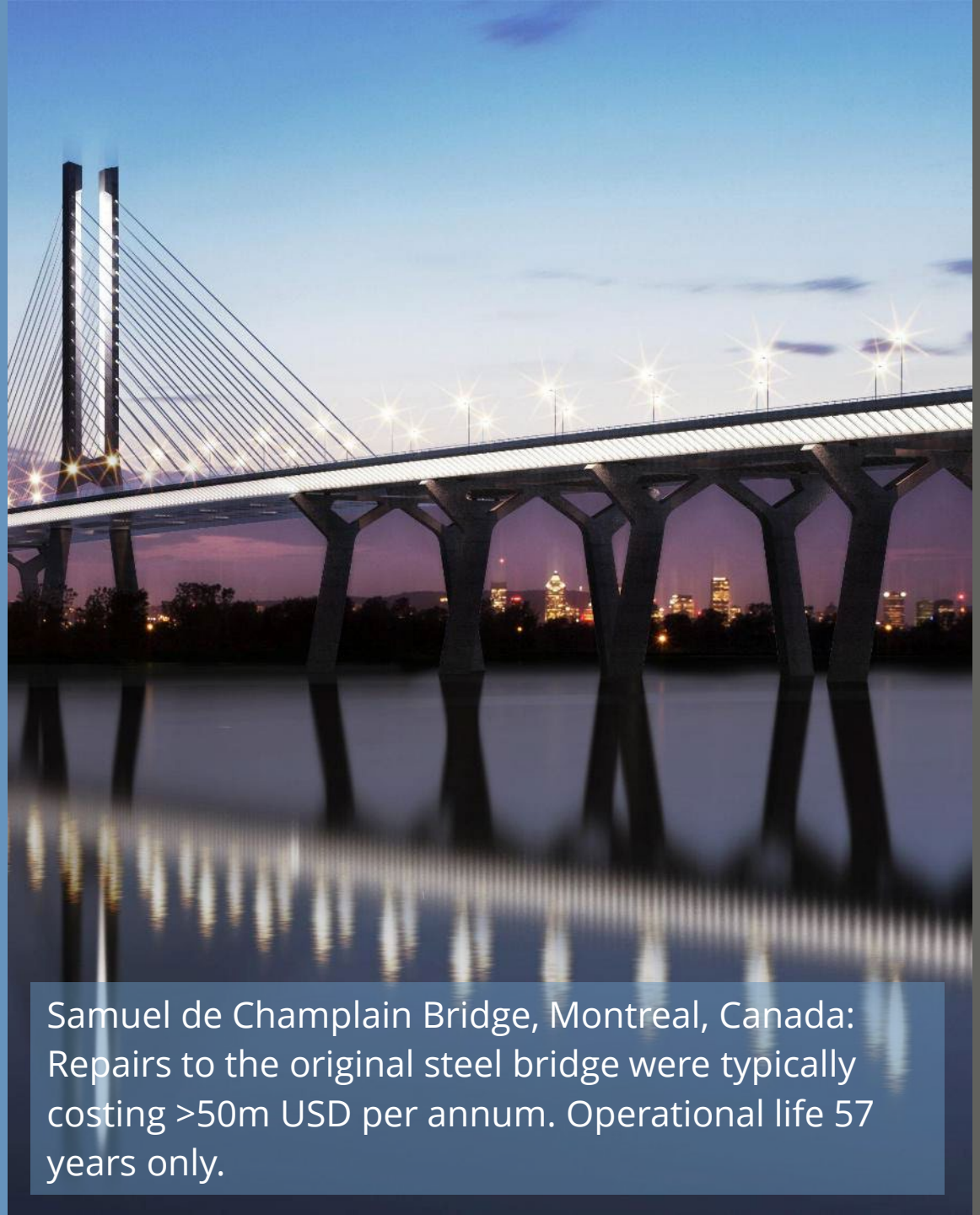
No SO_2

No rain washing *

EN 1.4462 (2205) selected

Drainage above deck supports

Maintenance Minimization or Avoidance; Asset Design



Samuel de Champlain Bridge, Montreal, Canada: Repairs to the original steel bridge were typically costing >50m USD per annum. Operational life 57 years only.

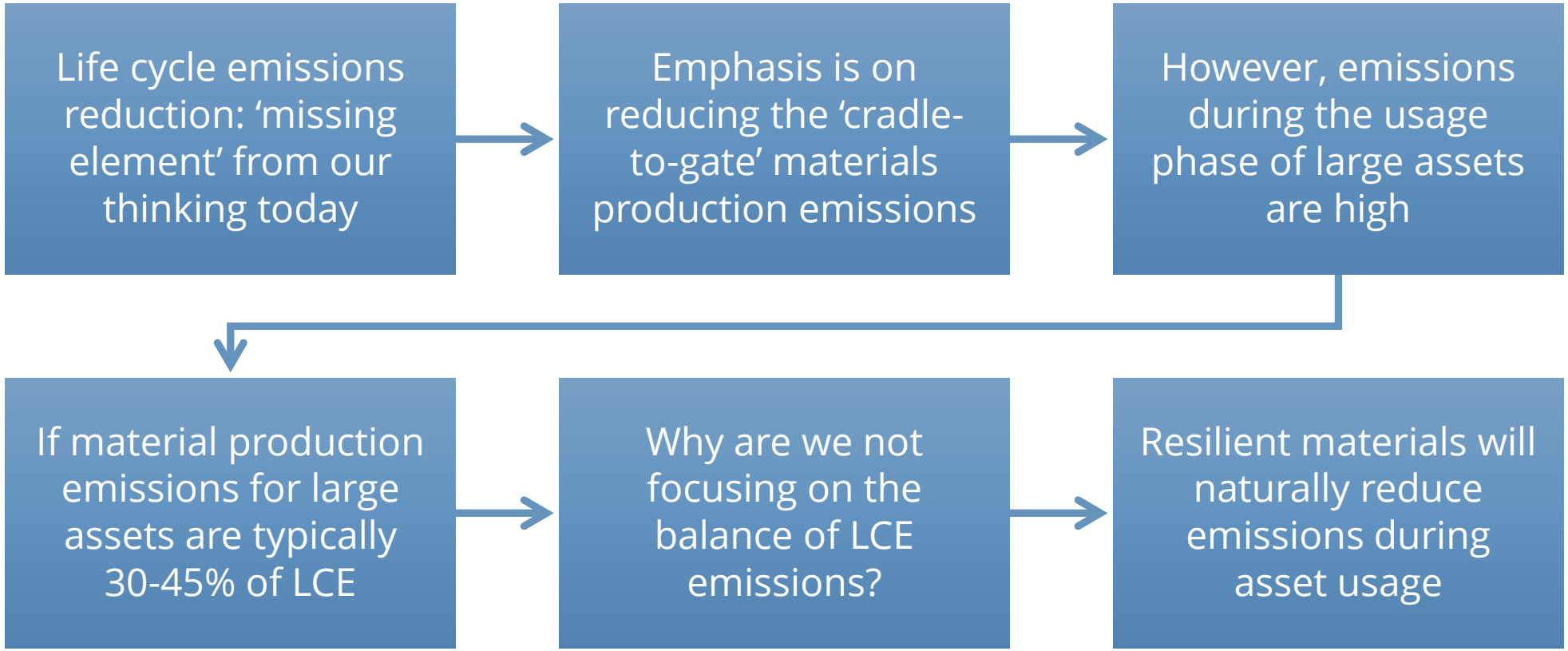
CRF = -15, CRC = III

- Marine environment
- De-icing salts regularly used
- No SO_2
- Some rain washing

EN 1.4362 (2304) selected

- 15kt reinforcement
- Decks & submerged piers

Maintenance Minimization or Avoidance; Emissions Reduction Opportunities

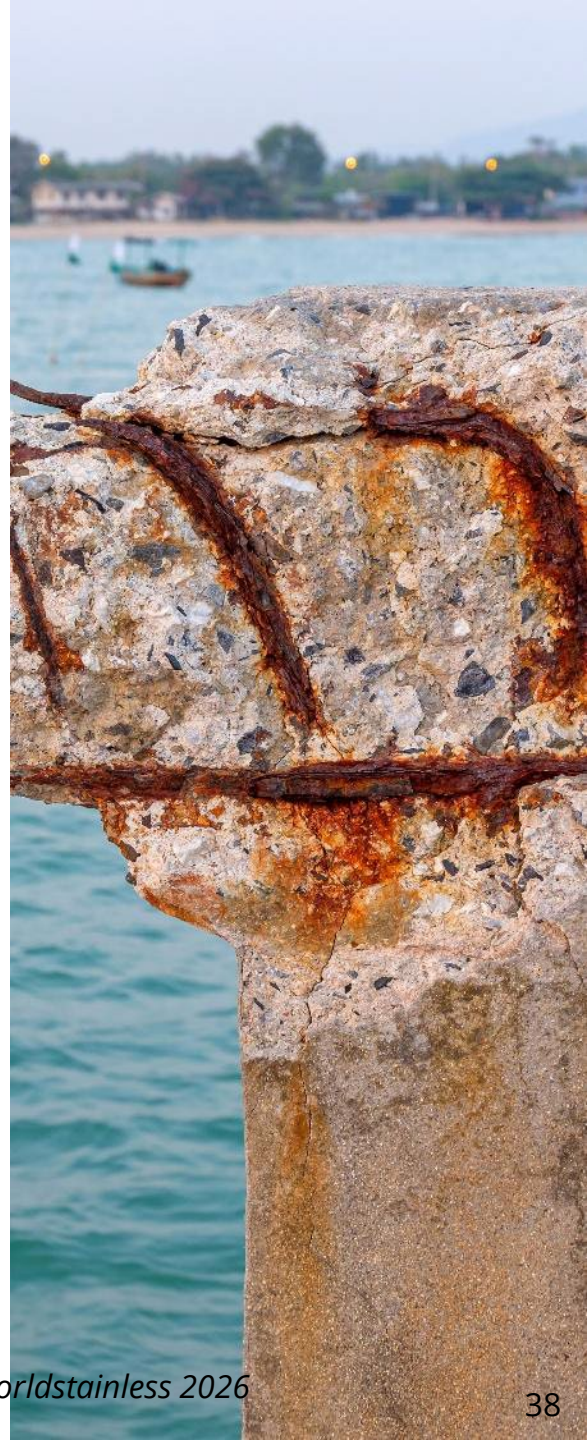


Data Source; worldstainless 2023

LCE = Life Cycle Emissions

Maintenance Minimization or Avoidance; Emissions Reduction Opportunities

- 21% of the annual global production emissions of steels: **generated to replace corroded steels**
- Global cement & concrete production: Around 1.5bn tonnes of CO_2e in 2024
  Global steel production: Around 4.0bn tonnes of CO_2e in 2024
- **Reduce** these figures for both material groups **by 20%** through the selective use of resilient materials in new applications
- **= a total reduction of 1.1bn tonnes of CO_2e annually**



Data Source; The Carbon Footprint of Steel Corrosion; Ianuzzi, M. and Frankel, G. S. njp Materials Degradation 6, Dec 2022, worldstainless 2026

Resilient Materials





Pooley Bridge, UK. Built with 2101 lean duplex to provide a service life >100 years

Data Sources; Why Things Break, Eberhart, M. 2003, How Engineering Works 2026, worldstainless 2026

Resilient Materials: Characteristics

- ✓ High yield strength
- ✓ Can absorb energy without permanent damage ie; offers good levels of strain hardening
- ✓ Offer good levels of toughness
- ✓ Withstand exposure to corrosive media: the requirements of this feature are conditional on understanding the corrosive media present
- ✓ Higher material cost, but lower life-cycle cost

Resilient Materials & Co-Materials

Using resilient materials selectively will extend the life of co-materials, considering:

Reinforced concrete;

If subjected to the use of de-icing salts and/or Chloride ion deposition / ingress, then the first sub-surface layer of reinforcement should be a Duplex structural stainless steel

Drainage points;

These points must ensure structural drainage is adequate for even extreme weather conditions;

If reinforced concrete sections form part of the drainage system, then the first sub-surface layer of reinforcement should be a Duplex structural stainless steel

Drainage points (contd);

If exposed steel beams are used below concrete sections in a Chloride-rich marine environment then two considerations are needed

i) There must be a drainage gap between the underside of the concrete sections and the upperside of the supporting steel beams

ii) The beams should be made from Duplex structural stainless steel as in the case of the Cala Galdana bridge to ensure no corrosion occurs

Resilient Materials & Co-Materials

Using resilient materials selectively will extend the life of co-materials, considering:

Material surface finish; A rough stainless steel surface finish (>0.4 microns Ra) in exposed locations which are subjected to wetting-evaporation cycles in Cl- rich environments will quickly start to show signs of corrosion

Fixings; The choice of fixing materials is often overlooked and/or not understood. Stainless steel structural products should be fixed with stainless steel fixings (if not welded)

Galvanic corrosion will occur and the fixings will fail if this simple rule is not followed.



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The Selective Use of Resilient Materials

- ✓ Resilient materials do not have to be used totally to replace traditional materials => 'money madness'
- ✓ However, to protect our global society, we do need to **think differently**
- ✓ Global urban population in 2025 was around 5 billion people and is expected to reach 7.5 billion people by 2050
- ✓ The notion of '**built to last**' needs to be at the heart of our thinking
- ✓ Using resilient materials selectively offers huge societal benefits

Structural stainless steels, when used selectively, must be part of the solution



Summary 1/2

Our global society needs to rethink how we design and build large assets

We cannot afford to continue to use materials unwisely

Produce → install → repair = not sustainable

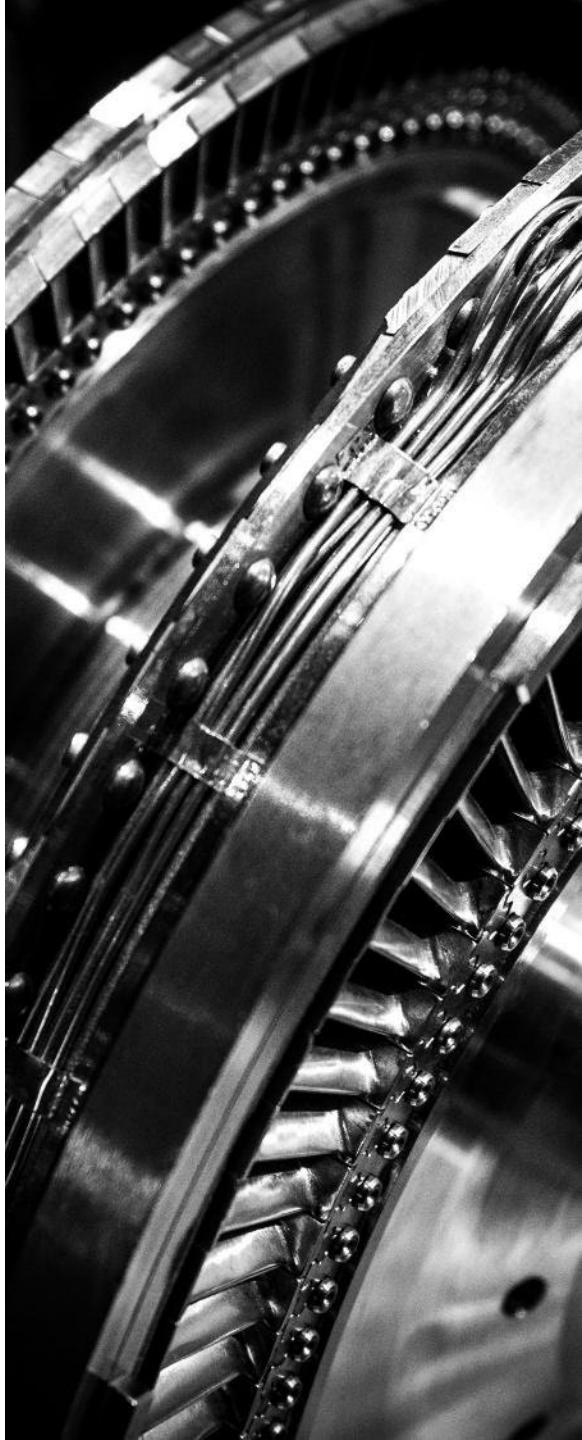
Our global population is increasing and therefore our urban settings need to:

- Be resilient and not be subjected to never-ending maintenance
- Permit ease of societal connectivity
- Not fail with associated damage and loss of life
- Use our available cash wisely through long-term thinking



Summary 2/2

- We have some amazing materials available including structural stainless which will protect co-materials, when used appropriately
- There is no need to ‘re-invent the wheel’
- Great examples have proven what is possible
- Let us use those examples and ‘steal them with pride’
- Can we afford not to think differently?
- If humans lived for 150 years, how would we think about building things?



Thank you for your attention

Any questions?

Appendices



Product Standards for Stainless Steels Covering Different Available Product Forms

Europe, EN 10088; 2014, Stainless Steels, All parts

USA, ASTM Product Standards (of which there are many)

eg; A480/A480M, A582/A582M, A565/A565M, A580/A580M, A581/A581M

EN ISO 3506; Stainless Steel Fasteners

China, GB/T 3280-2015; Cold rolled stainless steel plate, sheet and strip

China, GB/T 4237-2015; Hot rolled stainless steel plate, sheet and strip

Product Standards for Stainless Steels Covering Different Available Product Forms

China, GB/T 34472-2017; General technical requirements of stainless steel for building curtain walls

China, GB/T 34200-2017; Cold rolled stainless steel plate, sheet and strip for construction roofs and curtains

China, GB/T 37430-2019; High strength stainless structural steel for construction

China, GB/T 3098.25-2020; Mechanical properties of fasteners. Guidance for the selection of stainless steels and nickel alloys for fasteners

Product Standards for Stainless Steels Covering Different Available Product Forms

China, GB/T 3098.21-2014; Mechanical properties of fasteners.

Stainless steel tapping screws

China, GB/T 3098.6-2023; Mechanical properties of fasteners.

Stainless steel bolts, screws and studs

China, GBT36145-2018; Profiled stainless steel sheet for buildings

China, GB/T 33959-2017; Stainless steel bars for the reinforcement of concrete

Design Standards for Stainless Steels

Europe, EN 1993-1-4: 2006 & A2: 2020, Eurocode 3; Part 1.4, Design of Steel Structures, Supplementary Rules for Stainless Steels

Europe, EN 1994; Design of Composite Steel & Concrete Structures

USA, ASCE; Specification for the Design of Cold Formed Stainless Steel Structural Members (8-22)

USA, AISC 370; Specification for Structural Stainless Steel Buildings

USA, AISC DG27; Design Guide for Structural Stainless Steel (2nd Edition)

USA, AISC 313-21; Code of Standard Practice for Structural Stainless Steel Buildings

Design Standards for Stainless Steels

Australia; AS/NZS 4673;2001 Cold formed stainless steel structures

China, CECS 410-2015; Stainless Steel Design Standard

China, T/CSUS 14-2021 Technical Standard of Stainless Steel Core Plate Building Structure

China, T/CECS 952-2021 Technical specification for concrete-filled stainless steel tubular structures

South Africa, SANS 10162-4:1997 (Ed. 1.00); Structural use of Steel Part 4;

The design of cold-formed stainless steel structural members

Design Standards for Stainless Steels

USA, ASCE / SEI 8-22; Specification for the Design of Cold Formed Stainless Steel Structural Members

USA, AASHTO / NSBA; Specification for Structural Duplex Stainless Steel Bridge Plate Materials, 1st Edition, S18.1–2025

USA, AASHTO / NSBA; Specification for Design of Structural Duplex Stainless Steel Bridges, 1st Edition, S18.2–2025

Fabrication Standards for Stainless Steels

Global, SCI Technical Report; ED018; Execution of Stainless Steel Structures

Europe, BS EN 1011-3; 2018-TC; Welding, Recommendations for the Welding of Metallic Materials, Part 3; Arc Welding of Stainless Steels

Europe, BS EN 1090-2; 2018 + A1; 2024; Specification for the Fabrication and Installation of Steel, Stainless Steel and Aluminium Structures

China, T/CSUS 14-2021 Technical Standard of Stainless Steel Core Plate Building Structure

China, T/CECS 952-2021 Technical specification for concrete-filled stainless steel tubular structures

Fabrication Standards for Stainless Steels

China, GB 50205-2020 Standard for acceptance of construction quality of steel structures

Welding Duplex Stainless Steels

Duplex SS steels have a two phase structure of almost equal proportions of Austenite & Ferrite

The composition of the most common Duplex steels lies within the range 22% - 26% Cr, 4% - 7% Ni & 0% - 3% Mo

A small amount of nitrogen (0.1-0.3%) stabilizes the austenite

Modern Duplex SS are readily weldable but the procedure, especially maintaining the heat input range, must be strictly followed to obtain the correct weld metal structure

Data Source; worldstainless 2026 and The Welding Institute 2026

Duplexes; Avoiding Weld Imperfections

Although most welding processes can be used, low heat input welding procedures should be avoided

Preheating is not normally required however the maximum inter-pass temperature must be controlled

Choice of filler metal is important as it is designed to produce a weld metal structure with a Ferrite-Austenite balance to match the parent metal

To compensate for Nitrogen loss, the filler may be over-alloyed with Nitrogen or the shielding gas itself may contain a small amount of Nitrogen

Data Source; worldstainless 2026 and The Welding Institute 2026

Galvanic Corrosion; Hierarchy Table

Pos	Material	Galv Pot
1	Graphite	+300 mV
2	Gold	+150 mV
3	Ni Alloy 825	-10 mV
4	Titanium	-40 mV
5	2507 Duplex Stainless Steel	-60 mV
6	2205 & 2304 Duplex Stainless	-70 mV
7	316 & 317 Stainless Steels	-80 mV
8	Nicrofer	-90 mV
9	304 & 321 Stainless Steels	-90 mV
10	Ni Alloy 600	-130 mV
11	CuproNickel	-240 mV
12	430 Stainless Steel	-250 mV

Pos	Material	Galv Pot
13	Nickel-Silver	-280 mV
14	Mn Bronze	-300 mV
15	410 & 416 Stainless Steels	-320 mV
16	Copper	-350 mV
17	Brasses	-360 mV
18	Al Bronze	-370 mV
19	Austenitic Cast Iron	-480 mV
20	Low Alloy Steels	-610 mV
21	Carbon Steels	-650 mV
22	Aluminium and its Alloys	-880 mV
23	Zinc	-1050 mV
24	Magnesium	-1640 mV

Low number positions represent the most noble materials which are more protected from galvanic corrosion