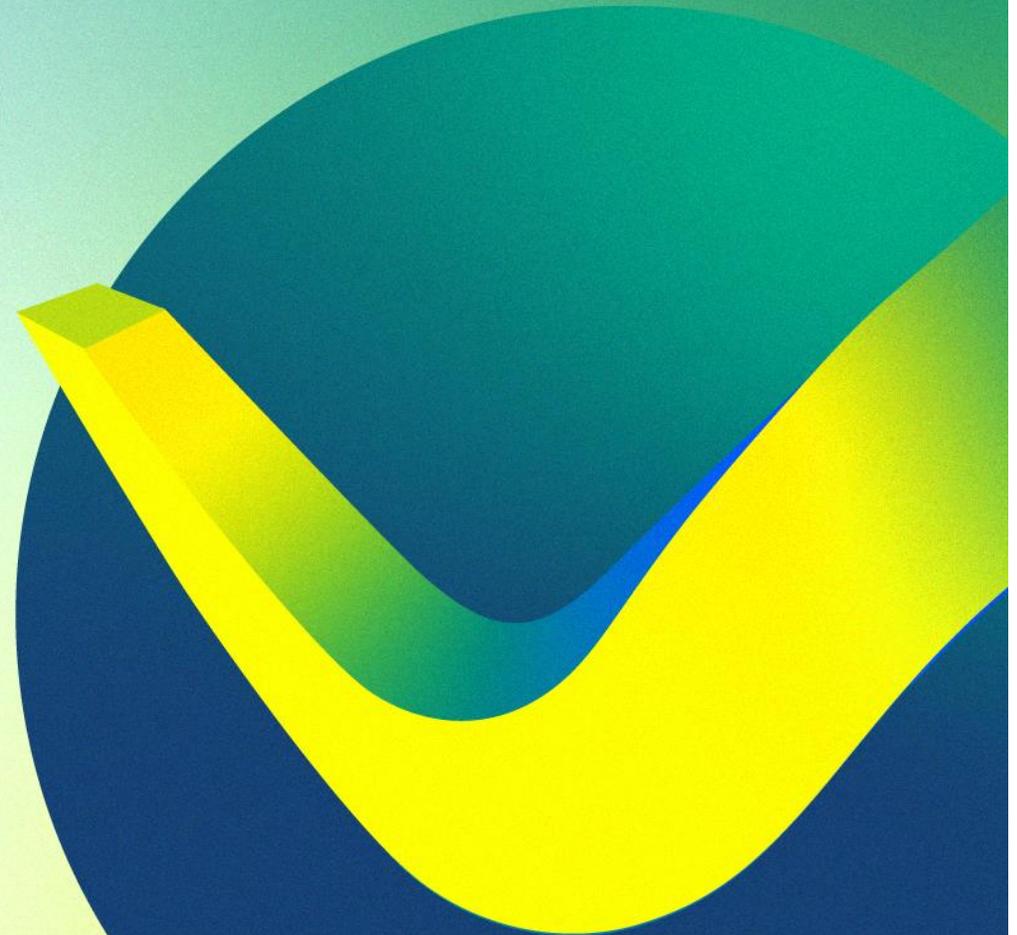


Antti Markkula

Head of Development & Support, Tubular Products
SSAB Europe

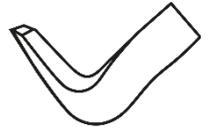


Innovative solutions for overhead power lines

The benefits of weathering steel tubes



Content



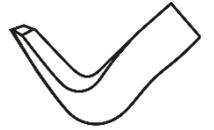
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WHY SUSTAINABLE INFRASTRUCTURE?

HOW DOES SSAB WEATHERING STEEL PROMOTE SUSTAINABILITY?

WHERE THIS STEEL CAN BE USED?

Construction has huge CO₂ reduction potential



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35%

The biggest steel
consuming segment
in Europe.

39%

Is responsible for 39% of
global CO₂ emissions.

Operational 28%

Embodied 11%



Decarbonizing of the sector
requires reduction of both
operational and embodied
carbon emissions.



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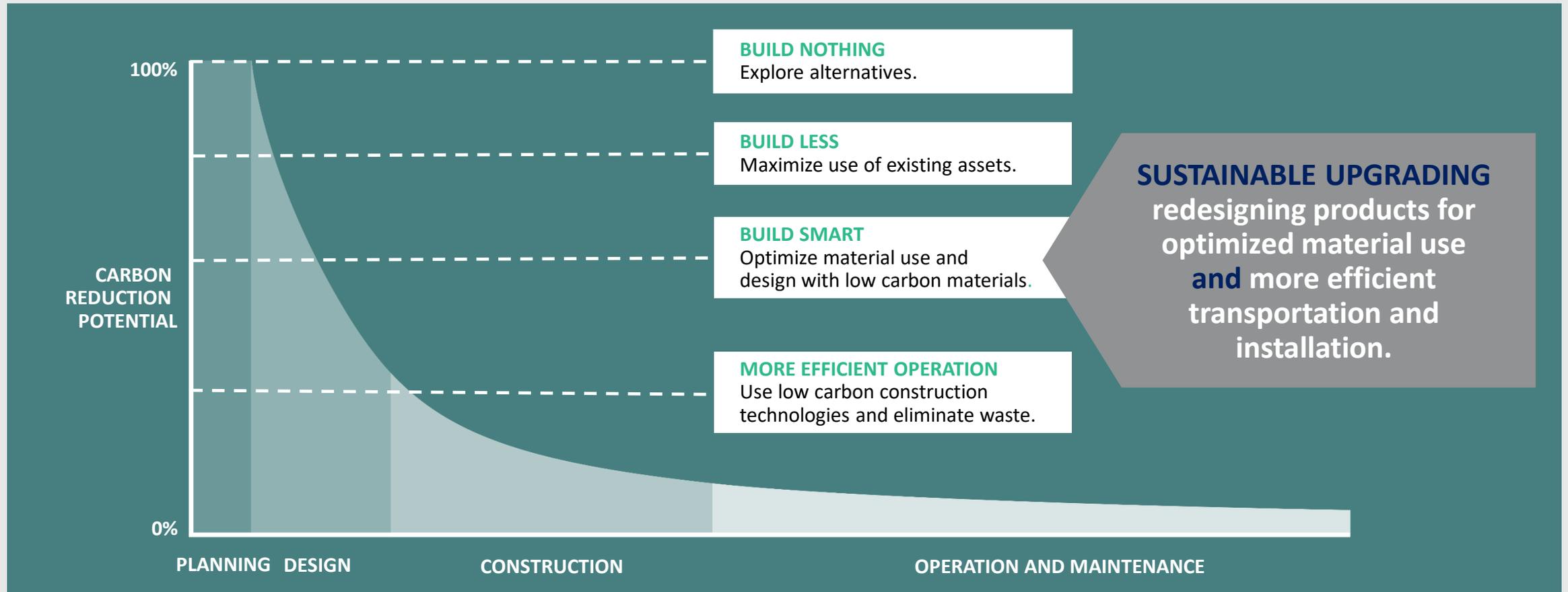


Earth is calling for
sustainable
infrastructure solutions!

Reduce embodied carbon by building smarter

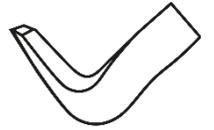


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Sources: HM Treasure: Infrastructure Carbon Review via WGBC "Bringing Embedded Carbon Upfront" Report

Content



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WHY SUSTAINABLE INFRASTRUCTURE?

HOW DOES SSAB WEATHERING STEEL PROMOTE SUSTAINABILITY?

WHERE THIS STEEL CAN BE USED?

The unique position of SSAB Weathering enables sustainable substitution of coated steel structures



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No hot dip
galvanizing

No
painting

Less material with
high-strength steel

USE STEEL BETTER

SSAB Zero™

SSAB Fossil-free™

**USE BETTER STEEL
AND GO FOSSIL-FREE**

A photograph of an industrial galvanizing process. A large metal structure is being lowered into a bath of molten metal. The scene is dimly lit, with the primary light source being the bright, glowing metal bath. The background shows industrial infrastructure like pipes and structural beams.

**More than
120 kg of CO₂
emissions**

**is released in
batch galvanizing
a steel ton**

A photograph of a painting process. A person in a blue uniform is using a spray gun to apply paint to a large, curved metal surface. The background is blurred, focusing attention on the worker and the paint application.

**About
160 kg of CO₂
emissions**

**is released in
painting
a steel ton**

Coating processes are part of embodied carbon emissions

Source: Batch hot dip galvanized of steel products to EN ISO 1461 EUROPEAN AVERAGE, S-P-00915

Thickness 8mm, galvanized coating thickness 85 microns

Source: EPDs from various paint suppliers

Paint System EN ISO 12944-5:2, C5-M(H), NDFT 320 μm (Zn-EP primer 40μm, EP 2x90μm, PUR 2x50μm)
Thickness 8mm, painted both sided



LOADING



TRANSPORT



BATCH
GALVANIZING



QUALITY
CONTROL



LOADING



TRANSPORT
BACK



UNLOADING

and they involve costs and increase lead times

SSAB



**After
25-35
years**

**the steel structure
needs to be
maintenance
painted**

depending on atmosphere, requirements, and materials

SSAB

Ready without galvanizing or painting

NATURAL PATINATION

Patina develops naturally under wet-dry cycles in atmospheric conditions.

This slows down corrosion and provides a service life comparable to coated carbon steel when applied properly.

LOWER COSTS

Lower costs already in manufacturing phase.

LOWER LIFE-CYCLE COSTS

No need for painting, meaning it's an almost maintenance-free solution.

When painted – great paint adhesion doubles the repainting intervals.

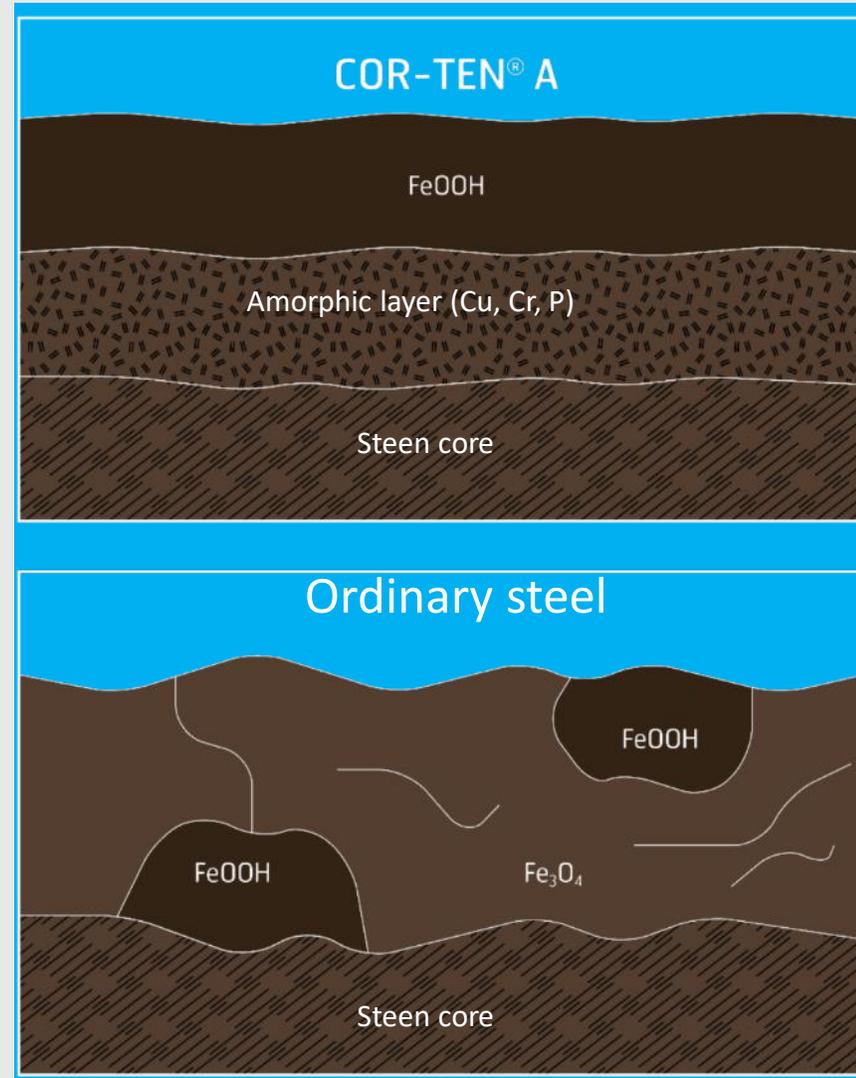
AESTHETICAL

Color blends into the landscape.



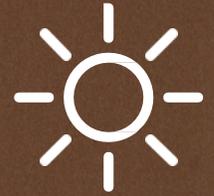
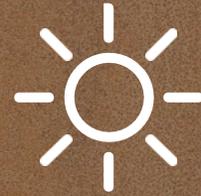
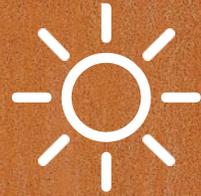
Dense patina protects from corrosion

- ▶ In SSAB Weathering, the corrosion preventive features are based on amorphous patina layer.
- ▶ In ordinary steel, iron oxide layer is inhomogeneous. Its microscopic cracks and porous structure allows further corrosion to progress.



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Patina forms on outermost surface of steel



Depending on weather conditions, it takes approx. 2-6 years to form final patina layer (surface appearance changes accordingly)

Cost efficient solution



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SSAB Weathering tube

Potentially ~5% thicker steel core for corrosion loss

Weathering alloys

Tube cost
(normal 355 grade)



-15%

Hot dip galvanized tube

Extra treatment (e.g. passivation/painting)

Galvanization

Tube cost
(normal 355 grade)



SSAB Weathering vs. Batch hot dip galvanized steel



SSAB Weathering

- ▶ Long lifetime (*C3:50-100+)
- ▶ No need for additional corrosion protection
- ▶ More environmentally friendly
- ▶ No coating damage in installation or transport
- ▶ Not for high salinity environment (suitable for corrosion cat. C2-C4)
- ▶ Not for buried structures without coating
- ▶ More design rules (e.g. lap joints)
- ▶ Natural color and appearance

Hot dip galvanized (ISO 1461)

- ▶ Long lifetime (C3:40-100+ EN ISO 14713-1, 85µm)
- ▶ More process steps with galvanizing (and paint)
- ▶ Use of natural resources for zinc coating
- ▶ Possibility of coating damage
- ▶ Can be used in high salinity environment (suitable for corrosion cat. C2-C5)
- ▶ Can be buried (more zinc can be required)
- ▶ Fewer design rules
- ▶ Industrial appearance

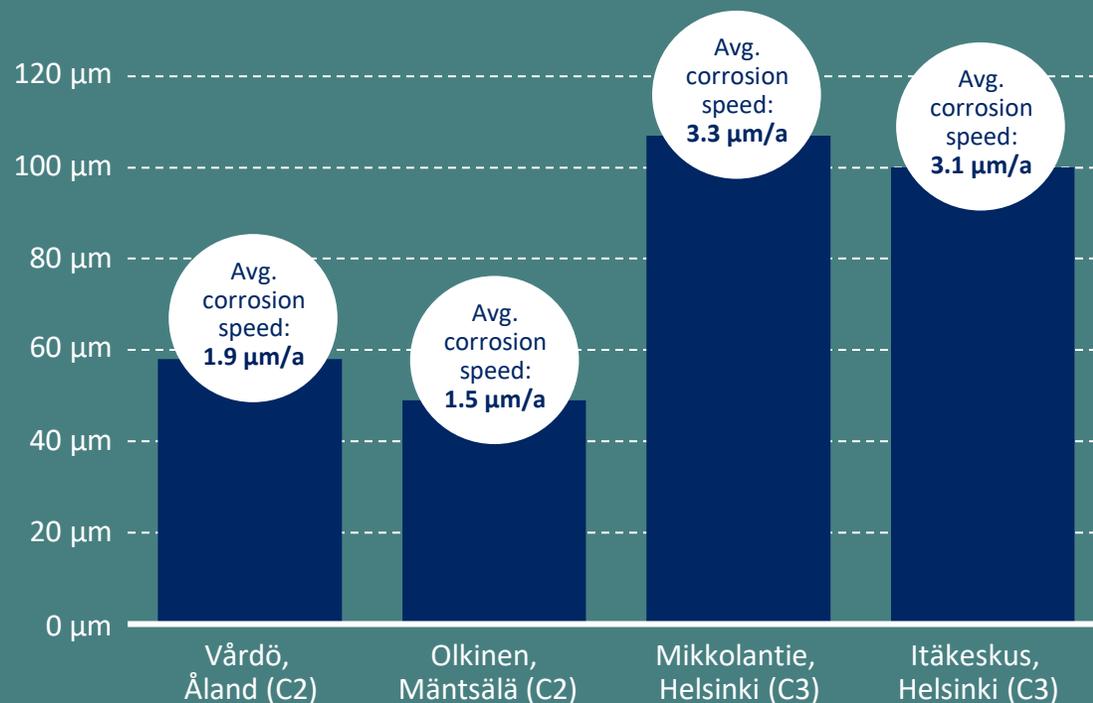
* Based on experience, and depending on corrosion allowance and proper application of weathering steel.



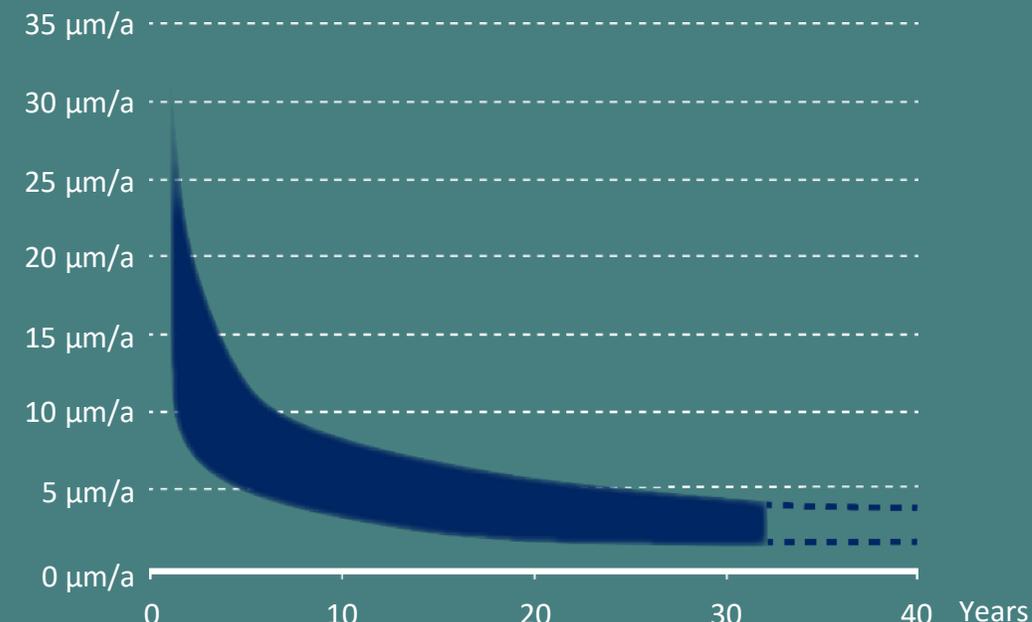
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Test results from real atmospheric conditions

Bridges in Finland: Cumulative corrosion loss of 32 years (1982–2014), material COR-TEN B



Development of corrosion loss (µm/a) over the lifetime



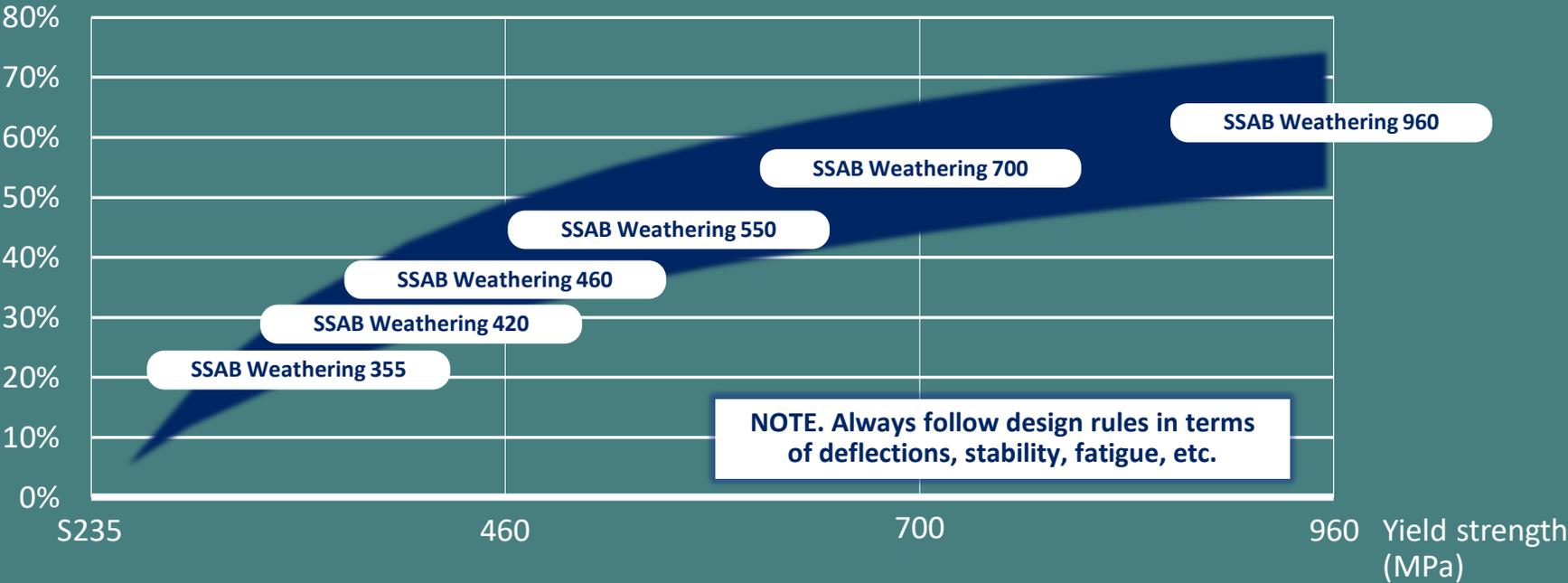
Source: VTT-CR-05247-14, Säänkestävien teräslevyjen korroosiotutkimus v. 2014, Leena Carpen, VTT Technical Research Center of Finland.

Stronger and more sustainable



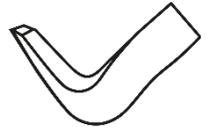
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Reduction potential of embodied carbon by Sustainable Upgraded design



High-strength steels enable thinner and lighter designs, reducing the amount of related manufacturing and transportation CO₂ emissions

Content



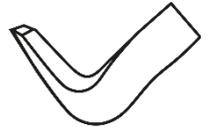
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WHY SUSTAINABLE INFRASTRUCTURE?

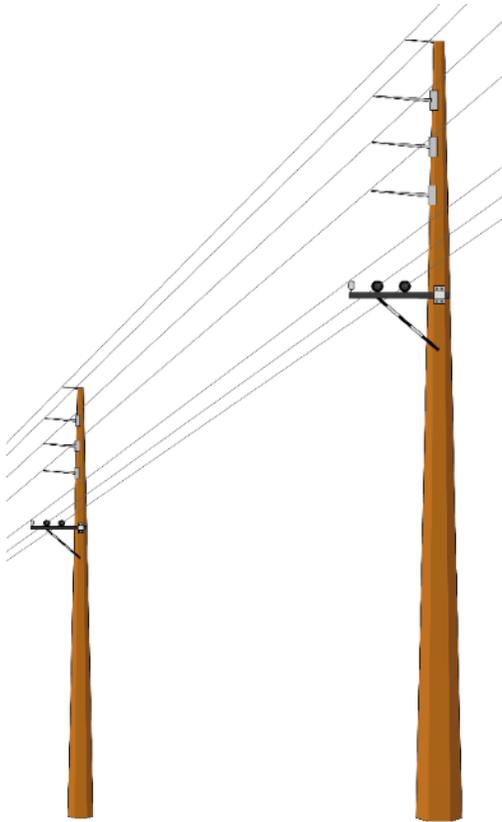
HOW DOES SSAB WEATHERING STEEL PROMOTE SUSTAINABILITY?

WHERE THIS STEEL CAN BE USED?

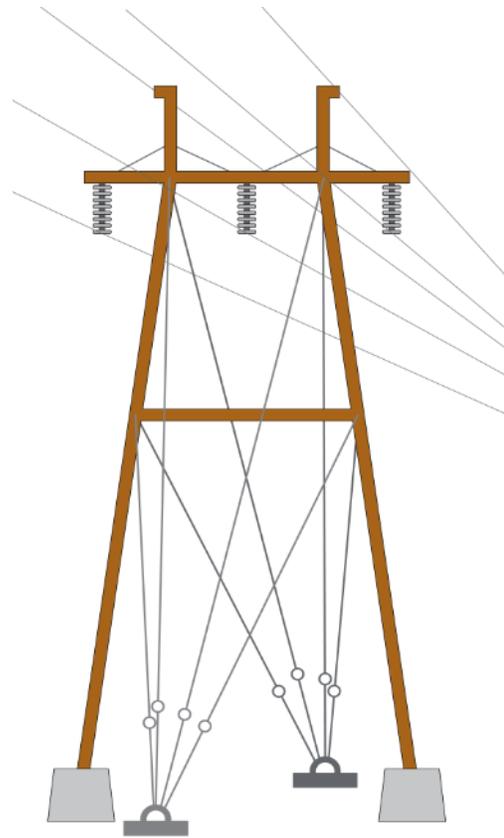
Example applications



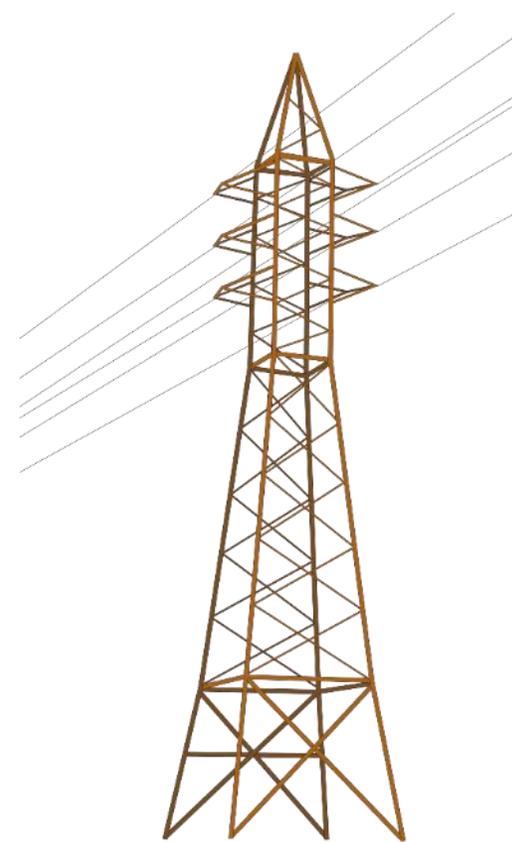
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Transmission monopoles



Transmission towers



Lattice towers



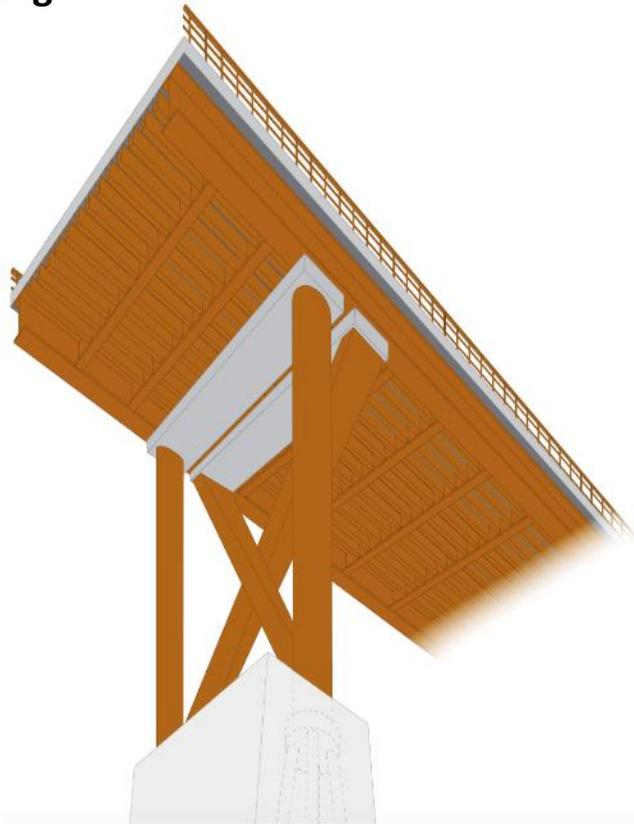
Lighting poles

Example applications (other infra)

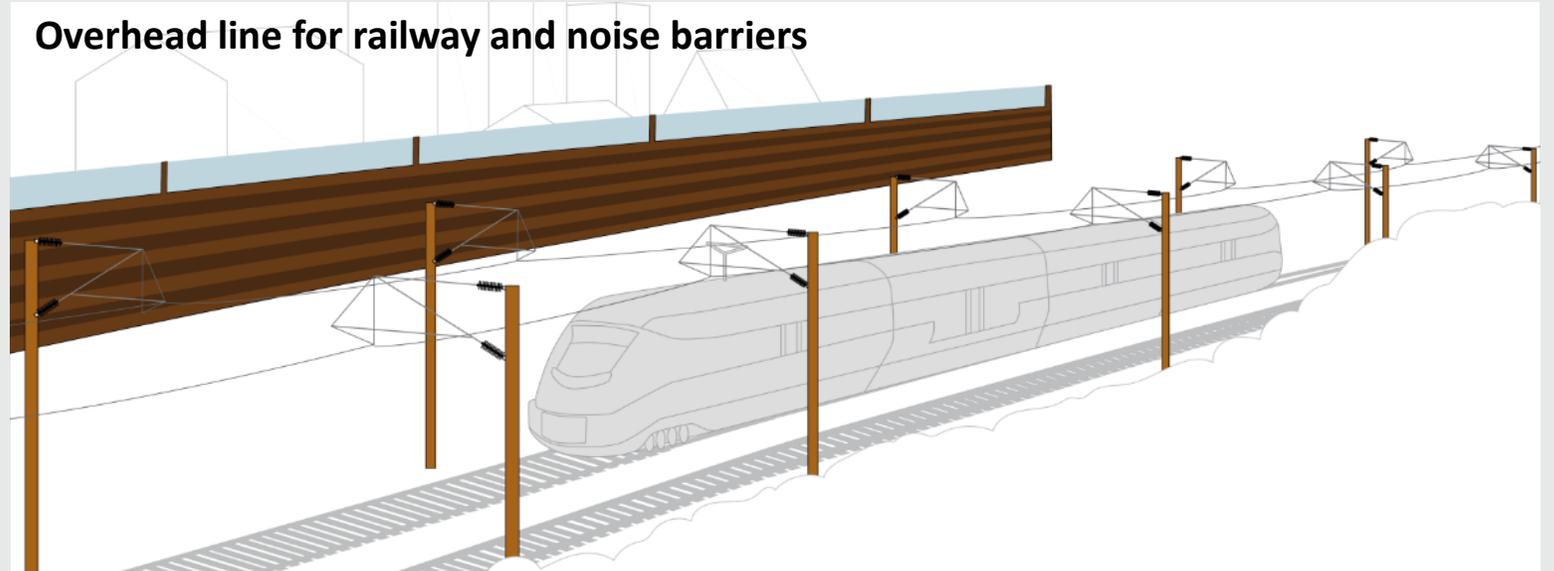


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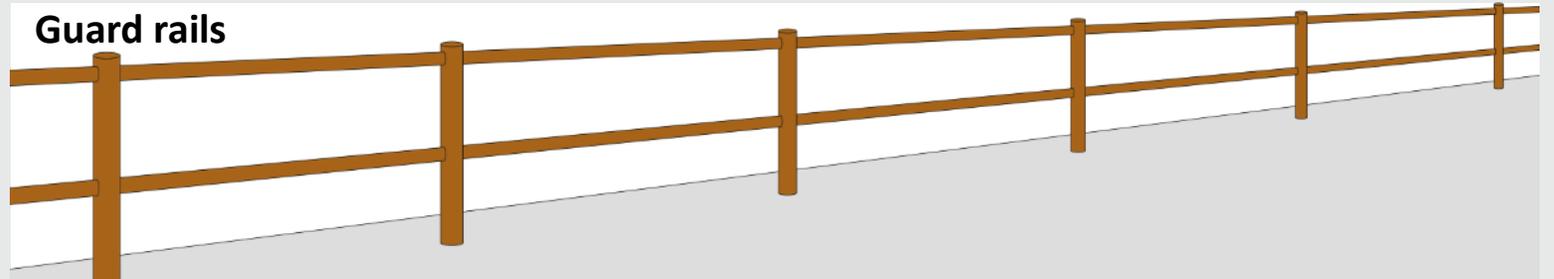
Bridges



Overhead line for railway and noise barriers



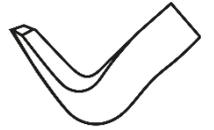
Guard rails



Transmission pole, 110 kV

Tornionjokilaakso, Finland

SSAB Weathering Tube 500WH



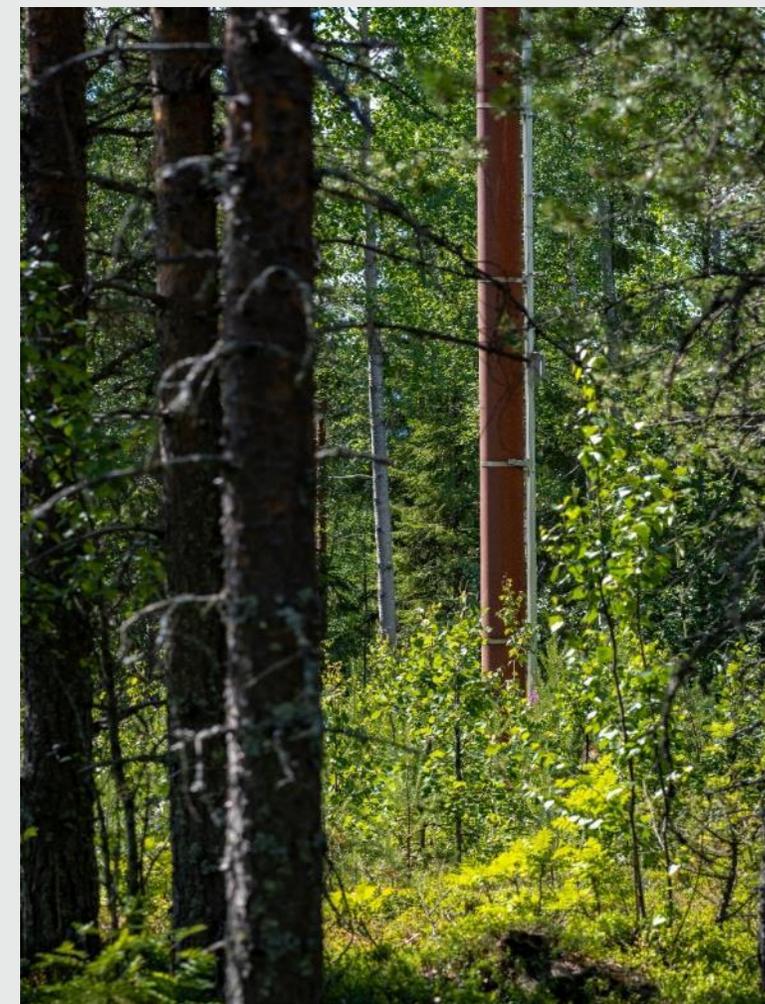
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Appearance blends to the landscape



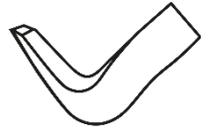
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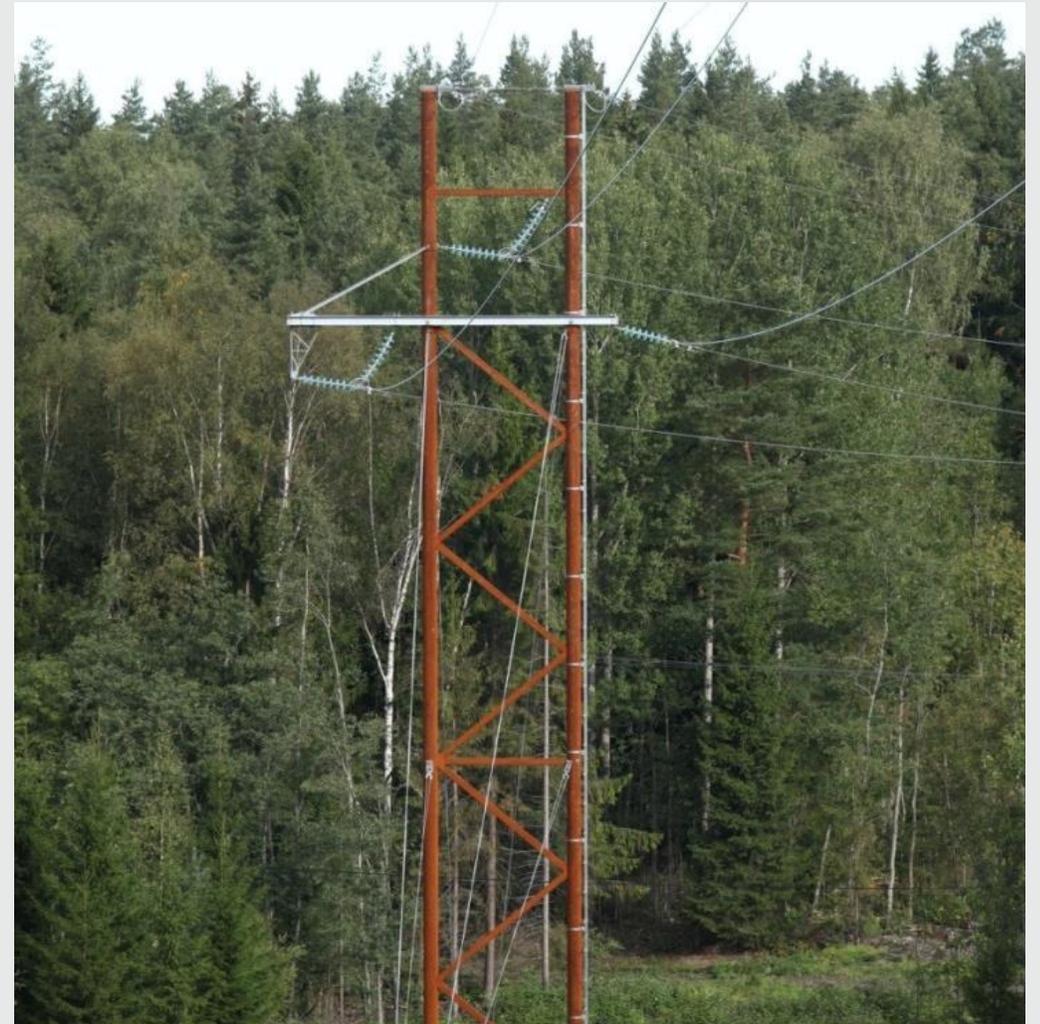
Transmission pole

Kuopio, Finland

SSAB Weathering Tube 355WH



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STEEL PRIZE

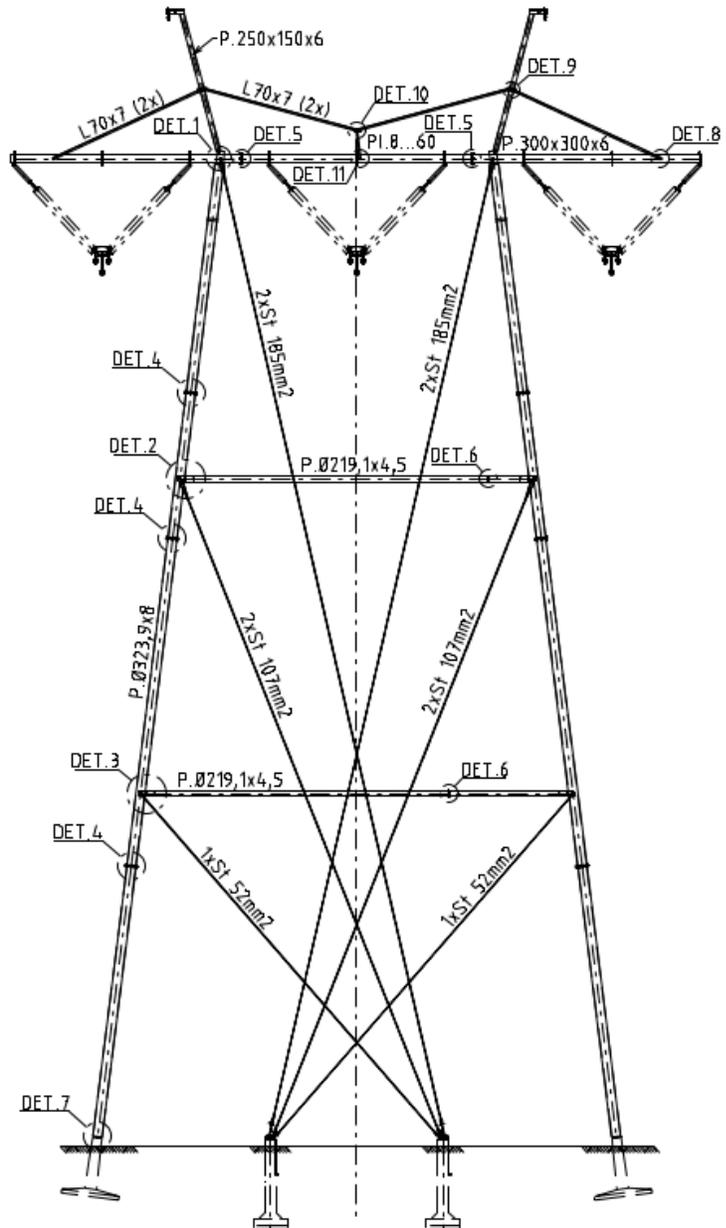


Transmission pole, 400kV

Raahe, Finland

SSAB Weathering Tube 355WH

(Planned for 2026)



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Hydropower station, Sweden



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Considerations for proper application of SSAB Weathering

SSAB

Considerations for proper application



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WET & DRY CYCLES

Weathering steels require alternating wet and dry conditions

- ▶ Avoid designs where water and dirt are collected.
- ▶ Avoid contact with soil or vegetation.
- ▶ Not suitable for burying or submerging in water.



DISTANCE FROM SHORE

Chlorides can destroy protective patina layer

- ▶ Minor problem in the area of Baltic sea: avoid direct splashes to surfaces.
- ▶ Minimum 1 km from the shoreline of ocean (depending on location).
- ▶ The corrosion rate of bare Weathering steels in chloride environments is similar to carbon steel.



DE-ICING SALT

Chlorides can destroy protective patina layer

- ▶ Continuous use of deicing salt is a risk.
- ▶ Weathering steels can be used near occasionally salted roads.
- ▶ Washing after winter season or advanced salt compositions can be used to reduce the effect of de-icing salt.

Considerations for proper application



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FASTENING WITH OTHER MATERIALS

- ▶ Usual fasteners can be used: hot dip galvanized, stainless steel or weathering steel bolts & washers.
- ▶ No direct connection to more noble metals like copper to avoid galvanic corrosion. With stainless steel, only small parts like bolts are acceptable.
- ▶ Clip between weathering steel and grounding cable made of copper.
- ▶ When surfaces slide against each other, the surfaces must be insulated from each other by a Teflon strip.



JOINT DETAILS

- ▶ Correct bolt positioning and tension.
- ▶ Connections must be compact to prevent water penetration.
- ▶ Structure design: good ventilation between parts is recommended.



RUST WATER

- ▶ During the patination process, water in contact with the steel will become rusty until the patina layer is fully developed (typically in 2-6 years).
- ▶ Rust water can be collected and lead to drainage in a controlled way.
- ▶ Easily cleanable materials can be chosen to come into contact with weathering steels.



SURFACE PREPARATION

- ▶ For hot-rolled products, it is recommended to remove mill scale from surfaces by pickling or shot blasting.

Product offer from SSAB



HOT-ROLLED



COLD-ROLLED



TUBES



SECTIONS

Thank You for listening.

SSAB

Industry track programme – Floor 2



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9.50-10.00	Industry introduction
10.00-10.30	Innovative steel solutions for more efficient and sustainable solar structures
10.30-11.00	Coffee break (Floor 3)
11.00-11.30	How hydrogen is changing the energy equation in Europe
11.30-12.00	Powering the future: The role of steel in energy storage systems
12.00-13.00	Lunch (Floor 5)
13.00-13.30	The fossil-free journey from a technical perspective (Floor 6)
13.45-14.15	The power of steel: Exploring the latest high-performance steel grades for industrial applications
14.15-14.45	Coffee break (Floor 3)
14.45-15.15	Innovative solutions for overhead power lines: The benefits of weathering steel tubes
15.15-15.45	Sum-up
15.45 -	Individual meetings





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