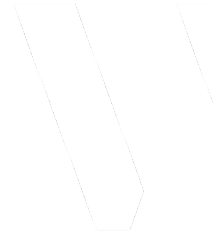


May 10, 2019



**Question today**  
*imagine tomorrow*  
create for the future

*Norman Proud, Associate, Devonshire Square, London*



# Weathering Steel

*An overview*



## Weathering steel

Usually known as Corten™ (the ‘Hoover’ of weathering steels)

In the UK, specified to BS EN 10025 – weathering steels are covered by Part 5.

# Comparison with the usual suspects..

EN 10025-2:2004 (E)

EN 10025-5:2004 (E)

**Table 9 - Mechanical properties - impact strength KV longitudinal for flat and long products <sup>a</sup>**

Designation		Temperature  °C	Minimum energy (J) Nominal thickness in mm		
According EN 10027-1 and CR 10260	According EN 10027-2		≤ 150 <sub>a b</sub>	> 150 ≤ 250 <sub>b</sub>	> 250 ≤ 400 <sub>c</sub>
S235JR	1.0038	20	27	27	-
S235J0	1.0114	0	27	27	-
S235J2	1.0117	- 20	27	27	27
S275JR	1.0044	20	27	27	-
S275J0	1.0143	0	27	27	-
S275J2	1.0145	- 20	27	27	27
S355JR	1.0045	20	27	27	-
S355J0	1.0553	0	27	27	-
S355J2	1.0577	- 20	27	27	27
S355K2	1.0596	- 20	40 <sup>d</sup>	33	33

**Table 5 - Mechanical properties - impact strength KV longitudinal for flat and long products of steels with improved atmospheric corrosion resistance <sup>a</sup>**

Designation		Temperature  °C	Minimum energy <sup>a</sup>  J
According EN 10027-1 and CR 10260	According EN 10027-2		
S235J0W	1.8958	0	27
S235J2W	1.8961	- 20	27
S355J0WP <sup>b</sup>	1.8945	0	27
S355J2WP <sup>b</sup>	1.8946	- 20	27
S355J0W	1.8959	0	27
S355J2W	1.8965	- 20	27
S355K2W	1.8967	- 20	40 <sup>c</sup>



## CE Mark

BS EN 10025 is a harmonised standard, therefore the steel is CE marked!

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## Other products are available...

- BS 7668 Hot finished structural hollow sections
- Current (due to be harmonised with ECs)
- Availability is limited and typically subject to minimum orders of 150 tonnes
- Beware COLD finished hollow sections



## Rolled Sections..

Not generally available but can be fabricated

7 Imported sections will generally not be the -J2 grades require for bridgeworks



# Design

- As per the normal Eurocode processes
- BD07 gives particular requirements
- Sacrificial corrosion allowance, typically
  - Internal faces, 0.5mm
  - External faces, 1.5mm
  - Do not include this material in the design process
  - Don't forget to add the allowance to weld sizes



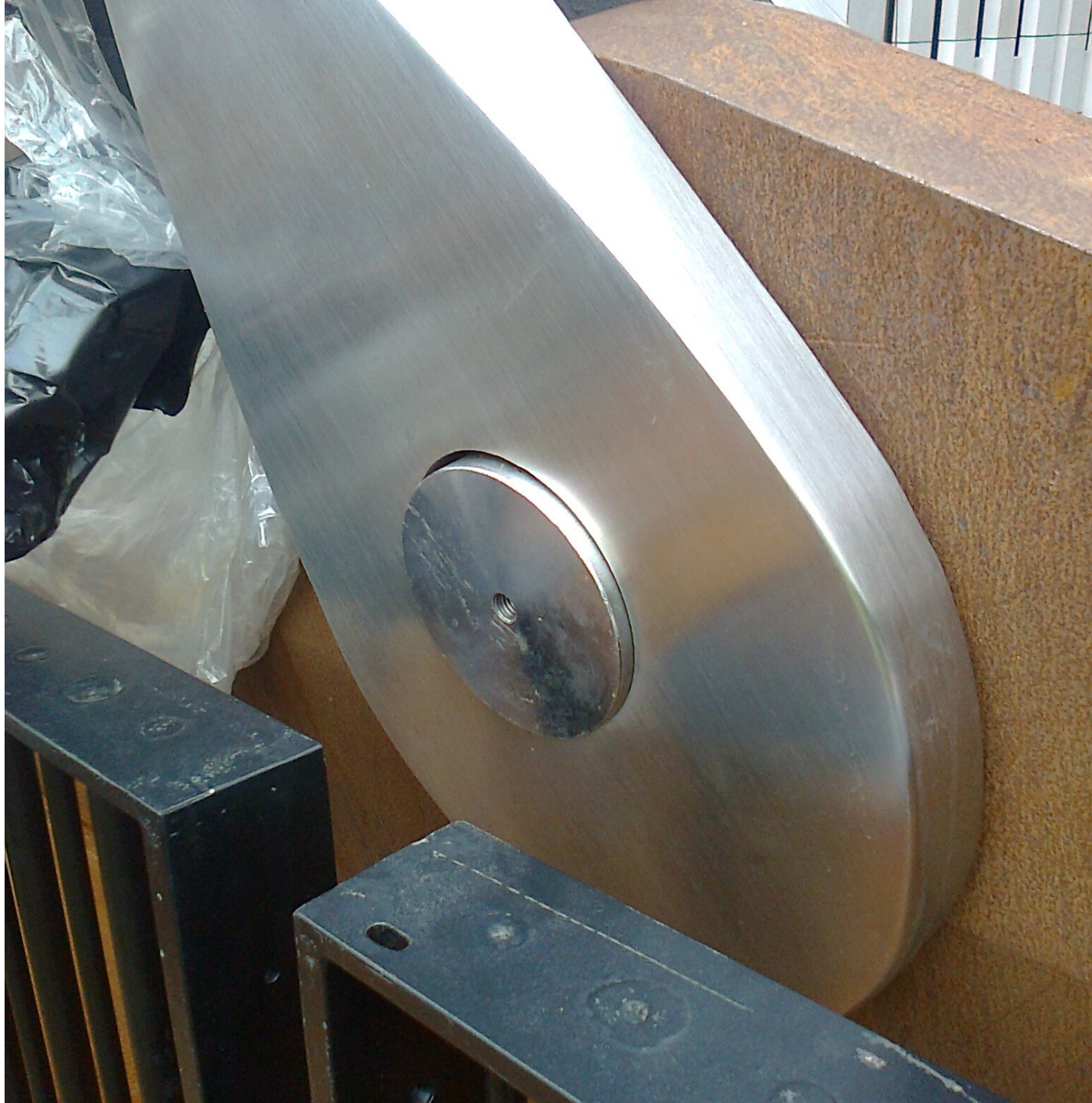
# Design

- Consider the wider site environment
- BD07 covers
  - vertical clearance to carriageways and water courses
  - proximity to coastal environments
- BD07 makes passing reference to microclimate effects

# Detailing

- The key to successful use of weathering steel is good detailing
- BD07 is largely concerned with good detailing
- Ensure that water is well managed and prevented from wetting the steel as far as possible

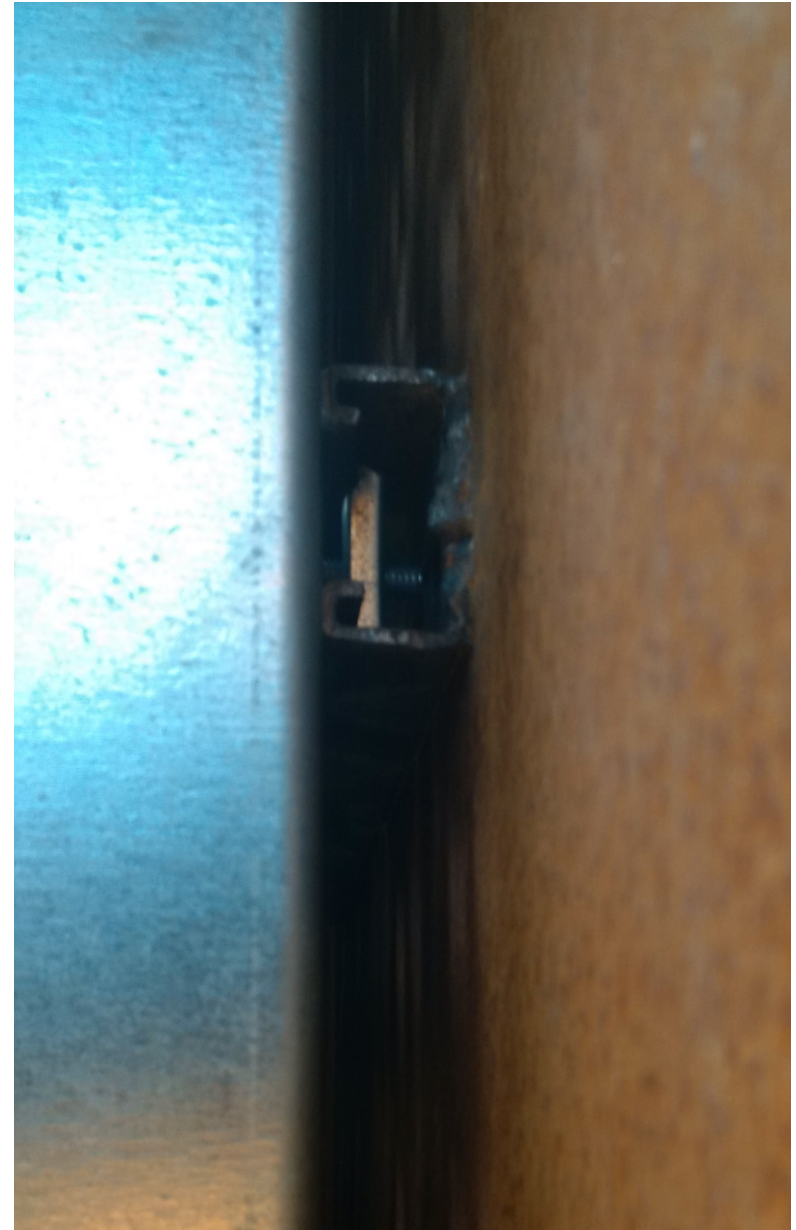
Don't forget  
bimetallic  
effects...  
Weathering  
steel is fine in  
contact with  
'normal'  
structural  
steels and in  
limited  
contact with  
stainless  
steel.





Don't forget bimetallic effects...  
Galvanised items will deteriorate rapidly if in contact with weathering steel.

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## Fabrication

Weathering steel is readily weldable though the filler material must also be a weathering grade.

Weathering grade bolts for preloading are available in a limited range of sizes ('M24' & M30), usually to compatible American ASTM standards.

Be aware of whether bolts are metric or imperial (US 1 inch) – recommended approach is to design for M24 bolts at the minimum spacing for 1" bolts, this allows the safe adoption of either size as available.

# Fabrication

Some times you  
just have to turn  
the bridge on it's  
side!

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## Fabrication

Inspection during fabrication is recommended to ensure the subtle differences - weld fillers, bolt grades - associated with weathering steel are observed.

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## Fabrication

Weld marks are unavoidable.

As this external face will not be painted, light blasting to remove the mark will be required.

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# Fabrication

Trial assembly is important for larger structures or components.

Protection to preserve the finish during transportation may be necessary.





# Maintenance

Ensure...

- drainage routes are clear and functioning
- debris does not build up in corners, crevices, etc.
- keep vegetation trimmed back

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# Inspection

As crucial as ever.

Any unexpected changes in the corrosion patina must be investigated - it is a sign that something affecting the structure has changed – leak, local conditions, etc.

# Inspection

Measurement of corrosion loss is important.

Document accurately where measurements are to be taken and the records kept.

Retirement and succession planning!

Take measurements as part of each Principal Inspection.

The initial rapid corrosion rate is expected to stabilise by the third PI.



**Thank you**

**Questions?**





