

3.9 Classification and Selection of Corrosion Protection Systems

3.9.1 Classification of corrosivity of atmospheres

The Detailed Specification (DS) to be used for the corrosion protection of the various items of plant shall be as defined in 3 of this document. Each procedure has been provided with an arbitrary reference number (e.g. DS -1) which should not be linked to other specifications or previous versions of this document. The procedures distinguish between different atmospheric environments of which the corrosivity is classified in terms of ISO 9223 as follows:

Table 2: Categories of corrosivity of atmospheres

Corrosivity category	General description	Corrosivity	Corrosion rate for mild steel
C1	Indoors and Desert to rural	Very low	$\leq 1.3 \mu\text{m/yr}$
C2	Rural to light industrial	Low	$\leq 25 \mu\text{m/yr}$
C3	Moderate industrial or marine	Medium	$\leq 50 \mu\text{m/yr}$
C4	High industrial or marine	High	$\leq 80 \mu\text{m/yr}$
C5	Severe / heavy industrial or marine	Very high	$\leq 200 \mu\text{m/yr}$

References:

- CSIR - Callaghan, BG Atmospheric corrosion testing in Southern Africa – Results of a twenty year national exposure programme
- TSI Investigation Reports - Eskom Resources and Strategy Research Reports and SABS ISO 12944 -2: 1998.
- ISO 9223: Corrosion of metal and alloys – Corrosivity of atmospheres – Classification.

3.9.2 Corrosion protection requirements

Table 3: Type of environment versus corrosion protection requirements

Corrosivity Rating	Environment	Corrosion rate of mild steel	Mild steel	Hot galvanised and zinc metal sprayed steel	Stainless steel	3CR12
VERY LOW (C1)	Indoors	Less than $5\mu\text{m/yr}$	Must be painted DS-1 or DS-2 or DS-3 or DS5	DS 13 or DS14 Painting optional - more for aesthetic/colour coding purposes	<u>Painting optional</u> - more for aesthetic/colour coding purposes	<u>Painting optional</u> - more for aesthetic/colour coding purposes
LOW TO HIGH (C2 to C4)	Outdoors (Inland industrial) and	5 to $80\mu\text{m/yr}$	Must be painted DS-5 or DS-6 or DS-7 (DS-8*)	DS 13 or DS14 Painting optional - more for aesthetic/colour coding purposes If required: DS-15 or DS-16 or DS-17	<u>Painting optional</u> - more for aesthetic/colour coding purposes If required: DS-18 or DS-19	<u>Painting optional</u> - more for aesthetic/colour coding purposes If required: DS-9 or DS-10 (DS12*)

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Corrosivity Rating	Environment	Corrosion rate of mild steel	Mild steel	Hot galvanised and zinc dip sprayed steel	Stainless steel	3CR12
HIGH TO VERY HIGH (C4 to C5)	Outdoors (Coastal and Very industrial)	80 to 200µm/yr	Must be galvanised or zinc sprayed and then duplex coated	DS 13 Or DS 14 Must be duplex painted DS-15 or DS-16 or DS-17	Painting recommended to protect from rust staining DS-18 or DS-19	Painting recommended DS-11 (DS12*)

* DS-8 and DS-12 - Coating specifications only to be used where spray painting techniques cannot be used.

Table 4: Summary of Detailed Specifications

DS Number	Indoors / Outdoors	Environmental Conditions	Applicability
DS-1	Indoors	Very low to Low corrosive environments	Powder coating of mild steel indoor components
DS-2	Indoors	Very low to Low corrosive environments	Spray painting of mild steel indoor components – Alkyd system
DS-3	Indoors	Very low to Low corrosive environments	Powder coating of mild steel outdoor components - Epoxy system
DS-4	Indoors	Very low to Low corrosive environments	Spray painting of mild steel outdoor components – Polyurethane system
DS-5	Outdoors	Low to High corrosive environments	Spray painting of mild steel outdoor components – Polyurethane system
DS-6	Outdoors	Low to High corrosive environments	Powder coating of mild steel outdoor components
DS-7	Outdoors	Low to High corrosive environments	Spray painting of mild steel outdoor components – Epoxy/polyurethane system
DS-8	Outdoors	Warning: This specification shall only be used to protect mild steel components, which due to their complicated geometry, cannot be properly painted by normal spray techniques. Before this technique can be used, the supplier shall submit full details regarding the specific products to be used, as well as the reasons why the spray-application specifications cannot be used. Permission to use this specification shall only be given once Eskom has confirmed that spray application isn't feasible.	The following procedure applies to the flow coating of mild steel components
DS-9	Outdoors	Low to High corrosive environments	Spray painting of 3CR12 fabricated components – Epoxy/polyurethane system
DS-10	Outdoors	Low to High corrosive environments	Powder coating of 3CR12 fabricated components
DS-11	Outdoors	High to Very High corrosive environments	Spray painting of 3CR12 fabricated components – Epoxy/Polyurethane

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