



# anti-corrosion

OROPAL TECHNOLOGY. PAINT SYSTEMS

**OROPAL**

INDUSTRIAL & DECORATIVE PAINTS SINCE 1923







# one hundred years

During its 100 years in operation, corrosion has been one of concerns that our chemical experts have tried to solve.

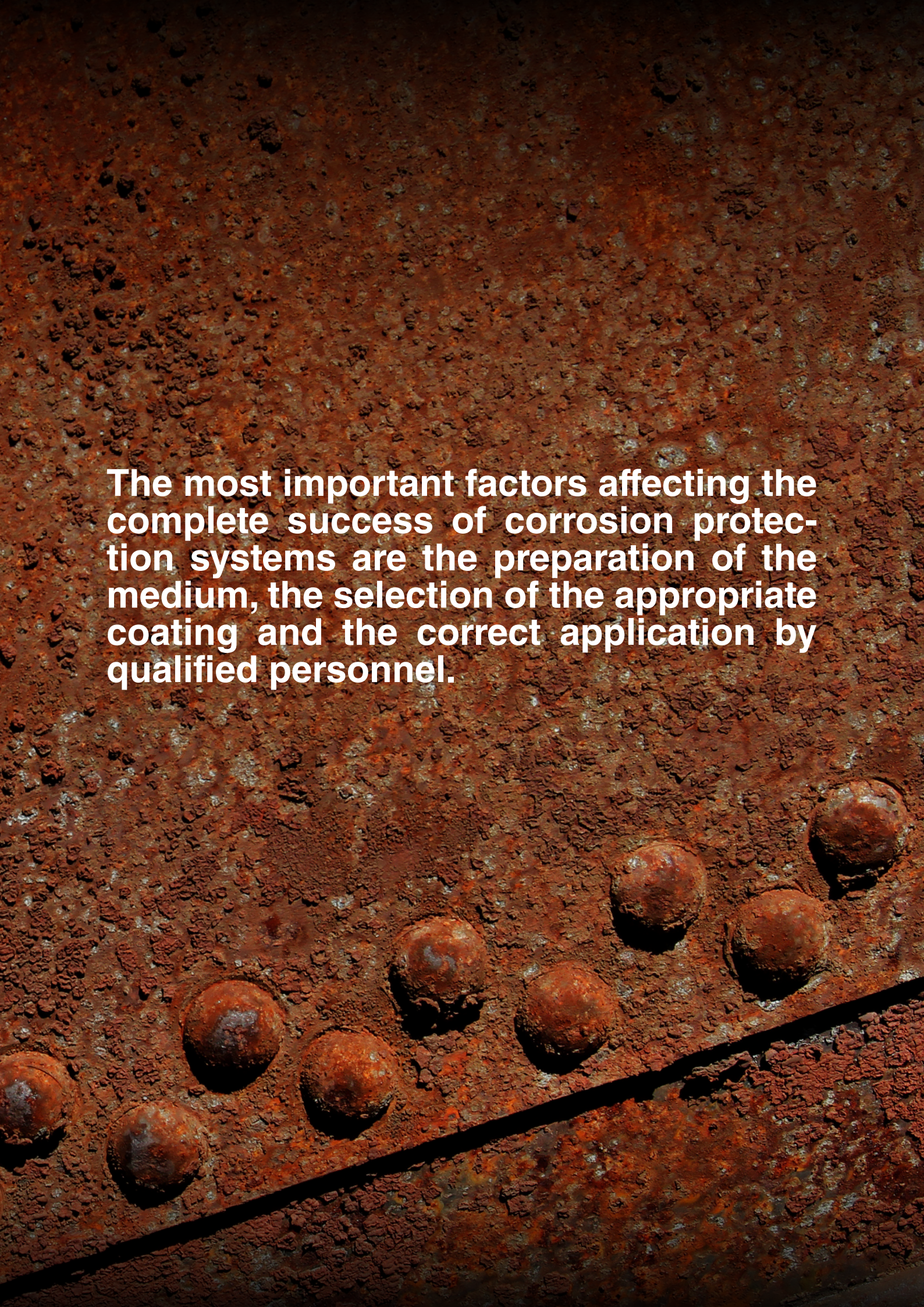
Experience has shown that good metal protection, with an adequate anti-corrosion treatment, substantially prolongs the useful life of objects and avoids the economic damage may be caused by corrosion.

Additionally, there is greater environmental awareness and regulations are stricter in this regard. Oropal therefore complies with the latest protection requirements and environmental sustainability.

In terms of anti-corrosive protection, Oropal has systems approved in accordance with the European standard ISO 12944 for all corrosive environments, based on tests carried out by **Cidetec**.

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**The most important factors affecting the complete success of corrosion protection systems are the preparation of the medium, the selection of the appropriate coating and the correct application by qualified personnel.**



# Preparation of the medium

It is firstly recommended that the substrate on which the coating is to be applied be thoroughly cleaned to remove any dirt, old coatings, rust or other materials. This will ensure long-term protection against rust.

Preparation of the medium is not considered a protection stage as such but rather ensures optimum adhesion between the substrate and the protective film. This is why this stage is crucial to ensure full performance of the complete system.

The standard defines the methods and grades of surface protection. However, it does not set any requirements as to its previous condition.

## Surface types

**UNCOATED SURFACE:** This is uncoated steel but that may be coated with calamine or rust and other contaminants. Uncoated steel surfaces show different degrees of rust according to the type and period of exposure to humid environments that they have withstood. In this sense, ISO 8501-1 describes four categories for the degrees of steel corrosion:

A - Steel surface largely covered with adhering mill scale but little, if any rust.

B - Steel surface which has begun to rust and from which the mill scale has begun to flake.

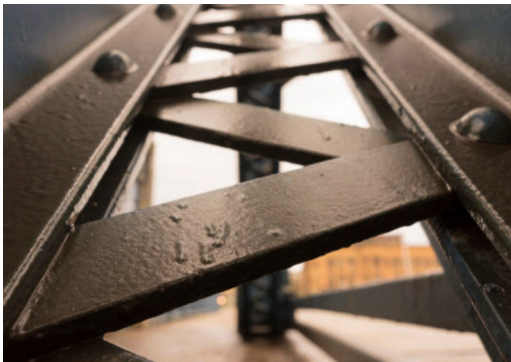
C - Steel surface on which the mill scale has rusted away or from which it can be scraped, but with slight pitting visible under normal vision.

D - Steel surface on which the mill scale has rusted away and on which general pitting is visible under normal vision.

**METALLIC COATED SURFACE:** It can be a thermally sprayed surface, in which a coating of zinc, aluminium or its alloys is given by means of flame or arc spray (ISO 2063) or a chemically treated surface that consists of prior cleaning, said chemical treatment (hot-dip galvanized, zinc plating or sheradised) and a final rinsing stage.

**SURFACE PAINTED WITH PREFABRICATION PRIMER:** Consists of automatically blast-cleaned steel to which a prefabrication primer is also applied automatically, pursuant to Standard EN 10238.

**OTHER PAINTED SURFACES:** Consist of steel/metallic steel that has already been painted.



## Cleaning systems

**ABRASIVE BLAST-CLEANING (GRADES SA):** This is the main cleaning method for steel structures that are to be painted. It involves the forced impact of abrasive particles on the steel surface using compressed air or centrifugal machines, so that a clean and uniform surface is obtained. There are different forms of blasting based on the equipment used, the use of water, etc.

The standardised grades in ISO 8501 are:

Grade Sa 1: Light blast-cleaning.

Grade Sa 2: Thorough blast-cleaning.

Grade Sa 2 ½: Very thorough blast-cleaning.

Grade Sa 3: Blast-cleaning to visually clean steel.



**CLEANING WITH HAND OR POWER TOOLS (GRADES ST):** This is also for surfaces to be painted although, in this case, it is more used for small areas or, in the case of hand tools, where electrical devices are not an option, either due to not having them or for them not being able to access the surface. Hand tools used may be metal brushes, spatulas, scrapers, synthetic fibre cloths with abrasives, grinding cloth or rust shelling hammers. It is not an effective method for the removal of well adhered mill scale.

Power tools may include rotating metal brushes (although they present a risk of not eliminating rust because they can lead to error when leaving a degree of rust polishing or calamine similar to clean metal), various types of cutting edges, percussion hammers and needle guns. Care must be taken when using power tools so as not to cause damage to the surface. These methods have an effectiveness between hand tools and blasting. They can however substitute blasting where you do not want to generate dust or accumulate abrasions.

The standardised grades in ISO 8501 are:

**Grade St 2:** Thorough hand and power tool cleaning.

**Grade St 3:** Very thorough hand and power tool cleaning.

**ACID PICKING (GRADES BE):** For surfaces intended for galvanising. The steel placed into baths with diluted acids (sulphuric, muriatic, phosphoric and mixtures of them), so that the rust is removed. Care must be taken so that only the rust layer is attacked. Inhibitors are often used for this.

**OTHER CLEANING:** There are many other cleaning methods (water cleaning, steam cleaning, emulsion cleaning, alkaline cleaning, organic solvent cleaning, acid pickling or chemical treatment).

ISO 12944-4:2018 specifies all these in its Annexes. Annex A "Standard preparation grades for primary (overall) surface preparation" and Annex C "Procedures for removal of extraneous layers and foreign matter".





# Selecting a painting system

Getting the best paint system is as simple as following the three steps below:

## 1 IDENTIFY THE CORROSIVE ATMOSPHERE

ISO 12944-2: 2018 classifies the environments.

Corrosivity category	Mass loss per m <sup>2</sup> / thickness loss (after the first year of exposure)				Examples of typical environments in temperate climates (informative)	
	Carbon steel		Zinc		EXTERIOR	INTERIOR
	Mass loss (g/m <sup>2</sup> )	Thickness loss (µm)	Mass loss (g/m <sup>2</sup> )	Thickness loss (µm)		
<b>C1</b> (very low)	≤ 10	≤ 1.3	≤ 0.7	≤ 0.1		Heated buildings with clean atmospheres: offices, shops, schools, hotels.
<b>C2</b> (low)	> 10 to 200	> 1.3 to 25	> 0.7 to 5	> 0.1 to 0.7	Atmospheres with low level of pollution. Mainly rural areas.	Unheated buildings where condensation may occur: e.g. depots, sports halls
<b>C3</b> (medium)	> 200 to 400	> 25 to 50	> 5 to 15	> 0.7 to 2.1	Urban and industrial atmospheres, moderate sulphur dioxide pollution. Coastal areas with low salinity	Production rooms with high humidity and some air pollution: e.g. food-processing plants, laundries, breweries, dairies.
<b>C4</b> (high)	> 400 to 650	> 50 to 80	> 15 to 30	> 2.1 to 4.2	Industrial areas and coastal areas with moderate salinity.	Chemical plants, swimming pools, coastal ship- and boatyards.
<b>C5</b> (very high)	> 650 to 1500	> 80 to 200	> 30 to 60	> 4.2 to 8.4	Industrial areas with high humidity and aggressive atmosphere and coastal and offshore areas with high salinity	Buildings or areas with almost permanent condensation and with high pollution.
<b>CX</b> (extreme)	> 1500 to 5500	> 200 to 700	> 60 to 180	> 8.4 to 25	Overseas areas with high salinity and industrial areas with extreme humidity and aggressive atmosphere and tropical and subtropical environments	Industrial areas with high humidity and aggressive atmosphere.

Additionally, four other immersion environments are defined:

- Im1** Immersion in fresh water
- Im2** Immersion in the sea or brackish water (without cathodic protection)
- Im3** Buried in soil
- Im4** Immersion in the sea or brackish water (with cathodic protection)

## 2 DEFINE THE MAINTENANCE FREQUENCY (DURABILITY):

ISO 12944-1:2018 introduced a durability framework that suggests the expected time that the paint lasts and therefore the estimated timeframe before maintenance. It is not therefore a guarantee.

LOW durability (L)	Up to 7 years
MEDIUM durability (M)	From 7 to 15 years
HIGH durability (H)	From 15 to 25 years
VERY HIGH durability (VH)	Over 25 years

## 3 SELECT THE OROPAL ANTI-CORROSION SYSTEM THAT BEST ADAPTS TO YOUR NEEDS:

Oropal has systems applicable for any type of atmosphere based on the recommendations of the standard. But more than that, **and thanks to our technicians' research work and the latest generation raw materials, innovative processes have been created that ensure the protection of steel and reduce the amount of coating to be applied, reducing customers' costs in relation to the proposals of the standard.**





## Category C2

From the C2 classification of protection against corrosion onwards, the regulations stipulate the protection period, the resin base and the dry film thickness.

### CATEGORY C2 SPECIFIES THE FOLLOWING CORROSIVE ENVIRONMENTS:

- 

Unheated buildings where condensation may occur.  
WAREHOUSES, SPORTS HALLS, ETC.
- 

Atmospheres with low level of pollution.  
MAINLY RURAL AREAS.

### COATING SYSTEMS FOR CORROSION IN CATEGORY C2

CLASSIFICATION	APPLICATION PROCESS	CATALYST	MIX RATIO	COATINGS	DFT	L/m <sup>2</sup> PER COAT	L/m <sup>2</sup> TOTAL	DURABILITY	SYSTEM DETAIL
C2M	OROPRIMER 420 OROLEX 284	- -	-	1 1	70 30	0.1319 0.0671	0.1990	From 7 to 15 years	12944-5/C2.02
C2H	OROPRIMER 420 OROLEX 284	- -	-	1 1	100 60	0.1884 0.1343	0.3227	From 15 to 25 years	12944-5/C2.03
C2H	OROPRIMER 485 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	1 1	80 40	0.1723 0.0877	0.2600	From 15 to 25 years	12944-5/C2.05-EP/PUR
C2VH	OROPRIMER 485 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	100 80	0.2153 0.1311	0.3464	Over 25 years	12944-5/C2.06-EP/PUR
C2VH	OROPRIMER 495 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	80 80	0.1615 0.1311	0.2926	Over 25 years	12944-5/C2.08-EP Zn(R)/PUR









## Category C3

C3 is the first category of high quality corrosion protection. In this category it is preferable to use two-component products to meet the higher requirements.

### CATEGORY C3 SPECIFIES THE FOLLOWING CORROSIVE ENVIRONMENTS:

- 

Production rooms with high humidity and some air pollution.  
LAUNDRIES, BARS, INDUSTRIAL BUILDINGS, RESIDENCES, ATTICS.
- 

Urban and industrial atmospheres, moderate sulphur dioxide pollution.  
Coastal areas with low salinity.

### COATING SYSTEMS FOR CORROSION IN CATEGORY C3

CLASSIFICATION	APPLICATION PROCESS	CATALYST	MIX RATIO	COATINGS	DFT	L/m <sup>2</sup> PER COAT	L/m <sup>2</sup> TOTAL	DURABILITY	SYSTEM DETAIL
C3L	OROPRIMER 420 OROLEX 284	- -	- -	1 1	70 30	0.1319 0.0671	0.1990	Up to 7 years	12944-5/C3.01
C3M	OROPRIMER 420 OROLEX 284	- -	- -	1 1	100 60	0.1884 0.1343	0.3227	From 7 to 15 years	12944-5/C3.02
C3M	OROPRIMER 485 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	1 1	80 40	0.1723 0.0877	0.2600	From 7 to 15 years	12944-5/C3.05-EP/PUR
C3H	OROPRIMER 485 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	100 80	0.2153 0.1311	0.3464	From 15 to 25 years	12944-5/C3.06-EP/PUR
C3H	OROPRIMER 495 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	80 80	0.1615 0.1311	0.2926	From 15 to 25 years	12944-5/C3.09-EP Zn(R)/PUR
C3VH	OROPRIMER 485 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	2 1	100 40	0.2153 0.0877	0.3030	Over 25 years	Innovative technology validated by <b>CIDETEC</b>
C3VH	OROPRIMER 490 OROMEL 623	OROCAT 790 OROCAT 781	6:1 (P) 4:1 (V)	1 1	100 100	0.1155 0.1639	0.2794	Over 25 years	Innovative technology validated by <b>CIDETEC</b>
C3VH	OROPRIMER 495 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	1 2	80 120	0.1615 0.2630	0.4245	Over 25 years	12944-5/C3.10-EP Zn(R)/PUR







## Category C4

C4 offers excellent protection against corrosion at the highest level. For these areas, three-coat systems or high thickness two-coat systems are mainly used. Despite this, with OROPAL you can obtain maximum C4MA protection with only 120 microns.

### OROPAL INNOVATION

OROPAL offers a two-component C4VH process that gives a **54%** reduction in the use of paint.

#### CATEGORY C4 SPECIFIES THE FOLLOWING CORROSIVE ENVIRONMENTS:



These are possible locations:  
SWIMMING POOLS, BOATYARDS, CHEMICAL PLANTS..

Industrial areas and coastal areas with moderate salinity..  
CHEMICAL PLANTS, BRIDGES, INDUSTRIAL BUILDINGS, RESIDENCES.

#### COATING SYSTEMS FOR CORROSION IN CATEGORY C4

CLASSIFICATION	APPLICATION PROCESS	CATALYST	MIX RATIO	COATINGS	DFT	L/m <sup>2</sup> PER COAT	L/m <sup>2</sup> TOTAL	DURABILITY	SYSTEM DETAIL
C4L	OROPRIMER 420 OROLEX 284	- -	- -	1 1	100 60	0.1884 0.1343	0.3227	Up to 7 years	12944-5/C4.01
C4L	OROPRIMER 485 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	1 1	80 40	0.1723 0.0877	0.2600	Up to 7 years	12944-5/C4.04-EP/PUR
C4M	OROPRIMER 485 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	100 80	0.2153 0.1311	0.3464	From 7 to 15 years	12944-5/C4.05-EP/PUR
C4M	OROPRIMER 495 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	80 80	0.1615 0.1311	0.2926	From 7 to 15 years	12944-5/C4.09-EP Zn(R)/PUR
C4H	OROPRIMER 485 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	2 1	100 40	0.2153 0.0877	0.3030	From 15 to 25 years	Innovative technology validated by CIDETEC
C4H	OROPRIMER 490 OROMEL 623	OROCAT 790 OROCAT 781	6:1 (P) 4:1 (V)	1 1	100 100	0.1155 0.1639	0.2794	From 15 to 25 years	Innovative technology validated by CIDETEC
C4H	OROPRIMER 495 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	1 2	80 120	0.1615 0.2630	0.4245	From 15 to 25 years	12944-5/C4.10-EP Zn(R)/PUR
C4VH	OROPRIMER 495 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	40 80	0.0807 0.1311	0.2118	Over 25 years	Innovative technology validated by CIDETEC
C4VH	OROPRIMER 485 OROPRIMER 490 OROMEL 623	OROCAT 744 OROCAT 790 OROCAT 781	4:1 (V) 6:1 (P) 4:1 (V)	1 1 1	80 100 100	0.1723 0.1155 0.1639	0.4517	Over 25 years	Innovative technology validated by CIDETEC







## Category C5

Category C5 is for industrial and marine areas in very aggressive environments that need the highest protection against corrosion. They therefore need higher quality two-component processes and the application must be suitable to leave a thick film. Instead, with OROPAL, you can get C5A protection with just 120 microns.

### CATEGORY C4 SPECIFIES THE FOLLOWING CORROSIVE ENVIRONMENTS:



Buildings or areas with permanent condensation and with high pollution.



Industrial areas with high humidity and aggressive atmosphere.  
Coastal areas with high salinity.  
LIGHTHOUSES, GANTRY CRANES.

### COATING SYSTEMS FOR CORROSION IN CATEGORY C5

CLASSIFICATION	APPLICATION PROCESS	CATALYST	MIX RATIO	COATINGS	DFT	L/m <sup>2</sup> PER COAT	L/m <sup>2</sup> TOTAL	DURABILITY	SYSTEM DETAIL
C5L	OROPRIMER 485 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	100 80	0.2153 0.1311	0.3464	Up to 7 years	12944-5/C5.01-EP/PUR
C5L	OROPRIMER 495 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	80 80	0.1615 0.1311	0.2926	Up to 7 years	12944-5/C5.05-EP Zn (R)/PUR
C5M	OROPRIMER 485 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	2 1	100 40	0.2153 0.0877	0.3030	From 7 to 15 years	Innovative technology validated by CIDETEC
C5M	OROPRIMER 490 OROMEL 623	OROCAT 790 OROCAT 781	6:1 (P) 4:1 (V)	1 1	100 100	0.1155 0.1639	0.2794	From 7 to 15 years	Innovative technology validated by CIDETEC
C5M	OROPRIMER 495 OROMEL 614	OROCAT 744 OROCAT 714	4:1 (V) 4:1 (V)	1 2	80 120	0.1615 0.2630	0.4245	From 15 to 25 years	12944-5/C5.06-EP Zn (R)/PUR
C5H	OROPRIMER 495 OROMEL 623	OROCAT 744 OROCAT 781	4:1 (V) 4:1 (V)	1 1	40 80	0.0807 0.1311	0.2118	From 15 to 25 years	Innovative technology validated by CIDETEC
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C5VH	OROPRIMER 495 OROPRIMER 490 OROMEL 614	OROCAT 744 OROCAT 790 OROCAT 781	4:1 (V) 6:1 (P) 4:1 (V)	1 1 2	80 120 120	0.1615 0.1386 0.2630	0.5631	Over 25 years	12944-5/C5.08-EP Zn (R)/EP/PUR





Certificates backed by:

**cidetec** >  
surface engineering

# OROPAL

INDUSTRIAL & DECORATIVE PAINTS SINCE 1923

If you need technical, safety or official certificates, contact us.

Our team will advise you in everything you need.

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