

Data sheet: C1.4
Availability and properties

Chromadek® - Colour Coated Material for Roofing and Cladding

Pre-painted hot-dip galvanised steel sheet

The Heritage pre-coated steel range that covers Africa

Chromadek® is ArcelorMittal South Africa's trade name for a range of colour coated sheets. This high quality product has been manufactured by ArcelorMittal in South Africa for more than 35 years. Chromadek® is the roofing and cladding material of choice made by architects, designers, industry and homeowners renowned for its aesthetic value, protection from the natural elements and the ease of application complimenting any building. These key attributes have been developed spanning research years to prolong the useful life of the paint system and sheeting in the harsh South African climate. Depending on the environment supported by the correct design, selection, installation and maintenance the applicable Chromadek® warranty is shown in table 4.

CHROMADEK® PRODUCT RANGE:

Chromadek® is produced by coating galvanized coated steel coil subject to stringent quality control standards on a continuous coil coating line. The galvanized steel is chemically cleaned and treated to enhance corrosion properties and paint adhesion. A primer which is cured in a prime oven is applied, followed by a top coat that is cured again to obtain its aesthetic and functional properties.

Standard colours and paint systems:

Chromadek® is available in a range of 14 standard colours based on a resin paint system consisting of Polyester/Polyurethane blends in specialised pigments ensuring corrosion resistance, durability and response to formability.

For further information, contact:

ArcelorMittal South Africa Limited, PO Box 2, Vanderbijlpark 1900.
e-mail address: chromadek@arcelormittal.com

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Table 1: Standard Colours

Name	Colour	% Gloss at 60° (±5 %)	Total Solar Reflectance	Thermal Emittance	Solar Reflectance index #	ArcelorMittal SA Reference number
			ASTM E903	ASTM C1371	ASTM 1980	
Fish Eagle White	White	30	0.67	0.87	80	N-14128I
White Lion	White	30	0.66	0.83	78	N-15010I
Sandstone Beige	Beige	30	0.51	0.87	58	N-15365I
Gemsbok Sand	Dark Beige	30	0.47	0.91	55	Y-15366G
Kalahari Red	Red-Brown	30	0.27	0.88	28	N-06551I
Buffalo Brown*	Brown	30	0.24	0.86	23	N-09412I
Traffic Green	Green	30	0.21	0.86	18	Y-03002G
Aloe Green*	Light Green	30	0.30	0.90	32	N-03286I
Umhlanga Wave	Turquoise	30	0.31	0.85	32	N-02103I
Azure Blue	Blue	30	0.24	0.85	22	Y-01109G
Kingfisher Blue	Light Blue	30	0.34	0.89	36	Y-01029G
Dove Grey	Light Grey	30	0.32	0.87	33	Y-13637G
Dark Dolphin*	Medium Grey	30	0.30	0.87	31	Y-13030G
Charcoal Grey*	Dark Grey	30	0.22	0.88	20	Y-13012G

* Colours with heat reflective pigment

#Calculated Solar reflectance index (SRI) according to ASTM 1980 under standard solar and ambient conditions (medium wind of 2-6 ms⁻¹).

Notes:

- Other colours and **paint** systems (i.e. PVDF) can be applied for larger projects and are subjected to enquiry.
- For an indication of the colours, refer to Data Sheet: Chromadek®, Standard Colours (Data Sheet C1.9)

Coating configuration:

Chromadek® is available as either **Standard Chromadek®** or **Chromadek Ultim®** designed for exposure and use in different atmospheric conditions:

Standard Chromadek® is intended for use under rural, Industrial (mildly chemically polluted) or moderate marine conditions and comprises a Z200 hot-dipped galvanized substrate pre-primed with a primer (Dry film thickness (DFT) of 5µm) and finished with a final paint coat (DFT of 18 - 22µm) on the top surface. A single backing coat (DFT of 8µm) is normally applied to the reverse side of the sheet.

Chromadek Ultim® is intended for heavy industrial or marine conditions, and comprises a Z275 hot-dipped galvanised substrate, pre-primed with a chrome free primer (DFT of 20µm) and finished with a final coat (DFT of 18 - 22µm) on the top surface, giving a total dry film thickness of 38 - 42µm. The reverse surface is coated with a 10µm corrosion resistant chrome free primer and a 10µm top surface paint system.

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Figure 1: Coating structure of Chromadek® Standard and Chromadek Ultim®.

Table 2: Paint System Properties:

Property	Test conditions	Method	Typical values	
			Chromadek® Standard	Chromadek Ultim®
Resistance to UV Weathering (Colour Change)	QUV-A	ASTM G154 ISO 7724/1/2/3	After 2000 hrs: $\Delta E < 2$	After 2000 hrs: $\Delta E < 2$
Resistance to UV Weathering (Chalking)	QUV-A	ASTM G154 ASTM D659-04	After 2000 hrs: Rating No 8	After 2000 hrs: Rating No 8
Resistance to corrosion: - Edge creep - Blister size	Salt Spray	ISO 7253 ASTM D1654 ISO 4628/2	After 500 hrs: 5mm max 2-S2	After 1000 hrs: 8mm max 2-S2
Bending		ASTM D4145	3T, No adhesion loss	3T, No adhesion loss
Impact resistance		ISO 6272	No adhesion loss	No adhesion loss
Pencil Hardness		ASTM D3363	F – H	F – H
Scratch Hardness		ISO 1518	25 – 40 N	25 – 40 N
Dry Film Thickness		ISO 2808, 5B	Top surface: 23 µm minimum inclusive of primer Bottom surface: Single backing coat of 8µm min	Top surface: 38 µm minimum inclusive of primer Bottom surface: 20 µm minimum inclusive of primer
Specular Gloss at 60°	At time of coating	ISO 2813	25 – 35%	25 – 35%
Insulating properties	Including convection	R-value	0.17m ² K/W	0.17m ² K/W

Mechanical properties:

Chromadek® is available in standard items as per the published price lists and in non-standard items subject to enquiry (items not shown on the price list subject to enquiry to evaluate feasibility for order acceptance).

Dimensions:

The nominal thickness includes the zinc coating, but excludes the paint system: The nominal thickness will be branded on the coils. The total coated thickness (TCT) will therefore be thicker than the microns indicated in Data Sheet C1.1 Table 1.

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Table 3: **Standard dimensions:**

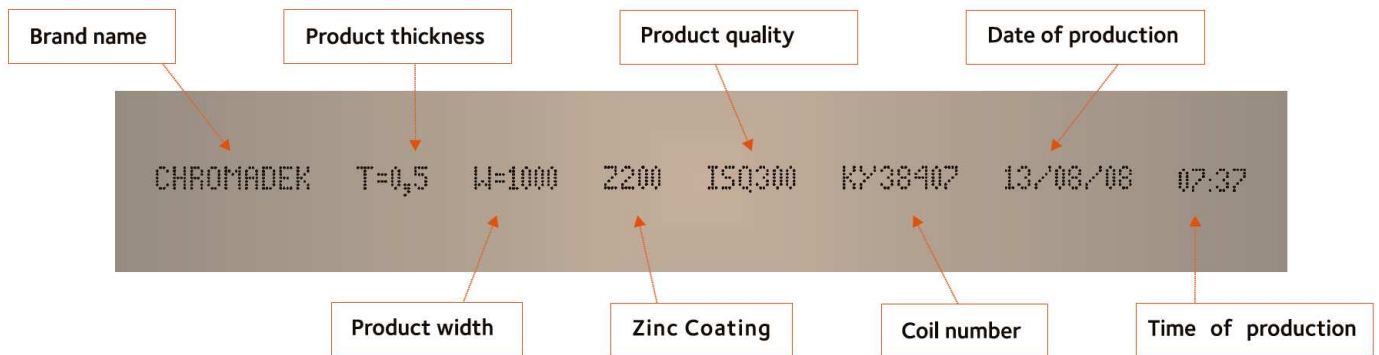
Nominal Thickness (mm)	Nominal Width (mm)
0.47	925, 1225
0.50	925, 1225
0.53	925, 1225
0.58	925, 1225
0.80	925, 1225

Shape and Dimension Tolerances:

Tolerances on shape and dimensions are depicted in the Data Sheet C1.2 **“Tolerances Galvanized Material”**.

Branding:

To easily identify Chromadek®, ensuring that premium material is used, all Chromadek® is branded on the reverse side 140mm in from the edge at approximately 900mm intervals along the length of the coil before profiling. A typical example of the identifying marking is depicted below:



Packaging, transportation and handling

Chromadek® is finished in a decorative coating offering general abrasion resistance, however precaution should be taken to prevent surface damage of the coating. During de-coiling the coil should not be allowed to unwind freely, as slippage between interleaving surfaces could lead to paint pick-off in these areas. No paint pick-off complaints will be entertained if tension control is not kept with a pinch roll before the strapping is cut during de-coiling. De-coiling tension must be lower than the coiling tension.

The thinner backing coats are more prone to scuffing damage (paint pick-off) and orders should specify the correct packaging in line with the mode of transport and the final destination. To avoid pressure marks coils should not be stacked, and should be dispatched 'eye-to-the-sky' (with the coil axis vertical) to prevent the occurrence of surface defects during transportation.

PROPERTIES AND PERFORMANCE OF COLOR COATED PRODUCTS:

In general the environment surrounding a building has a marked influence on pre-painted materials useful life. Related to this aspect aesthetic life is governed by the stability of the paint system against degradation from sunlight (UV, temperature) which is revealed by the degree of fading. The functional life is the period up to the moment when the steel can no longer weatherproof the building structure and is indicated by excessive corrosion (perforation).

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Aesthetic performance:

The sun affects the ageing of the paint system by ultraviolet radiation and heating. The colour selected impacts on performance and lighter colours will last somewhat longer than darker colours. Furthermore, the north facing areas of a roof could be affected differently than the southern areas, so to the west from the east. The fading characteristics of the paint system are scientifically measured by the ability of the paint system to retain its original colour intensity (delta E value) and shininess (% Gloss). With the advancement in paint technology, UV stabilisers and heat-reflective pigments are incorporated in the formulation that eases the impact of the harsh South African sun on the deterioration of paint systems. The Total Solar Reflectance (TSR) of dark colours is also enhanced with an associated cooling effect of up to 8°C in the Chromadek® roof temperature.

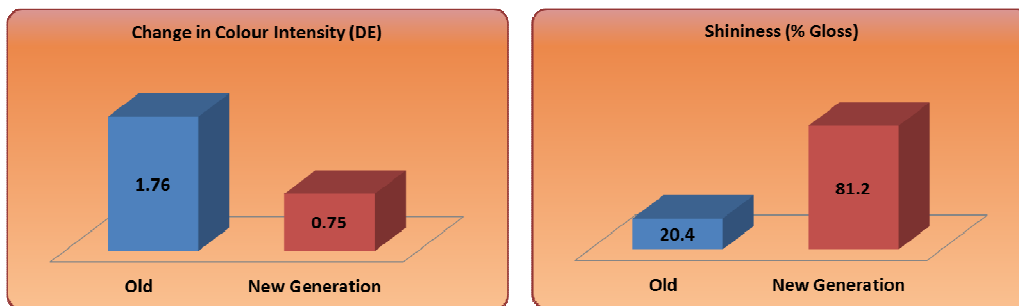


Figure 2: Colour- and Gloss retention results after 4 year exposure of Chromadek® "Traffic Green" at St Helena Bay, West Coast, South Africa.

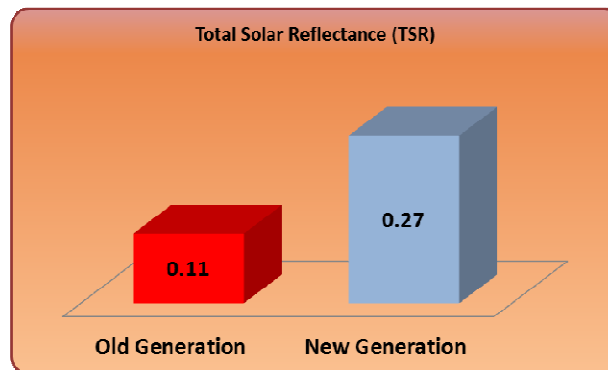


Figure 3: Heat Reflective pigments in a paint system improve the Total Solar Reflectance (TSR) properties of darker colours.

While paint fading is a normal process that occurs during the lifetime of a building, the quality of Chromadek® paints are covered in a warranty advising that the fading will not occur prematurely. The expected decrease of colour intensity of Chromadek® due to natural weathering under normal atmospheric conditions is indicated in the following graph:

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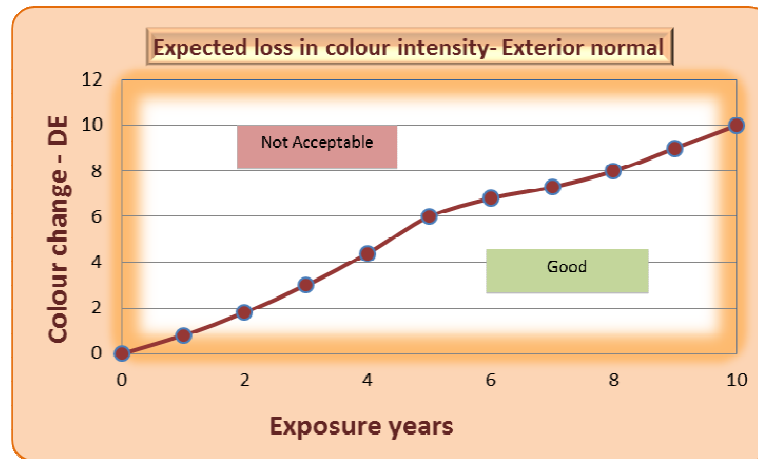


Figure 4: **Expected fading curve of Chromadek® shown by the change in colour intensity (designated by an increase in DE).**

Functional performance:

The useful life of the pre-coated product depends on the environment to which the cladding is exposed. The paint system provides protection by acting as a barrier between the metal and moisture, oxygen and other corrosion-inducing chemicals. Furthermore, the paint formulation includes specific corrosion inhibiting agents that ensure paint integrity when exposed to the environment. Inherently each aspect of the total paint system contributes to Chromadek®'s functionality.

Products used in close proximity to the coast is often exposed to salt laden condensation and the coating life can be shorter than further inland. Similarly, local industrial emissions could also have an effect on the coating life. Thin pre-painted coats are more sensitive to scratches and corrosion than thick-film coatings.

In order to ensure good functional performance the integrity of the paint system is crucial and aspects such as blisters and edge creep along scratches could limit the life span. If these are evident, prompt repair painting and/or complete repainting should be considered to regain the full original corrosion-resistance integrity of the metallic coated sheet, this excludes touch up painting.

Cut-edge performance:

At the cut-edge of pre-painted Chromadek®, the steel as part of the substrate is normally exposed. The cut-edges on Chromadek® sheets are not prone to corrosion as the zinc of the galvanized substrate cathodically protects the exposed edge.

In most cases the amount of coating loss due to galvanic corrosion is negligible derived from the exposed areas of bare steel being relatively small. Traces of white deposits on cut edges should not be a reason for concern as the mechanism of cut edge protection ensures adequate protection.

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Warranty:

ArcelorMittal South Africa guarantees the prime quality of Chromadek® and that the material will have an **aesthetic** and **functional** useful life in the natural elements for a minimum of 10 years prior to perforation from the date of supply. However, ArcelorMittal South Africa cannot accept liability for scratches or other damage to the material sustained during and after profiling, transport to or storage at the building site or after installation.

For warranty purposes ArcelorMittal South Africa may be approached for a:

- Provisional warranty (warranty of intent) during the tendering stage; and
- Warranty of the material on the building after installation.

Please note that no warranty is deemed to be valid unless ArcelorMittal Steel South Africa Limited has formally issued a warranty in response to a detailed written request from the client.

The recommended application for the different Chromadek® coating configurations is tabulated in table 4 below. Standard Chromadek® is suitable for applications in light industrial or marine environments further than 5 km from the coastal high water mark (HWM). Chromadek Ultim® with enhanced corrosion properties can be utilised up to 400 meters from the coastal high water mark (HWM). Chromadek® is normally excluded from any warranty by ArcelorMittal South Africa when used within 5km from the HWM as it is not recommended for such regional applications. Chromadek Ultim® is excluded from any warranty when used within 400m from the HWM.

Table 4: Warrantee (in years) for Chromadek® products according to regional application (Aesthetic and Functional).

Colour coated product	# Coating thickness (µm)	Rural un-polluted		Urban Inland/ Industrial		Marine/ Heavy Industrial			
		C1/C2® Low corrosion risk		C3® Medium risk		C4/C5® High Corrosion risk			
		Dry with occasional condensation - no specific pollution.		Higher humidity with some air pollution or mild coastal (>5 km from HWM)		Exterior environment of buildings located 1 to 5 km from HWM		Industrial area, high humidity/coastal high salinity (>400m to 1 km from HWM)	
		*Weathering & Non Peeling	Non-Perforation	*Weathering & Non Peeling	Non-Perforation	*Weathering & Non Peeling	Non-Perforation	*Weathering & Non Peeling	Non-Perforation
Chromadek®	40	10	20	10	20	NR	NR	NG	NG
Chromadek Ultim®	60	10	30	10	30	10	20	10	15

@ Based on environment and corrosion categories as outlined in ISO 9223 and ISO 12944 standards.

The top coat thickness which includes metal and paint systems.

* Natural weathering degradation curves as provided in Figure 4.

HWM High Water Mark

NR Not recommended, but can be considered with manufacturer's agreement

NG No Guarantee

Terms & Conditions Apply

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Supply conditions

Chromadek® is supplied in terms of Price List 147 with ArcelorMittal South Africa's General Conditions of Sale.

PROCESSING OF COLOR COATED SHEETS:

Roll-forming

Roll-forming rather than press braking is recommended for the forming of sections and components from pre-painted steel sheet, since there is less chance of damaging the paint coating. A multitude of sections can be roll-formed provided the necessary adjustments are made in roll clearances.

Bend diameters should be larger than those used for the bend tests to which the material is subjected during Quality Control Testing.

Lubricants

The organic coatings used for Chromadek® usually act as excellent dry film lubricants. Where lubricants are needed, the water-soluble types are recommended. If emulsified compounds are used, it is important that they are completely removed immediately after roll-forming, in order to prevent staining of the paint coating.

DESIGN, INSTALLATION AND MAINTENANCE:

The building and roof design as well as procedures adopted by the roof installer could have a marked influence on the useful life of the pre-painted roofing and cladding. By taking cognisance of a few important aspects the functional life can be optimised:

Design factors:

In areas with frequent rain followed by long periods of relatively high humidity, the following design factors must be addressed:

- Overlapping of sheeting (end laps) is to be avoided if possible, as waterproofing of lapped areas is seldom successful in the long term with the risk of crevice corrosion through the ingress of rain water through capillary actions. The use of full-length sheets is recommended.
- The slope of the roof shall be such that water can drain freely from it without ponding. The minimum recommended slope for Box Ribbed or S-Rib sheeting and Concealed Fix is 2° as per SANS10237. Concealed fixing profile designs are available from reputable profilers/roof manufactures that will lower the risk for capillary action and corrosion at through-fastened fixtures. Low pitched roofs (minimum 2°) are also feasible with concealed fixed roofing systems.
- In a high salt-laden environment (i.e. marine climate) and heavy industrial environments the underside of roof overhangs, sheltered areas, canopy type roofs and loading bay canopies could be prone to accelerated corrosion from the underside. Sea salts or aggressive contaminants tend to accumulate on these surfaces if they are not regularly washed down with clean water. The underside paint system is usually less protected due to type and thickness of coating. Designers should avoid this type of design or allow for additional protection in coastal or highly polluted industrial areas by means of covering or specifying a more protective paint coat on the reverse side of the sheet.

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Compatibility with other materials:

Most common materials used with traditional galvanised steel in the construction industry can be used with Chromadek® as per the guidelines advised in table 5 and 6. Contact with lead, copper and brass (also COR-TEN®) as well as run-off from the materials advised in table 6 should be avoided as it could cause staining of the Chromadek® and enhance corrosion due to galvanic action.

Fasteners guideline to be used with Chromadek® and solar panels

- Table 5 derived from SANS 10237 serves as a general guide to acceptable combinations of metals, based on the premise that the area of cladding and accessories is relatively large in comparison to that of the fastener material.
- If the atmosphere inside a building with metal cladding contains corrosive gases or vapors, some roof materials may require extra protection against the corrosive agents, especially if the cladding is not lined. Such extra protection should also be applied to the fastenings and accessories.
- The resistance of external cladding of certain metals to corrosive agents is partly dependent on the beneficial washing action of rain and on freedom from ponding. Increased corrosion may result in areas protected from rain.

Table 5 - Acceptability of direct contact between metals or alloys

Cladding Material	Accessory or fastener material												
	Aluminium and aluminium alloys		Copper and copper alloys		Stainless steel		Zinc-coated steel and zinc		Aluminium/zinc alloy-coated steel		Lead		
	Atmospheric classification												
	C4+	Other	C4+	Other	C4+	Other	C4+	Other	C4+	Other	C4+	Other	
Zinc-coated steel and zinc (Chromadek)	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Notes:

C4+ = corrosivity category C4 (high), C5-1 (very high – industrial) or C5-M (very high – marine) according to ISO 9223.

Other = corrosivity category C1(very low), C2 (low) or C3 (medium) according to ISO 9223.

‘Yes = Acceptable’ and ‘No = not acceptable’ imply the following:

i) Yes = Acceptable

because of bimetallic contact, either no additional corrosion of the cladding system will take place or, at the worst, only very slight additional corrosion. It also implies that the degree of corrosion would not significantly shorten the service life.

ii) Not acceptable – moderate to severe corrosion of the cladding or accessories will occur, a condition which may result in significant reduction in the service life.

Unless adequate separation can be ensured, pre-painted cladding materials should be considered in terms of the base material.

Staining and damage to Chromadek® surface

A roof system shall be designed to prevent the drainage from one surface damaging or staining a lower surface, this aspect needs to be taken into account with solar panel installations.

Table 6 derived from SANS 10237 serves as a general guide to acceptable combinations of upper and lower metals and alloys with regard to drainage from one to the other.

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Table 6 - Acceptability of drainage from one surface to a lower metal or alloy surface

Upper cladding/ accessory material	Lower cladding/accessory material					
	Aluminium and aluminium alloys	Copper and copper alloys	Stainless steel (300 Series)	Zinc-coated steel and zinc	Aluminium/zinc alloy-coated steel	Lead
Aluminium and aluminium alloys	Yes	No *	No *	No	Yes	Yes
Stainless steel (300 Series)	No *	No *	Yes	No	No *	No *
Zinc-coated steel and zinc	Yes	No *	No *	Yes	Yes	No *
Aluminium/zinc alloy-coated	Yes	No *	No *	No	Yes	No *
Copper and copper alloys	No	Yes	No*	No	No	No*
Glass, glazed tiles, acrylics and plastics	Yes	Yes	Yes	No	No	Yes
Prepainted sheet?	Yes	Yes	Yes	No	Yes	Yes
Plastics including polycarbonate	Yes	Yes	Yes	No	Yes	Yes
Glass fibre	Yes	Yes	Yes	No	Yes	Yes
Fibre cement	Yes	Yes	Yes	Yes	Yes	Yes
Cement tiles	Yes	Yes	Yes	Yes	Yes	Yes
Lead	Yes	Yes	Yes	Yes	Yes	Yes

NOTES:

- a) * Whilst drainage between the materials shown would be acceptable, direct material contact should be avoided (see Table 5)
- b) 'Yes' implies 'acceptable' and 'No' implies 'not acceptable'. 'Acceptable' and 'not acceptable' imply similar service performances to those noted in Table 5.

Solar panel installation fitted to either a Chromadek® or Chromadek Ultim® roof needs to ensure the following conditions is avoided to ensure the warranty remains intact (see table 5 & 6 for guidelines)

- fluid emanating from corrosive chemicals of any kind
- run off from piping
- deposits or heavy metal particles such as iron, lead and copper or alkalines
- contact with corrosive products such as ash, cement dust or animal excrement wet impregnated timber, soil and wet materials retaining moisture

Mixing of sheet material:

The use of different brands of coated sheet on one building is not recommended as differences in colour, gloss and weathering performance may be apparent within a short period of time. This stems from differences in the formulation applied for coil coating by the various companies. ArcelorMittal South Africa will not accept liability for problems caused by the mixing of roof-sheeting brands or Chromadek® products.

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By the very nature of colour and the normal variance in manufacturing processes, a slight variation in colour can be apparent between production batches of coils. It is therefore recommended that profiles for a single elevation should be manufactured from the same production batch. Building contractors and erectors should aim to ensure that this practice is followed during the installation of the roof sheets and cladding.

Installation of pre-painted roof sheeting

The recommended method of cutting sheets on site is by using a sheet nibbler, which gives a clean edge and does not damage either the sheet or paint coating. It is imperative that all steel particles (swarf) and other debris are removed daily as installation proceeds, since they can cause damage, discoloration or corrosion. A thorough building clean up after completion of construction should be conducted to remove all loose particles, objects and dust from walls and roofs.

Abrasive cutting or trimming of Chromadek® sheeting on top of roofs should be avoided. However, if unavoidable, the cutting surface should be covered during the cutting process. Iron particles must be removed from the roof surface by means of a bristle brush or broom, as it is not easily washed down by rain. If left on the roof the iron particles will start to rust, tarnishing the Chromadek® paint surface.

It is important to use the correct fastener class during the installation of Chromadek® roof-sheeting or cladding systems to ensure life-expectancy. All fasteners used for fixing Chromadek® to be in accordance with AS 3566 Class 3 (correct class of fastener to be applied for **marine** and **industrial applications**). Fasteners and other holes made should be properly sealed to prevent moisture ingress that could accelerate corrosion.

Anyone walking on roofing panels must wear soft-soled rubber shoes. Such traffic across the roof must be restricted to a minimum. It is recommended that soft material of some form be used to temporarily protect the paint coat in trafficked areas.

Slight scratches which may occur during erection or handling can generally be left as is because they are not visible from a distance and the galvanised metal coating will offer adequate protection against corrosion.

Inspection and Maintenance:

A biannual inspection of the Chromadek® coated surface is recommended to enable timeous maintenance and to prolong the useful life of the sheeting. The following should be done during the inspection:

Accumulation of dirt: It is important to remove dirt and debris that is not removed by normal rainfall which could bind moisture and corrosive substances to the coated surface. Washing may be carried out with a hose and a soft bristle brush, using clean water. In areas where heavy dust deposits dull the surface, a solution of clean water and natural cleaner can be applied, followed by rinsing with clean water. In any case, the customer must check that the cleaning procedure and detergents used do not damage the coating. Defects associated with aggressive washing and/or cleaning operations (mechanical or chemical damage) are not covered by the warrantee.

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Metal deposits: Loose fasteners, pop-rivet mandrills, metal drillings/objects increase the risk of corrosion and should be removed.

Fasteners: Ensure that the correct class of fasteners are used for the application. All fasteners used for fixing Chromadek® to be in accordance with AS 3566 Class 3 (correct class of fastener to be applied for **marine** and **industrial applications**). Make sure fasteners are also washed and inspected for signs of corrosion. Replace if they show signs of failure, rust or degradation of the waterproof membrane.

Damage to paint coating could increase the risk for corrosion if considered to be severe. Cleaning and touching-up with appropriate paint should be considered. In areas where edge corrosion is evident - (i.e. overlapping sheets and sheet ends), the corrosion will spread unless treated in good time. Clean the corroded edge thoroughly and repaint.

Repainting of roofs:

If the need should arise to repaint a Chromadek® roof, it can be done with an appropriate roof preparation method and a suitable paint system. ArcelorMittal can be contacted for advice and referral to approved and reputable roofing refinisher(s).

GENERAL

Quality systems

A quality assurance system that complies with SANS 9001 is in operation throughout the manufacturing process, and the galvanised substrate used for ArcelorMittal South Africa's Chromadek® products conform to the requirements of both SABS ISO 3575 and SABS ISO 4998.

Recycling

Chromadek® and its steel content is 100% recyclable.

Also visit our www.Chromadek.com website for additional information on Chromadek®.



For further information, contact:

ArcelorMittal South Africa Limited, PO Box 2, Vanderbijlpark 1900.

e-mail address: chromadek@arcelormittal.com

Care has been taken to ensure that the information in this data sheet is accurate. ArcelorMittal South Africa Limited does not, however, assume responsibility for any inaccuracies or misinterpretations of this data. We are continuously engaged in product development and revised data sheets will be issued from time to time. Please ensure that you have the most recent issue. Effective date: **March 2016**