



sandwich panel

type of paint (dye) and color details



## Comparison of Paints and Coatings in terms of Their Characteristics

Type of Paint	Code	Application Thickness	Chemical Endurance	UV Endurance	Impact Resistance	Corrosion Resistance	Humidity Resistance	Color Difference Stability	ASM Resistance	Heat Resistance (max./min/°C)
Polyester	PES	20-25	**	*	***	**	***	***	***	90/-30
High Duple Polyester	HDP	20-25	***	**	***	**	****	****	****	90/-30
Polyviniliden Fluorid	PVDF	20-27	****	*****	***	****	*****	*****	*****	80/-40
Polyurethane	PUR	25	****	***	***	****	****	***	***	80/-40
Kloroid Polyviniliden Plastis	PVC(P)	100-200	*****	****	****	*****	****	**	****	70/-40
Film	PVC	100-200	*****	*	*****	*****	****	**	****	70/-40

\*\*\*\*\* Excellent , \*\*\*\* Very Good, \*\*\* Good, \*\* Average, \*Poor

Endurance period of food safe and anti-bacterial paints should be assessed to be the same as the endurance periods of polyester painting. No heavy metals are used for manufacturing antibacterial or food-safe paints. Guarantees for all the types of the paints are provided. However, guarantee periods may vary for each project because such periods depend on environmental conditions, geographic location and application.

### Polyester Paints

This is one of most commonly used dyes because of its affordability and wide range of colors and easy accessibility. Among types of dyes, it is the simplest basic dye. Corrosion and endurance to UV and chemicals is less than the other types of dyes. Coils which are painted at the same time but manufactured at different times and installed on different facets create ton and brightness difference. This justifies that its color and brightness endurance is low. This is apparently observed on dark-colored panels. Through additions to resins of polyester dyes, chemical and mechanical endurance can be increased (High Double Polyester). However, high-endurance polyester dyes are not preferred so much because the higher the endurance is, the more it costs.

### PVDF Paints

When compared to polyester dyes, its mechanic and chemical endurance is higher. It has excellent UV endurance and can resist against discoloration for the longest time. It is the most durable dye against stains and dirt. It has high brightness. Its endurance against scratches and corrosion is quite good although it is lower than plastisol. Because its cost is high, it is generally preferred for prestigious buildings. It should be preferred for the zones with high UV.

### Plastisol Paints

It is type of coating/painting with the highest corrosion resistance. Allowing to manufacturing with patterns makes it preferable for aesthetic reasons. Its UV and chemical resistance is good though it is not as good as PVDF. However, corrosion and discoloration may be observed depending on the local and climate conditions. It should be preferred for roofs with lesser slopes in wet regions due to its corrosion resistance. It shouldn't be used in places where the surface temperature may exceed 80°C.

### Polyurethane Paints

It is a type of dye having higher resistance to UV, impacts and corrosion when compared to polyester. It should be preferred particularly for high buildings (height: 20 m and above). Polyurethane dyes with high endurance against scratches are more aesthetic and highly-costly dyes.

## Film

PVC films are coatings with high impact and chemical resistance. It is very sensitive against UV. It has a very low endurance against discoloration. Because it is manufactured in different patterns and colors, it is generally preferred for visuality and aesthetics.

Suggestions for Usage Area According to Types of Paints		Corrosion Resistance	Uv Dayanımı
Polyester	PE	RC3	RUV2
Polyviniliden Fluorid	PVDF	RC4	RUV4
Kloroid Polyviniliden Plastis	PVC	RC4	RUV2
Polyurethane	PUR	RC3	RUV3

## Examples for Mild Climatic Environments

	External Environment	Internal Environment
C1 - Very Low	-	For buildings heated with clean atmosphere, for example, offices, shops, schools, hotels.
C2 - Low	Atmospheres with lower level of pollution. (Generally rural areas)	Unheated buildings, places where condensation may occur, for example, stores, sport halls.
C3 - Mild	Urban and industrial atmospheres, medium level of Sulphur dioxide pollution (Shores with lower level of salt)	Places with high humidity and air pollution such as dining halls, manufacturing process plants, laundries, beer factories, dairies.
C4 - High	Industrial areas (Shore with medium level of salt).	Chemical plants, swimming pools, shores, ships and shipyard.
C5 - I - Very High (Industrial)	High humidity-containing and aggressive atmosphere and industrial areas.	Buildings or areas with condensation and high pollution almost at all the times.
C5 - M - Very High (Sea)	High level of salt, shores and marine areas.	Buildings or areas with condensation and high pollution almost at all the times.

## UV Resistance Category According to Regions

RUV2	Zones on the north of Latitude 45° in Northern Hemisphere and places up to 900 m.
RUV3	Zones on the south of Latitude 45° in Northern Hemisphere, zones on the north of Latitude 37° and places up to 900 m.
RUV4	Zones on the south of Latitude 37° in Northern Hemisphere and places up to 900 m.

Ankara is located on 39° 57' of northern latitude. Its altitude is between 79 -1.150 m and pollution level is high. PCDF and light-colored paints are suggested because of their high UV endurance and resistance against pollution on the outer metal. It is recommended to use PVDF in the category of paints and light color.

## Criteria of Color Tone Difference

Color difference values seen during the production process are specified below as Color Difference Acceptance Tolerances. However, in addition to all the values below, it has to be accepted that the appearance of paint/color will change slowly, gradually and regularly in the process of a building's façade is exposed to same conditions.

Color Difference Acceptance Tolerances	
Upper Sheet for Roof Products (Exterior Surface).	$\Delta E: 1,70 + 0,20$
Lower Sheet for Roof Products (Interior Surface)	$\Delta E: 1,50 + 0,20$
Upper Sheet for Wall Panels) (Exterior Surface)	$\Delta E: 1,20 + 0,20$
Sheet for Wall Products (Interior Surface) Except Light / Dark Color.	$\Delta E: 1,30 + 0,20$
Lower Sheet for Wall Products (Interior Surface) Light / Dark Color	$\Delta E: 1,30 + 0,20$

Note :  $\Delta E$  refers to total color difference between the sample and measured material color. The value of this measure can differ up to  $\Delta E = 2,0$  based on human eye, the eye sensitivity, the color being light or dark, bright or dull, and the light intensity.

WARNING: Tone differences and deformation on the metal are among the problems which are mostly encountered for metallic and luminous colors.	
Metallic Colors	RAL 9006 - RAL 9007
Luminous Colors	RAL 1026 - RAL 2005 - RAL 2007 - RAL 3024 - RAL 3026

Climatic effects are also specified as variable effects according to TS EN 14509 standards (eg. temperature difference between the two surfaces of the panel)

According to the this standard, temperature gradients resulting from the difference between exterior temperature (T1) and interior temperature (T2) are considered as variable effects.

In Europe, four different lowest winter temperature ratings are used based on latitudes, altitudes above sea level, and distance to the sea: 0°C, -10°C, -20°C, -30°C. The exterior temperature for the roof panels that have a layer of snow on top of theirs is 0°C.

Exterior surface T1 temperature has a maximum summer temperature based on surface color and reflectability. T1 values suitable for availability calculations, and T1 values taken at minimum level for maximum limit situation are followed:

- (i) **Extra light color**  $R_G=75-90$   $T1= +55\text{ }^{\circ}\text{C}$
- (ii) **Light color**  $R_G=40-74$   $T1= +65\text{ }^{\circ}\text{C}$
- (iii) **Dark color**  $R_G=8-39$   $T1= +80\text{ }^{\circ}\text{C}$

$R_G$  is reflection value when magnesium oxide = 100%.

Maximum temperature difference between interior and exterior temperatures may increase during installation.

As it can be seen on the related standard, dark colored panels get exposed to thermal load more than light colored ones, and they can get deformed more easily, since they can be exposed to a temperature difference around 80°C between the day and night cycles. Since dark colours absorbs solar power and radiation better, there will be inner and outer heat differences, and since there will be dilatations on the outer surface, this will cause shrinks. Highest difference between inner and outer surfaces may occur during installation. Because of this, installation of the panels with light color at low temperatures increases the effects of thermal load on the building during midseason.). If panels with dark colour are going to be used, building design should be made in accordance with the thermal load. Panelsan does not take any responsibility with these deformations and does not give any warranty.

Suggested Panel Sizes By Color Groups				
Insulation	Panel Type	Color Groups		
		Group 1 / Very Light Colors	Group 2 / Light Colors	Group 3 / Dark Colors
PUR -PIR	HS-OS Wall Panels	10.00 m	6.00 m	6.00 m
	Wall, Cold Room	12.00 m	12.00 m	9.00 m
	Roof	13.50 m	13.50 m	11.00 m
Rockwool-Glasswool / MW	HS-OS Wall Panels	10.00 m	8.00 m	6.00 m
	Roof	13.00 m	11.00 m	9.00 m
EPS	HS-OS Wall Panels	10.00 m	9.00 m	6.00 m
	Roof	13.00 m	11.00 m	9.00 m

If dark color is chosen for external surface of the panel, the following conditions should be considered in order to minimize the deformation:

- The construction where panel will be installed shall be free from errors in vertical and horizontal line.
- Team to perform panel installation will be required to be experienced and to act in line with the rules applicable to installation, lifting and lowering.
- Appropriate screws and equipment should be chosen for panels and construction and installation should be proceeded with an appropriate torque.
- For the partially delivered panels, the installation of one party of panels should be installed on the same wall in terms of not having different color tone. Also pay attention to production date, special warnings during the installation
- Projects should be assessed well (appropriate carriage tables) and appropriate panels and metal thickness for static tables should be chosen.
- Table of 'Panel Sizes According to Color Groups' shall be taken as basis for roof and facet panels.
- Temperature of the day when installation will be made should be +10°C and above in order to minimize thermal stress.
- Wall panels should be installed with a single opening system. Even if all these conditions are satisfied, PANELSAN never warrants the homogeneity smoothness on the dark color group for the external surfaces and never take liability for the same issues. Sandwich panels are long-lasting products. Because of this, although the panels are fully straight when they are produced at the factory, they can be exposed to different effects over time (eg. load bearing, wind, pressure, internal/external temperature difference). These effects may result in deformation on flat surfaces, and losing of flatness on surfaces.

\*For the colours apart from the RAL codes on the table, please contact with your sales representative.

Color Groups	RAL Codes
Group 1 - Very Light Colors	1015 - 1016 - 1018 - 6019 - 7035 - 9001 - 9002 - 9010
Group 2 - Light Colors	1002 - 1003 - 1004 - 1014 - 1015 - 1017 - 1019 - 1021 - 1023 - 1035 - 2000 - 2003 - 2004 - 2008 - 5012 - 5018 5024 - 6018 - 6021 - 6033 - 7000 - 7037 - 7040 - 9022
Group 3 - Dark Colors	3000 - 3002 - 3003 - 3005 - 3011 - 3013 - 5002 - 5005 - 5009 - 5010 - 5011 - 5022 - 6000 6003 - 6005 - 6011 - 6020 - 6029 - 7015 - 7016 - 7022 - 7024 - 7026 - 7031 - 7038 - 7043 - 8011 - 8012 - 8014 - 8016 - 8017 - 8019 - 8022 - 8023 - 9004 - 9005 - 9006 - 9007 - 9017