

You must define your project indoor and the outdoor type of atmosphere in order to select the most appropriate types of panel facings.

Indoor atmosphere

With no clean room specific data, we have to reply on food and food processing industries classification for metallic panel facing types.

Aggressivity	Cleaning	Hygrometry	Temperature	Examples	Minimum category of appropriate coatings (NF P34.301)	Recommended coatings
Ai 1 Non-aggressive environment	Regular maintenance	Low	-40°C to +25°C -40° to +77°F	Storage of wrapped dry products	I	Polyester 25 µm PVDF 35 µm PVC 120 µm PET 55 µm Stainless steel 304 Stainless steel 304 + PVC + PET
Ai 2 Non-aggressive environment	Regular maintenance	Average	0°C to +25°C +32° to +77°F	Storage in controlled atmosphere	II	
Ai3 Non-aggressive environment	No Intensive cleaning	High	0°C to +25°C +32° to +77°F	Storage, processing moist ambient	IIIa	
Ai4 Slightly aggressive environment	No Intensive cleaning	High	0°C to +30°C +32° to +86°F	Preparation of pre-cooked foods	IVb	PVDF 35 µm PVC 120 µm PET 55 µm Stainless steel 304 Stainless steel 304 + PVC + PET
Ai5 Aggressive environment	Intensive cleaning	High	0°C to +35°C +32° to +95°F	Cooking rooms, dryers	Vc	PVC 120 µm PET 55 µm Stainless steel 304 Stainless steel 304 + PVC + PET
Ai6 Very aggressive environment	Very intensive cleaning	Saturated	0°C to +40°C +32° to +104°F	Showers washrooms	(*)	Stainless steel 304 + PVC + PET Stainless steel 316L

Extract from DTU 45.1 – Food handling facilities

N.B. :

- The table is provided as a guide only, the classes must be appropriate to the controlled conditions of each facility.
- A single parameter could justify the selection of ambient conditions (hygrometry, cleaning frequency, chemical aggressivity, salinity)

Aggressivity criteria

- 1 – No aggressive ambient conditions: environment presenting no aggressivity due to corrosive chemical components and/or microorganisms.
- 2 – Slightly aggressive ambient conditions: environment with no aggressive ambient conditions but whose walls could occasionally be splashed with slightly aggressive liquids.
- 3 – aggressive ambient conditions: environment where acid, basic or saline acid vapours occur and/or with presence of microorganisms and/or likely to be subjected to disinfection.
- 4 – very aggressive ambient conditions: environment where acid, base or saline acid vapours or gas occur and/or with presence of microorganisms and/or frequent risk of splashing of walls and/or likely to be subjected to disinfection with aggressive products.

Cleaning criteria

- 1 – regular maintenance: this involves regular supervision and occasional cleaning (frequency from one to several years according to the use of the facility) using non-aggressive methods and resources (no pressure washing).
- 2 – non-aggressive cleaning (usually on monthly basis): cleaning performed with neutral products at temperature of 30°C 86°F and low pressure spraying of $\leq 0.3\text{Mpa}$ 6 266 lbf/sq.ft.
- 3 – intensive cleaning (usually on daily basis): cleaning performed with neutral products (ph 5 to 9) at temperature of 40°C 104°F and pressure of 3.5 Mpa 73 099 lbf/sq.ft (pressure of spray nozzle).
- 4 – very intensive cleaning (usually on daily basis): cleaning performed with occasional use of extreme pH (<math><5</math> or >9) and/or high temperature (<math><60^{\circ}\text{C}</math> 140°F) and/or high pressure washing (pressure <math><5\text{Mpa}</math> 104 430 lbf/sq.ft at output from nozzle and impact pressure <math><0.04\text{Mpa}</math> 835 lbf/sq.ft).

Humidity criteria

- 1 – humidity ambient conditions: ambient conditions are said to be «humid» where the hygrometry of the facility is high and if under the operating conditions of the facility there is a risk of condensation.
- 2 – very humid ambient conditions: ambient conditions are said to be very humid where the hygrometry of the facility is very high and if under the operating conditions of the facility the risk of condensation is frequent.
- 3 – saturated ambient conditions: ambient conditions are said to be saturated where the hygrometry of the facility is very high and if there is a permanent risk of condensation in the operating conditions of the premises.

Outdoor atmosphere

Outdoor atmospheres are classified by categories in order to comply with NF P 34-301 specifications for the selection of panel facings.

	Rural or no polluted atmosphere III	Urban or industrial atmosphere		Marine atmosphere				Specific atmosphere	
		normal III	harsh	20 to 10 km <i>12.43 to 6.22 mi</i> III	10 to 3 km <i>6.22 to 1.87 mi</i> IV	< 3 km <i>1.87 mi</i> V	mixte	high UV	special

Galvanized or coated with alloy (zinc and aluminium) steel

Polyester 25 μm <i>1mil</i>	••	••	•	••	-	-	-	-	•
PVDF 35 μm <i>1.3mil</i>	••	••	•	••	••	-	-	-	•

- unsuitable
- consult maker
- suitable

N.B.: the PET and PVC system are unsuitable for exterior use.

Technical characteristics of the supports

- z225 hot-galvanized **pre-powder coated or lined steel sheet**, mini shade s280 GD+Z, according to standard NF EN 10326, thickness 0,50 mm 0.019", 0,63 mm 0.024" or 0,75 mm 0.029"

- **Stainless steel sheet** shades, thickness 0,60 mm 0.023" or 0,80 mm 0.031"

* x5CrNi 18-10 (EN 1-4301 or AISI 304)

* x2CrNiMo17-12-2 (EN 1-4404 or AISI 316L)

- **Pre-powder coated aluminium** shade EN AW.3004 H46 according to standard EN 1396, thickness 0,67 mm 0.026"

Test types and results of various panel facings on galvanized steel sheets

	Testing standards and conditions	Polyester powder coat 25 µm	Conductive powder coat	PVDF powder coat 35 µm	PVC film 120 µm	PET 55 µm system
Category	XP P 34-301	IIIa		IVb	Vc	Vc
Gloss	ISO 2813 (ECCA-T2) incidence 60°	30 ± 6%	30 ± 6%	30 ± 6%	25%	30 ± 6%
Shock resistance	ISO 6272 (ECCA-T5)	No loss of panel face adherence				
Adherence by bending	ISO 1519 (ECCA-T7)	3t	3t	2t	0t	1t
Resistance to humidity	ISO 6270 (ECCA-T9)	≥ 1000 h	≥ 1000 h	≥ 1000 h	≥ 1000 h	≥ 1500 h
Resistance to neutral salt spray	ISO 7253 (ECCA-T8)	≥ 360 h	≥ 360 h	≥ 500 h	≥ 500 h	≥ 500 h
Chalk hardness	ISO 3270 (ECCA-T4)	H	H	HB	2H	2H
Adherence to panel face (grid pattern)	ISO 2409		Class «0»			
Panel face resistance to heat	ISO 3270 (ECCA-T13)	100 h to 80°C 176°F ΔE ≤ 0,1		100 h to 70°C 158°F ΔE ≤ 0,1	100 h to 70°C 158°F ΔE ≤ 0,1	
Resistance to abrasion	ISO 7784	40 mg	5.6 mg	30 mg	10 mg	
Reaction to fire	NF P 92-507	M0	M0	M0	M1	M0
Surface resistivity	ASTM D257	10 ¹¹ Ω/□	10 ⁷ Ω/□			

Special warning for HPL panel face

Compact laminated sheets are very sensitive to hygrometry conditions : high variation of dimensions under extreme high or low ambient humidity can occur.

For that reason, several precautions must be taken at the different production or delivery stages : HPL sheets or finished HPL panels must be stored under tight controlled ambient conditions: from 10 to 30°C 50°F to 86°F and relative humidity 40 to 60 %). Finished HPL panels should not be used under high temperature and/or high relative humidity conditions.

Storage and working conditions : The 2 sides of the HPL panels must remain aerated and within the average temperature range of 10 to 30°C 50°F to 86°F and relative humidity from 40 to 60 %.

Ignoring these warnings, bending or twisting of the HPL panels may occur.

Resistance of panel faces to chemical products

Information given as a guide only

Coatings		Polyester lacquer	Conductive lacquer	PVDF 35 µm 1.38 mils	PVC 120 µm 4.7 mils	PET 55 µm 2.16 mils	Compact laminated	Stainless steel 304 + PVC + PET	Stainless steel 304	Stainless steel 316L
Chemical products	Chemical family									
Acetone	Ketone	⊖	⊖	⊖	⊖	⊖	☺	☺	☺	☺
Acetic acid (CH ₃ COOH) (vinegar) 10%	Acid	⊖	⊖	☺	☺	☺	☺	☺	☺	☺
Hydrochloric Acid (HCl) 10%	Acid	⊖	⊖	⊖	⊖	☺	☺	✓	⊖	☺
Nitric acid (H ₂ NO ₃) 10%	Acid	⊖	⊖	☺	☺	☺	☺	☺	☺	☺
Phosphoric acid (H ₃ PO ₄) 10%	Acid	⊖	⊖	☺	☺	☺	☺	☺	☺	☺
Sulphuric acid (H ₂ SO ₄) 10%	Acid	⊖	⊖	☺	☺	☺	☺	☺	☺	☺
Ethyl alcohol - Methylated spirit	Alcohol	☺	☺	☺	☺	☺	☺	☺	☺	☺
Isopropyl alcohol	Alcohol	☺	☺	☺	☺	☺	☺	☺	☺	☺
Ammonia - NH ₄ OH	Base	⊖	⊖	☺	☺	☺	☺	☺	☺	☺
Ammonium bisulphite	Salt	☺	☺	☺	☺	☺	☺	☺	☺	☺
Buthanol	Alcohol	☺	☺	☺	☺	☺	☺	☺	☺	☺
Sodium hypochlorite - NaClO (Javel water) high concentration		⊖	⊖	⊖	⊖	☺	☺	✓	☺	☺
Therebentine	Alcohol	☺	☺	☺	☺	☺	☺	☺	☺	☺
MEK (Methyl ethyl Ketone)	Ketone	⊖	⊖	⊖	⊖	⊖	☺	⊖	☺	☺
Methanol	Alcohol	☺	☺	☺	☺	☺	☺	☺	☺	☺

Caption ⊖ Prohibited ☺ Recommended ✓ Suitable To be studied case by case

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Chemical products	Chemical family									
Phenol	Alcohol	☺	☺	☺	☺	☺	☺	☺	☺	☺
Potash - Potassium hydroxide - KOH - 10%	Base	☹	☹	☺	☺	☺	☺	☺	☺	☺
Alkaline industrial soap	Base soap	☹	☹	☺	☺	☺	☺	☺	☺	☺
Chlorinated industrial soap	Neutral soap	☹	☹	☺	☺	☺	☺	☺	☺	☺
No chlorinated industrial soapé	Neutral soap	☺	☺	☺	☺	☺	☺	☺	☺	☺
Kitchen salt (Sodium chloride - NaCl)	Salt	☹	☹	☹	☹	☹	☺	☺	☺	☺
Kitchen salt + use of acidic cleaning agents	Salt + Acid	☹	☹	☹	☹	☹	☹	☑	☹	☺
Sodium hydroxide - NaOH - 10%	Base	☹	☹	☹	☺	☺	☺	☺	☺	☺

Panel face resistance to hydrogen peroxide H2O2 (oxygenated water) (fogging tests)

Materials	Pre-coated sheet - polyester 25 µm 0.98 mil - PVDF 35 µm 1.38 mil - lacquer thk. ≤ 50 µm 1.97 mil	Painted sheets - paint 50 µm 1.97 mil ≤ thk. < 80 µm 3.15 mil	Painted sheets - paint thk. ≥ 80 µm 3.15 mil	Film clad sheets (process) - PET 55 µm 2.16 mil - PVC 120 µm 4.7 mils	Compact laminated	Stainless steel 304 + PVC + PET	Untreated stainless steel 304, 316L,
Decontamination frequency							
Low	☹	☹	☑	☺	☺	☺	☺
Average	☹	☹	☑	☺	☑	☺	☺
High	☹	☹	☹	☑	☑	☑	☺

Refer to Chapter 12 – Panel face shade chart for further information.