

# STANDARD SPECIFICATION FOR ALUMINUM COMPOSITE PANEL

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## Dubai Municipality Standard

## المواصفات القياسية لبلدية دبي

DMS 36: 2019

### Revision History

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**Title of DMS:**

Standard Specification for Aluminum Composite Panel

**This Dubai Municipality Standard is:**

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## Foreword

With a view to have a comprehensive set of Dubai Municipality Standards which would be consistent and fulfill local needs and yet be at par with International requirements, Dubai Central Laboratory is developing standards taking guidance as much possible and required from International and Regional Norms.

This Dubai Municipality Standard (DMS) describe a classification, specification and test method required for ALUMINUM Composite Panel.

The standard has been prepared under the scheme of standardization of calibration/test procedures for use of DCL laboratories and by other interested persons/organizations. The standard is issued after validation.

This procedure combines essential features and specification requirements of International practices. It has been developed in such a way as to provide as much information about the operating characteristics of the measured. Attempts have been made to make the contents user friendly.

## 1 Scope

This standard describes a classification, specification and test method required for Aluminum Composite Panels when used for constructing curtain walls façade (external & internal) for buildings.

The following regulations or other relevant national Regulations may be referred for in this standard:

- Al SA'FAT Dubai Green Building Evaluation System – 2017

This standard does not cover the following:

- Roofs and roof cladding;
- Thermal insulation panels

## 2 References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. The titles of these references are listed in the last page.

## 3 Terms & Definitions

This following terms and definitions are applicable to this standard.

### 3.1 Aluminum Composite Panels (ACP):

Factory-manufactured panels consisting of Aluminum skins bonded to both faces of a “Non-combustible mineral filled core”. The core material can be:

- mineral material (such as magnesium oxide, aluminum hydroxide...etc)
- low-density polyethylene thermoplastic fire rated (LDPE -FR)
- Corrugated aluminum sheets with minimum thickness of 0.2 mm

3.2 Skin :

Flat, thin Aluminum sheet with specified thicknesses.

3.3 Aluminum skin

Non-corrosive special grade aluminum sheets with minimum of 0.5 mm thickness complying with the specification of 3000 or 5000 series as per ASTM B 209.

3.4 LDPE –FR :

Low-Density Polyethylene Thermoplastic Fire Rated

3.5 PVDF:

Is the abbreviation for polyvinylidene fluoride, which can also be referred to as PVF2. This polymer is part of a class of materials known as fluorocarbons or fluoropolymers, which are characterized by high thermal stability and excellent chemical resistance

A thermo-cured system composed of specially formulated inhibitive primer, fluoropolymer color coat containing not less than 70% polyvinylidene fluoride resin by weight; complying AAMA 2605.

3.6 Core

Layer of material, having FR properties, which is bonded between two Aluminum faces.

3.7 bond, bonding

Adhesion between the face(s) and the core normally provided by an adhesive. The adhesion between the core and the faces of the panel has a fundamental role in the satisfactory performance of the panel. The surface preparation of the facing material shall be appropriate for the adhesive or the method of adhesion.

3.8 Adhesive

Any non metallic substance applied to the skin surface of the sandwich panel core that binds them together and resists their separation.

### 3.9 Protective film

An easy-to-peel film to protect the cladding system from the construction dust, stains or damages during transportation, fabrication, installation and handling.

### 3.10 Durability

Ability of the panel to withstand the environmental effects and accommodate the consequent decrease in mechanical strength with time caused by factors such as temperature, humidity, cycles and their various combinations.

## 4 Classification:

ACP is classified flame-retardant type by combustion performance:

- 4.1 ACP- B composed of low density polyethylene with at least 75% of mineral material.
- 4.2 ACP-A2 composed of at least 90% of mineral material with low density polyethylene or corrugated aluminum sheets.
- 4.3 ACP-A2 composed of corrugated aluminum sheets.

## 5 General Requirements

### 5.1 Requirements for materials

#### 5.1.1 Aluminum coil(sheet) :

Shall be alloy products with higher corrosion resistance and mechanical property (such as 3000 series, or 5000 series) with a minimum thickness of 0.5 mm. The Aluminum coil shall be treated with cleaning and chemical pretreatment to remove oil stain.

#### 5.1.2 Coating materials

For panel should be fluorocarbon resin with favorable weather resistance, or other coating materials with equivalent or outstanding performance.

*Note 1: fluorocarbon resin Polyvinylidene Fluoride (PVDF) is widely use at present, but pure PVDF resin should not be coated on the aluminum and it should be combined with other materials to change the coating performance, so it is called as 70% fluorocarbon resin.*



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### 5.1.3 Core Material

- Composed of low density polyethylene with at least 75% of mineral material (classified B).
- Composed of at least 90% of mineral material with low density polyethylene (classified A2).
- Corrugated aluminum sheets with minimum thickness of 0.2 mm (classified A2).

The core materials of ACP shall meet any of the following requirements for fire performance:

- Class B,A2, as per EN 13501-1

5.1.4 Composite binding film used between core material and aluminum product shall be fire retardant.

### 5.2 Dimensions and tolerance

5.2.1 Commonly used specifications and sizes of panel are as following:

- Length: 2000, 2440, 3000, 3200 mm.
- Width: 1220, 1250, 1500 mm.
- Minimum Thickness: 4 mm.

*Note: Length and width of panel shall be decided between relevant parties.*

5.2.2 The tolerances for length, width, straightness and squareness of edges shall Comply with the requirements listed in Table 1

Table 1: Tolerances for length, width, straightness and squareness of edges

Item	Tolerances
Length/mm	±3
Width/mm	±2
Thickness/mm	±0.2
Diagonal Line Differential/mm	≤5
Side Straightness/(mm/m)	≤1
Warp Degree/(mm/m)	≤5

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### 5.3 Aluminum skin physical properties

The below mentioned physical properties shall comply with the values specified in table 2

Table 2: Aluminum skin thickness and Coating Thickness values

Physical Properties	Test Method	Requirements
Thickness - Aluminum skin (top and bottom)	Caliper	≥ 0.50 mm
Tensile strength	ASTM E 08	≥170 MPA
Elongation %	ASTM E 08	≥ 7

*ASTM B209- Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate*

### 6 Performance requirements

The performance of ACP shall meet the requirements in Table 3

Table 3: Performance requirements

S/NO.	Property	Test method	Requirement
1	Thickness of panels	Calibrated Caliper	±0.2 mm
2	Weight of panels	Calibrated weighing device	± 5% from Declared value
3	Coating thickness	ASTM D 1400	≥25 μm
4	Abrasion resistance	ASTM D 968 (Method A)	≥ 50 L/mil
5	Pencil hardness	ASTM D 3363	≥ H
6	Coating Film adhesion	AAMA 2605 (Clause 7.4)	No loss of adhesion (0% failure)
7	Impact resistance	AAMA 2605 (Clause 7.5)	No removal of film from substrate
8	Shear strength	ASTM C 273	≥ 3.2 MPa
9	Gloss at 60°	ASTM D 523	± 5% from Declared value
10	Bend test	ASTM D 522	2T (No Cracks)
11	Peel off test	Peel off test (ASTM D903)	> 08 kg /25 mm for B > 11 kg /25 mm for A2
12	Panel tensile strength	ASTM E 08	≥50 MPa
13	Punch shear test	ASTM D 732	≥20 MPa

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14	Corrosion resistance: 1. Humidity resistance for 4000 hrs at 38°C and 100%RH in accordance with ASTM D 2247 or ASTM D 4585. 2. Salt spray resistance ASTM B 117	AAMA 2605	1. Humidity resistance: No formation of blisters to extent greater than "Few" blisters size #* as shown in Fig. 4 of ASTM D 714. 2. Salt spray resistance: Minimum rating of 7 on scribe or cut edges, and a minimum blister rating of 8 within the test specimen field in accordance with Table 1 & 2 of AAMA 2605 an
15	Weathering resistance	ASTM C 481 (Cycle A)	<ul style="list-style-type: none"> <li>• shear strength no effects when test as per ASTM C 273</li> <li>• film adhesion no effects when test as per AAMA 2605 (Clause 7.4)</li> <li>• Impact resistance no effects when test as per AAMA 2605 (Clause 7.5)</li> </ul>
16	Temperature for thermal deformation	ASTM D 648	≥100 ° C
17	Thermal conductivity	ASTM C 518	Declare value
18	Linear thermal expansion coefficient	ASTM D696	≥ 2.4 mm/m/c°
19	Reaction to fire classification	UAE fire safety code	Approval from DCD as per fire code

## 7 Other Metal Skin

Any other Metal skin such as Stainless Steel, Titanium ...etc shall meet the physical requirements.

## 8 Factory production control

The organization shall implement a factory production control (FPC) system to ensure that products placed on the market conform to the declared performance characteristics. The FPC system shall consist of procedures, inspections and tests to control all aspects of manufacture, from checking the incoming goods up to delivery and acceptance by client of the finished product. The FPC system shall cover as minimum the following:

- 8.1 Personnel – The organization shall be able to demonstrate that the personnel assigned to carry out tasks that will affect the quality and conformity of the finished product shall have appropriate competencies, responsibilities and authority.
- a) Tasks and responsibilities shall be documented;
  - b) Competencies and trainings records are maintained;
  - c) Training needs are identified and training plans are prepared and implemented.

*Note: Personnel requiring special qualifications shall satisfy the relevant requirements*

- 8.2 Equipment – The organization shall be able to demonstrate that equipment influencing the conformity of the components are, where appropriate, calibrated and/or verified, inspected, and maintained. Calibration, verification, inspection and maintenance procedures are documented and records are maintained.
- 8.3 Structural design process - In the case of structural design carried out by the manufacturer, the FPC system shall ensure compliance with the design brief, identify the procedures for checking the calculations and those individuals responsible for the design.

The records shall be sufficiently detailed and accurate to demonstrate that the manufacturer's design responsibilities have been carried out satisfactorily. A record

of the documents shall be retained for a period defined in the manufacturers FPC procedure.

- 8.4 Constituent products (raw materials) – The organization shall have a system for verifying and ensuring that constituent products conform to the specifications and related documented information are traceable, controlled, and maintained.

The specification for the constituent products (raw materials) used in manufacture shall be retained according to the manufacturer`s FPC procedures.

- a) Related procedures are established, documented and implemented;
- b) identification system and traceability are maintained;
- c) All related documented information are maintained.

- 8.5 Manufacturing process – The organization shall maintain detailed documented procedures.

- 8.6 Product evaluation - The organization shall establish procedures to ensure that the declared values and classes of all of the characteristics are maintained. The means of production control of characteristics and the sampling methods for a component or family to be evaluated shall be specified. If the component specification includes a prescribed inspection and test plan for component properties then those requirements shall be followed.

- 8.7 Non-conforming products - The organization shall have written procedures that specify how to deal with non-conforming products. Such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer`s written procedures.

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**9 Evaluation of Conformity**

- 9.1 Dubai Municipality – Dubai Central Laboratory Department (DCLD) is the designated Conformity Assessment Body for assessing conformity to this standard.
- 9.2 Conformity to this standard shall be evaluated through, the DCLD Factory Assessment Certification Scheme and the relevant DCLD Specific Rules for Certification.

## Bibliography

GBT 17748-2008	ACP standard
SASO 2752: 2018	Aluminum Composite Panel For External Cladding And Internal Finish
ASTM D 1400	Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base
ASTM D 968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 3363	Standard Test Method for Film Hardness by Pencil Test
AAMA 2605	High Standards for Coated Aluminum Extrusions and Panels
ASTM C 273	Standard Test Method for Shear Properties of Sandwich Core Materials
ASTM D 523	Standard Test Method for Specular Gloss
ASTM D 522	Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
ASTM D903	Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM E 08	Standard Test Methods for Tension Testing of Metallic Materials
ASTM D 732	Standard Test Method for Shear Strength of Plastics by Punch Tool
ASTM C 481	Standard Test Method for Laboratory Aging of Sandwich Constructions
ASTM D 648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
ASTM C 518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM D696	Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer