

ALUMINIUM COMPOSITE PANEL-PE SPECIFICATION

PRODUCT COMPOSITION:

Two sheets of aluminum sandwiching with a solid core of extruded thermoplastic Core material formed in a continuous co extrusion process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material.

Exterior / Face panel is Aluminum Sheet Coated with PE & HDPE and interior / Rear side of Panel will be available Mill Finish / Polyester Service Coat / Chromated.

Aluminum Face Sheets:

Aluminum Thickness : 0.35 mm (nominal)
Alloy : AA1000/1100 Series (PE & HDPE Painted material)

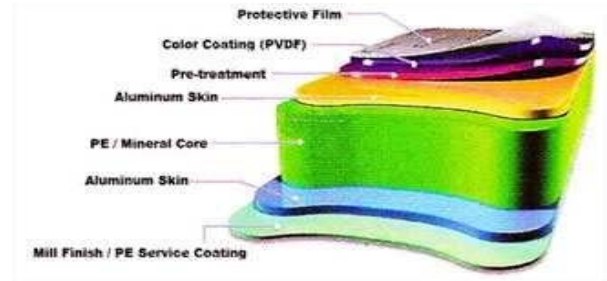
TYPICAL COMPOSITION OF ALUMINIUM COMPOSITE PANEL (DIAGRAMATIC REPRESENTATION)

THICKNESS ACP- PE:

4MM

PANEL WEIGHT:

4MM : 5.3 Kgs/m²



Product	Total Panel Thickness (mm)	Component Thickness (mm)			Aluminium	Core Material
		Top Skin Aluminum	Core PE	Bottom Skin Aluminum		
CITY PANEL ACP - PE	4	PE & HDPE Coated- 0.35mm	3.4mm	Polyester Coated -0.35mm	Alloy AA 1000/1100 - H16	Low Density Polyethylene Core

PRODUCT DIMENSION:

CITY PANEL ACP is available in various dimensions however our standard panel size is 4mm x 1250mm x 2400mm. Other available sizes are as follows:

Dimension	Unit	Standard	Size Available
Width	mm	1220-1250	1000 - 1550
Length	mm	2440	≤ 6000
Thickness	mm	4	3, 5 & 6

TOLERANCES:

1. Dimensional / Standard Size(Rounded)
 Thickness : 4MM±0.3mm and
 Width : +/- 2.0 mm
 Length : +/-3.0mm
2. PanelBow : Maximum 0.8% of any 1828mm (72") panel dimension.
3. Squareness : 5mm
4. Maximum deviation from panel flatness shall be 1/8" in 5'0" on panel in any direction for assembled units. (Non-accumulative - No Oil Canning)
5. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
6. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

PRODUCT PERFORMANCE (PHYSICAL PROPERTIES):

7. Bond Integrity

Bond integrity tested, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be neither adhesive failure of the bond a) between the core and the skin nor b) Cohesive failure of the core itself below the following values:

Peel Strength: 145.96 N mm/mm (32.8 in lb/in) as manufactured

Physical Properties	Method	Unit	ACP - PE	
			4MM	6MM
Weight	-	Kg/m ²	5.4	7.4
Specific Gravity	-		1.35	1.20
Linier Thermal Expansion at 100 °C	ASTM E228	x10 ⁻⁶ / °C	24	24
Thermal Conductivity	ASTM D976	W/(m.K)	0.43	0.4
Deflection Temperature	ASTM D648	°C	116	116

COMPARISON WITH OTHER BUILDING MATERIALS:

Physical Properties	ACP - PE	AL	FE	S.Steel	Concrete	Glass	Acryl Sht	Gypsum
Specific Gravity	1.2- 1.35	2.71	7.9	7.9	-	2.5	1.2	0.86
Linier Thermal Expansion (1m /50°C)	1.2mm	1.2mm	0.6mm	0.9mm	0.63mm	0.5mm	3.5mm	-
Thermal Conductivity - W/(m.K)	0.4 - 0.5	210	45	17	1.62	1	-	0.04

COMPARISON WEIGHT & RIGIDITY:

City Panel ACP Specific Gravity 1.25		Aluminum Specific Gravity 2.71			Stainless Steel Specific Gravity 7.89		
Thickness (mm)	Weight (Kg / M ²)	Thickness (mm)	Weight (Kg / M ²)	Weight Ratio %	Thickness (mm)	Weight (Kg / M ²)	Weight Ratio %
4 MM	5	3.3	8.9	62	2.4	18.9	29
6 MM	7	4.5	12.2	61	3.2	25.2	29

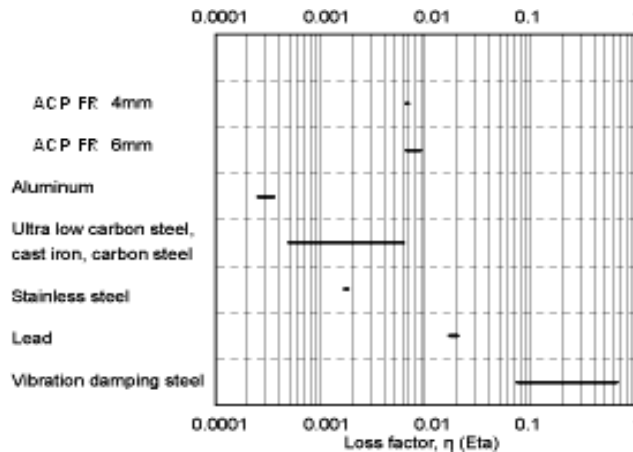
DEFLECTION TEMPERATURE:

CITY PANEL panel is having an approximate Deflection Temperature of 110°C. This characteristic proves the property of panel to resist boiling water. The City Panel ACP-PE has a temperature stability of -40°C to +80°C, and recommended heating temperature and duration for heating the Panels as follows.

- ❖ Heating less than 30 Mnts Max Temperature 90°C
- ❖ Heating more than 30 Mnts Max Temperature 70°C

VIBRATION DAMPING:

City Panel ACP has best vibration damping effect that absorbs mechanical energy arises out of vibration to convert it into thermal energy.



Above chart depicts Vibration damping property in comparison with other materials like Aluminum, Stainless Steel, Carbon Steel, Lead etc.

As seen in the Chart City Panel ACP has larger vibration loss than solid metals.

MECHANICAL PROPERTIES:

Properties of Skin

We are using Alloy 1000 series /1100 – H16 of about 99% pure aluminium which has best flexibility and corrosion resistance. 1000 series can be readily welded by the TIG and MIG processes.

MECHANICAL PROPERTY	METHOD	UNIT	ALUMINUM AA1100 – H16
0.2% Proof stress	ASTM E8	MPa	152
Flexural Elasticity	ASTM E8	GPa	70

Mechanical properties of ACP

City Panel-PE ACP is having the below mechanical properties as average:

Mechanical Property	Method	Unit	ACP - PE	
			4mm	6mm
Tensile Strength	ASTM E8	MPa	44	34
0.2% Proof Stress	ASTM E8	MPa	38	30
Elongation	ASTM E8	%	14	17
Flexural Elasticity , E	ASTM C393	GPa	40.1	29
Flexural Rigidity, E x 1	ASTM C393	kNmm ² /mm	138	348
Punching Shear Strength	ASTM D732	N/ mm ²	25	22

BENDING LIMIT:

We can bend the ACP-PE in a Press Break or 3 roll Bending machine. Normally the smallest radius which we can apply to bend the panel without wrinkles at the radial surface of panel is termed as the bend radius. In 3 roll machine the bending diameter depends on the roll diameter, length and type of machine. Smallest bending radius (Parallel in Press Break Machine).

Thickness	ACP/PE
4mm	120 mm

THERMAL CONDUCTIVITY:

Compared to solid materials, the ACP-PE panel has a lower thermal conductivity the table below shows the thermal conductivity comparison of different materials.

Material	Thermal Conductivity(W/(mK))
ACP/PE 4mm	0.4- 0.5
Aluminium	205
Steel	50.2
Polyurethane	0.02
Glass Wool	0.04
Brick	0.28
Concrete	0.8
Gypsum Board	0.13
Air at 0°C	0.024

HEAT TRANSMISSION:

City Panel ACP-PE panels reduce the Heat transfer from the outer air to the inner air. The air gap between the Panel and the wall increases the thermal insulation. The heat transmission coefficient (U- Value) 4MM ACP fixed wall system is given below.

Type of panel Cladding	100 air Gap 115mm Brick wall	75air Gap 25mm Glass wool 115mm brick wall
ACP /PE 4mm panel	1.46 W/m ² K	0.85 W/m ² K

COATING FINISHES:

1. Aluminum Coil alloy (1000 Series) coated with Polyester (PE) and High Durable Polyester (HDPE) paint. PE & HDPE Coating system offers one, two or Three Layer coating depending on color selection such as Metallic colors and Normal RAL Colors. Metallic Colors are normally two & Three (3) coat system consisting Primer, Color and Clear Top coat. Normal RAL colors usually have one & Two (2) coat system composed of inhibitive Primer and Color Coat; in conformance with the following general requirements of AAMA 620.

a. Color:

Generally we are manufacturing ACP with various options of color coating, basically we have Four different types of colors such as: Solid / Enamel Colors, Metallic Colors, Natural Finishes (Stone & Timber) and Sparkling Colors.

- 1) Standard color as selected by the owner / architect / engineer.
- 2) Custom colors as per customer requirement.
- 3) Clear coat over pretreated natural and brushed aluminum substrates.

b. Dry Film Thickness:

- 1) Metallic (2 Layer) : 28 micron (minimum)

c. Gloss at 60° : 25 – 80%

d. Color Retention

- ASTMD-2244 : Max 5 Units (Accelerated Test 4000 Hrs)

e. Gloss retention :

- f. ASTM D523-89 : minimum 70% after 4000 Hrs

g. Hardness:

- ASTMD-3363 : 2H

h. Impact:

- ASTMD-2784 : No Breakage / Loss of Paint

i. Adhesion:

- ASTMD-3359, Dry : No Removal (1 mm x 1mm Cross hatch)
Wet : No change at after 37.8 formulated °C, for 24
1hr Boiling water: at 100°C 20 min, No change

- j. Abrasion Resistance
ASTMD-968 : Passed (Sand Falling / Sand blasting)
- k. Humidity Resistance
ASTMD-714 : 3000 Hrs (RH 100 % at 35°C)
- l. Salt Spray Resistance:
ASTMB-117 : 3000 Hrs (5% NaCl solution at 35°C)
- m. Chemical Resistance:
 - 1) ASTMD-1308 : 10% Muriatic Acid for an exposure of 15 minutes.
No visual change viewed by unaided eye
 - 2) ASTM D-1308 : 20% Sulfuric Acid for an exposure of 18 hours.
No visual change when viewed by unaided eye.
- n. Mortar Resistance (AAMA 605.2): No Change
- o. Detergent Resistance
ASTMD2248-93 : No Change (Detergent, 3% solution, 38°C, 72hrs)
- p. Chalk Resistance
ASTMD 4214 : Max 8 Units (Accelerated Test 4000 Hrs)
- q. Bend ability : 1T – 2T

PANEL CORE:

The core of CITYPANEL-PE panels is Low Density Polyethylene from local market LDPE offers better melt flow characteristics. This gives more flatness and fabrication easiness to the panel.

PANEL STRENGTH:

The panels used for the external cladding must with stand the wind load. This wind load will cause deflection of the panels and if the deflection is small the panel will not deform.

The permanent deformation of the panel is calculated by 0.2% yield stress divided by the safety factor. In the calculation we are assuming that the total strength of the panel is the strength of the Aluminium skins. If the calculated 2% proof stress is greater than the permissible, normally the panel is strengthened by giving additional stiffeners. The other factors affecting the strength of the panel are:

1. Panel thickness, width and length
2. Supporting conditions.
3. Wind load

STRENGTH OF SUBSTRUCTURE:

The sub structure where we are installing the panels should take care the wind load and the panels. The strength of the substructure depends on the material and section of the structure, anchoring intervals of sub structure and wind pressure. The maximum deflection on the sub structure must be smaller than the 0.5% of supporting intervals.