TECHNICAL DATA BULLETIN

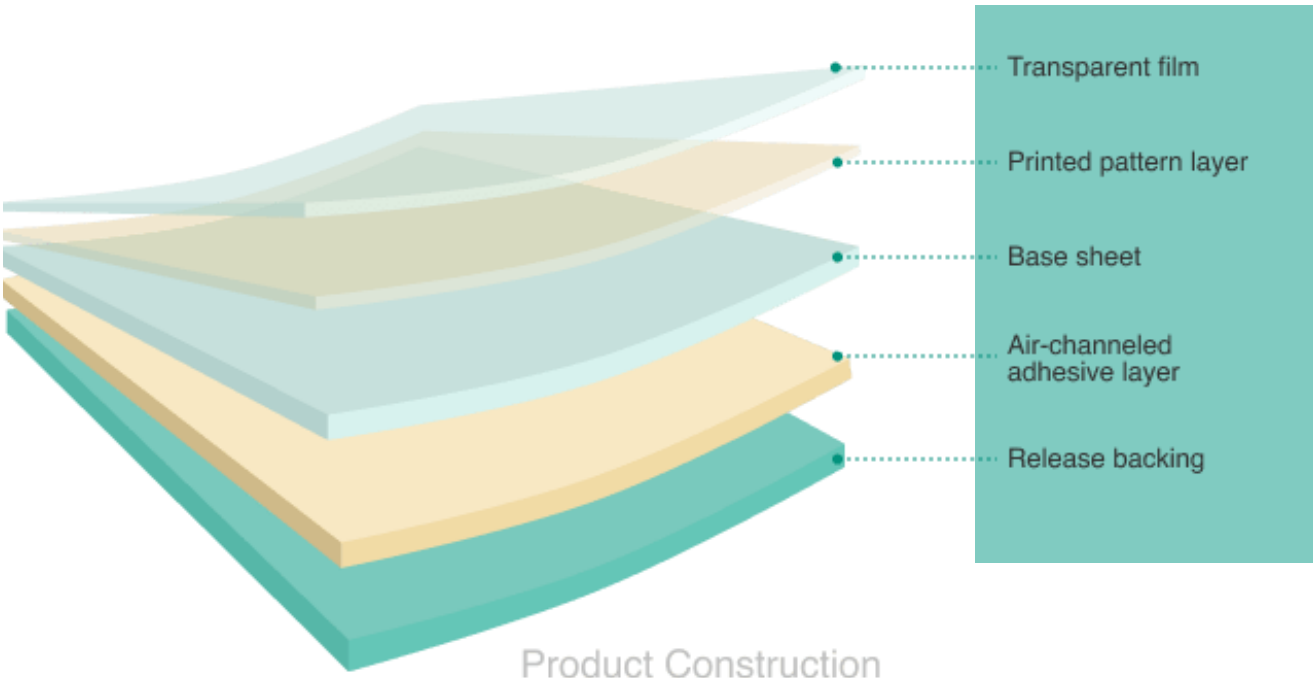
Bodaq is an architectural decorative vinyl film wrap that is self-adhesive, stretchable, lightweight, durable, and designed for interior applications. It uses an acrylic adhesive with grid grooves for air bleeding, which allows air bubbles to be released along these grooves. This feature enables the film to be quickly and easily affixed to large or complex surfaces, ensuring a smooth and professional finish.

PRODUCT SPECIFICATIONS

- **Roll Specification**: weight - 65 lbs; width - 48”; length - 164 ft.
- **Film Thickness**: 0.2 mm (8 mil (8/1000 inches)
- **Composition**: PVC (Polyvinyl Chloride)
- **Manufacturer**: Hyundai Living & Culture Department of Hyundai Group, South Korea

PRODUCT STRUCTURE

Bodaq is a printed film with the adhesive backing.



Note: The actual structure and materials may vary slightly between series.

- **Transparent Film**: Provides a protective and clear top layer.
- **Printed Film Layer**: Made of vinyl-chloride plastic, imitates materials such as wood, marble, concrete, brick, paint, metal, and fabric.
- **Base Sheet**: Supports the structural integrity of the film.
- **Air-Channeled Adhesive Layer**: Made from acrylic plastic (PMMA), ensures easy, bubble-free application; PMMA is strong, lightweight, and free from harmful bisphenol-A subunits.
- **Release Backing**: Protects the adhesive layer, ensuring the film remains in perfect condition until application.

APPLICATION ENVIRONMENT

- **Optimal Film Application Temperature Range**: 12°C to 38°C (54°F to 100°F)
- **Low Temperatures** may cause adhesive failure or film swelling. Avoid cutting film as it may split.
- **High Temperatures**: Film becomes more flexible and difficult to apply.
- **Adhesive Performance**: improves gradually post-application, reaching optimal strength in 3 to 7 days.

STORAGE & DELIVERY CONDITIONS

For storage and delivery, stack cartons (film roll packages) with labels facing the same direction. Do not stack more than 7 cartons high or more than 1 pallet.

Avoid dropping cartons to prevent edge damage or cracking. Store the product indoors in a clean, dry place, away from direct sunlight and moisture, and at temperatures below 38°C. Do not expose the product to outdoor weather conditions. Designed for interior use only, the product should be used within one year.

When storing rolls, tightly roll and tape them by hand to prevent unrolling. If the film loosens, the release paper may detach from the film.

SUSTAINABILITY CERTIFICATIONS

Hyundai L&C's sites acquired environmental management system ISO 14001 and health safety management system KOSHA/K-OHSMS/OHSAS 18001 certification.

Bodaq Interior Film is an ***eco-friendly solution***:

It is free from harmful heavy metals (lead, cadmium, mercury, hexavalent chromium, etc.).

Formaldehyde (HCHO), the substance that causes sick house syndrome, is not released.

Minimized release of volatile organic compounds (TVOC, toluene, etc.).

It has excellent antimicrobial and anti-mold properties

It meets the safety requirements for hazardous chemicals in the Common Safety Standards of Children's Products.

Bodaq carries **Eco-Friendly** certification for its ability to abide by the most stringent standards for the minimized release of volatile organic compounds (VOCs).

Bodaq Interior Film has obtained the **Atopy Safety Mark** from the Korea Atopic Association as a building material that does not emit such harmful substances as formaldehyde, toluene, benzene, and styrene, which can cause atopic dermatitis and aggravation.

Carbon Footprint Mark reveals how much carbon dioxide was produced during the full life cycle of a product - in its manufacture, transport, use, and disposal. Bodaq Interior Film is acknowledged by the Environmental Product Declaration in accordance to 'Environmental Technology and Industry Support Act.' GWP: 1.96 kg CO2 eq./m2

Bodaq Interior Film satisfied the Group Standard Certification Criteria of Korea Air Cleaning Association which is certified by **Healthy Building Material** Certificate.

Korea Eco-Label granted by Korea Environmental Industry and Technology Institute, a state-run eco-labeling body, recognized Bodaq Interior Film as an eco-friendly product that uses less raw materials and energy, and generates less pollution compared to other products with the same function.

FIRE SAFETY

Bodaq Interior Film meets a high Class A (Class I) fire and smoke ratings - the lowest fire spread rate and minimal smoke production. This means that Bodaq can be installed in high-risk areas - airports, elevators, healthcare facilities, hospitality amenities, transport, etc.

Test Method:

- ASTM E-84 Standard Method of Test for Surface Burning Characteristics of Building Materials, which is an equivalent to UL723 Standard Test Method for Surface Burning Characteristics of Building Materials

Result:

- Bodaq finishes meet Class I or A rating

Test Method:

- KS F 2271:2016 Testing method for incombustibility of internal finish material and element of buildings

Result:

- Incapacitation time - 14.9 min

Note: The test was conducted under the following conditions: Heat condition - sub heater: 3 min, main heater: 3 min. Environmental condition: (20.0 ± 1.0) Co, (52 ± 1)% R.H.

Test Method:

- DIN 4102-1 Test of Flame Retardancy - fire behavior of building materials and elements

Result:

- Building material class B1 Not easily flammable

Note: For this test method Bodaq withstood the test specified in DIN 4102-16 using the ‘Brandschacht’ apparatus specified in DIN 4102-15

Bodaq has been approved by Korea Fire Industry Technology Institute as a **flame retardant material** in accordance with the provisions of Article 36-1, 37-1 of the Fire Facility Establishment Maintenance and Safety Supervision Law, and Article 9, 12-1 of the Fire Service Equipment Type Approval Enforcement Regulation.

ELEVATOR SAFETY COMPATIBILITY

Bodaq Interior Film is TSSA, ASME A 17.1 in the USA and CSA B44 in Canada approved.

ADHESIVE STRENGTH

Test Method:

- KS T 1028:2018 Test method of pressure-sensitive adhesive tapes and sheets

Result:

- 10.72 N units/mm
- 180o peel adhesive strength (after normal state 30 min) - 7.83 N units/mm
- 180o peel adhesive strength (after normal state 24 hr) - 10.29 N units/mm
- 180o peel adhesive strength (after aging test) - 6.71 N units/mm

Note: A piece of Bodaq was applied to the steel surface and then was peeled off at 5 mm/s at a 180o angle.

ANTIMICROBIAL ACTIVITY & EFFICACY

Test Method:

- JIS Z 2801:2010 Test for Antimicrobial Activity of Plastics tests the ability of a material to inhibit the growth of microorganisms or kill them. The procedure is very sensitive to antimicrobial activity. This test method has been adopted as an ISO procedure - ISO 22196.

Result:

- Value of antimicrobial activity: 1.0 - 1.1 log
- Antimicrobial efficacy shows if the product is sufficient to kill microorganisms: the value of antimicrobial activity should not be less than 2.0 log

Note: The solutions were fixed at (35 ± 1) Co , 90% relative humidity for 24 hours, and determine bacteria cell growth inhibition rate by pour Agar plate method. Test Bacteria: Staphylococcus aureus ATCC 6538P and Escherichia coli ATCC 8739. Value of antimicrobial activity after 24 hours: 1.0 and 1.1 respectively.

ABRASION RESISTANCE

Test Method:

- KS M ISO 9352:2013(2018) Determination of resistance to wear by abrasive wheels. International equivalent: ISO 9352 : 2012(R2017)

Result:

- 15.1 mg weight loss

Note: Abradant type - CS-10; applied weight - 1000 g; test cycles - 1000 cycles; weight loss after 1000 cycles abrasion.

STAIN RESISTANCE

Bodaq showed no change and damage after standing for 24 hours in the following reagents: 5% Acetic Acid, Acetone, 5% Ammonia water, coffee, 0.5% detergent, Ethanol, milk, olive oil, water, soy sauce, cola, wine vinegar, 100% Hydrochloric Acid, 5% Sodium Carbonate, 5% Sodium Chloride.

SCRATCH RESISTANCE

Test Method:

- ASTM D3363-05(2011)e2 Standard Test Method for Film Hardness by Pencil Test

Result:

- SI units 3H

Note: The test was conducted with a Mitsubishi pencil, 750 g

This test method covers a procedure for determination of the film hardness of an organic coating on a substrate in terms of drawing leads or pencil leads of known hardness. This test method is similar in content (but not technically equivalent) to ISO 15184 Determination of film hardness by pencil test.

STRETCHING CAPABILITIES

Test Method:

- KS T 1028 : 2009 Test method of pressure-sensitive adhesive tapes and sheets

Result:

- Tensile breaking elongation (transverse/width direction) - 220%;
- Tensile breaking elongation (machine/height/grain direction) - 80%

TEAR RESISTANCE

Test Method:

- KS M 3505 : 2010 Polyvinyl chloride films for agriculture

Result:

- Right angle tear load (machine/height/grain direction) - 18.8 N units
- Right angle tear load (transverse/width direction) - 21.0 N units

Test Method:

- KS T 1028 : 2018 Test method of pressure-sensitive adhesive tapes and sheets

Result:

- Tensile strength (transverse/width direction) - 42.9 N units/10 mm
- Tensile strength (machine/height/grain direction) - 60.2 N units/10 mm

PHTHALATES CONTENT

Test Method:

- KS M 1991 Determination of phthalates contents in polymer materials

Result:

- DBP (Di-N-Butyl Phthalate), BBP (Butyl Benzyl Phthalate), DEHP (Di (Ethylhexyl) Phthalate), DNOP (Di-N-Octyl Phthalate), DINP (Di-Isononyl Phthalate), DIDP (Di-Iso-Decyl Phthalate) - less than 50 mg/kg (detection limit: 50 mg/kg)

HEAVY METALS CONTENT

Test Method:

- IEC 62321-5 : 2013 Determination of Cadmium and Lead by ICP-OES (inductively coupled plasma optical emission spectrometry)

Result:

- Cadmium (Cd) - not detected
- Lead (Pb) - not detected

Test Method:

- IEC 62321-4 : 2013 Determination of Mercury by ICP-OES (inductively coupled plasma optical emission spectrometry)

Result:

- Mercury (Hg) - not detected

Test Method:

- IEC 62321 : 2008 Determination of Hexavalent Chromium by spot test/Colorimetric Method using UV-Vis

Result:

- Hexavalent Chromium (Cr VI) - not detected

Test Method:

- Test method of environmental hazards (National Institute of Environmental Research notice No. 2019-32)

Result:

- Lead (Pb), Cadmium (Cd), Chromium(6+) (Cr+6), Mercury (Hg) - not detected (detection limit: 5 mg/kg)

PBBs* & PBDEs* Content

**Polybrominated Biphenyls and Polybrominated Diphenyl Ethers*

Test Method:

- IEC 62321-6 : 2015 Determination of Polybrominated Biphenyls and Polybrominated Diphenyl Ethers in polymers by GC-MS (gas chromatography-mass spectrometry)

Result:

- Mono Brominated Phenyl, Dibro Brominated Phenyl, Tri Brominated Phenyl, Tetra Brominated Phenyl, Penta Brominated Phenyl, Hexa Brominated Phenyl, Hepta Brominated Phenyl, Octa Brominated Phenyl, Nona Brominated Phenyl, Deca Brominated Phenyl - less than 5 mg/kg (detection limit: 5 mg/kg)
- Mono Brominated Diphenyl Ethers, Dibro Brominated Diphenyl Ethers, Tri Brominated Diphenyl Ethers, Tetra Brominated Diphenyl Ethers, Penta Brominated Diphenyl Ethers, Hexa Brominated Diphenyl Ethers, Hepta Brominated Diphenyl Ethers, Octa Brominated Diphenyl Ethers, Nona Brominated Diphenyl Ethers, Deca Brominated Diphenyl Ethers - less than 5 mg/kg (detection limit: 5 mg/kg)