

Bodaq Technical Data Bulletin

Bodaq is an architectural decorative film that is a self-adhesive, stretchable, lightweight, durable, high-quality finishing material made for interior applications.

Bodaq is applied using an acrylic type adhesive, which has an adhesive surface with grid grooves for air-bleeding air bubbles between the film and the substrate. The air bubbles are released along these grooves, enabling the film to be quickly and easily affixed to large or complex surfaces.

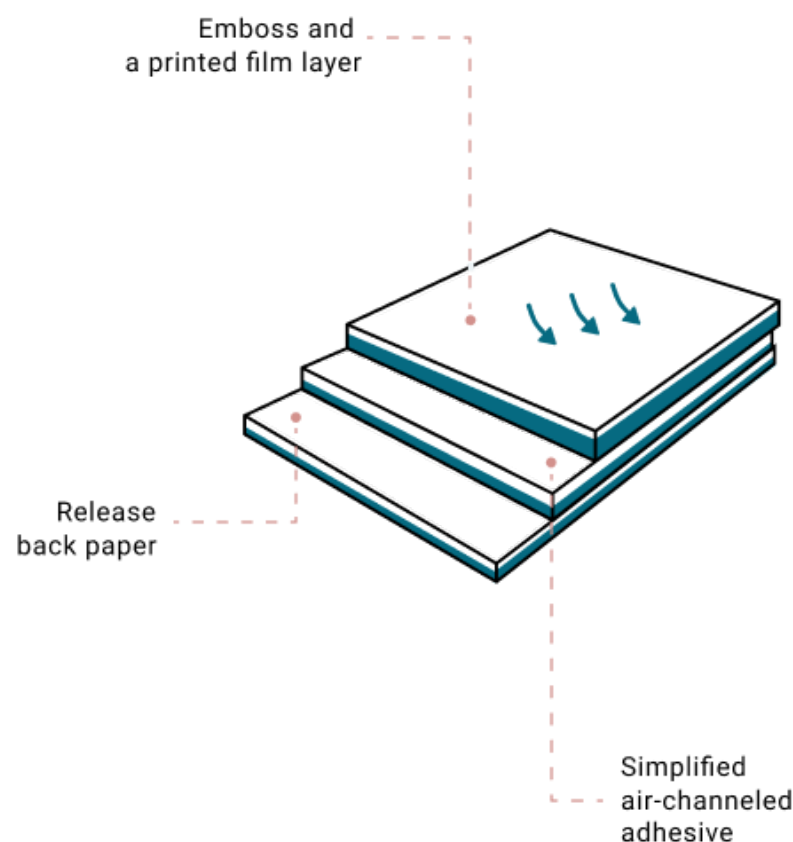
Product Specifications

- 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 structures and materials may be slightly different from each series.

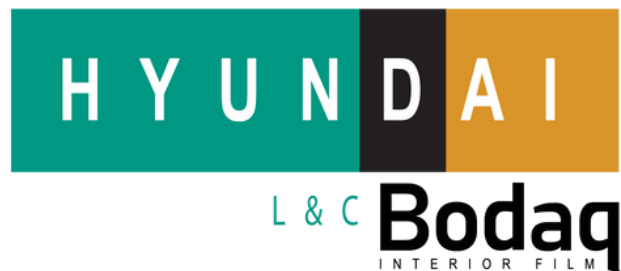


Storage and Delivery Conditions

- For storage and delivery, stack cartons (film rolls packages), so that their labels face the same side. Do not stack more than 7 cartons, and do not stack more than 1 pallet.
- Do not drop cartons, the edge of the product may crack or damage.
- The product should be stored indoors in a clean place with a temperature under 38 C°, and away from direct sunlight and moisture. The product must not be exposed to weather conditions in the open air. The product was designed for interior use only. Use within one year.
- When storing rolls, prevent them from unrolling by tightly rolling and taping them by hand. If stored film loosens on the roll, the release paper may detach from the film.

Application Environment

- Optimal film application temperature: 12 C° ~ 38 C° (54 F ~ 100 F).
- When the temperature is too low, there may be adhesive failure or film swelling.
- When the temperature is too high, the film may be difficult to apply because it becomes more flexible.
- Do not cut the film under the low temperature conditions, as it may split.
- Adhesive performance improves gradually after application, and reaches its best strength in 3 ~ 7 days.



Eco-Friendly 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 meets the Safety Standard (KF mark standard) applied to wallpaper and paperboard
- It meets the safety requirements for hazardous chemicals in the Common Safety Standards of Children's Products
- It has excellent antimicrobial and anti-mold properties



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.



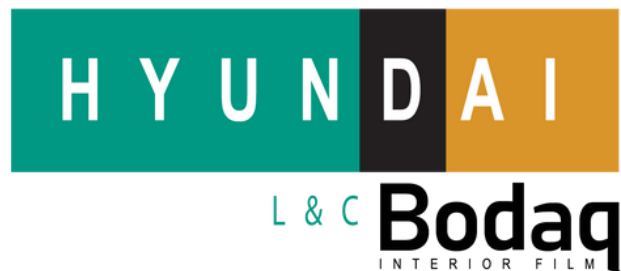
Carbon Footprint Mark reveals how much carbon dioxide was produced during the full life cycle of a product - in its manufacture, transport, use, and disposal. Bodaq Interior Film is acknowledged by the Environmental Product Declaration in accordance to "Environmental Technology and Industry Support Act" 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. This certification, 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: $(20.0 \pm 1.0) ^\circ\text{C}$, $(52 \pm 1)\% \text{ R.H.}$

Test Method:

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

Result:

- Building material class B1 Not easily flammable

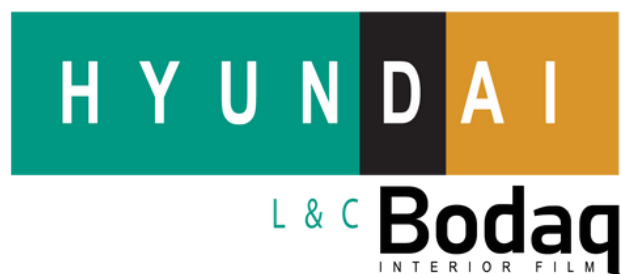
Note: For this test method Bodaq withstood the test specified in DIN 4102-16 using the 'Brandschacht' apparatus specified in DIN 4102-15

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.

The code makes specific requirements to address issues of fire resistance, structural integrity, and electric shock in the elevator cab. The American Society of Mechanical Engineers (ASME) reviews the standards regularly. The Code has been last revised in 2019 implementing some changes to door requirements, seismic requirements, etc.



Adhesive Strength

Test Method:

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

Result:

- 10.72 N units/mm
- 180° peel adhesive strength (after normal state 30 min) - 7.83 N units/mm
- 180° peel adhesive strength (after normal state 24 hr) - 10.29 N units/mm
- 180° 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 180° 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) C°, 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)

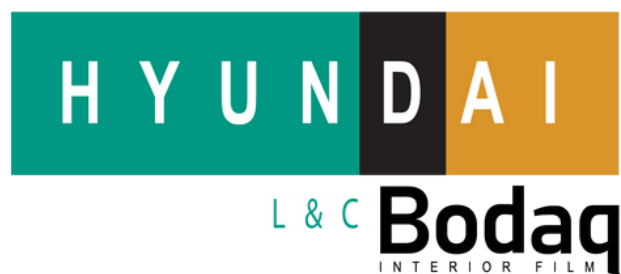
Result:

- 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+) (Cr⁶⁺), Mercury (Hg) - not detected (detection limit: 5 mg/kg)

PBBs (Polybrominated Biphenyls) and PBDEs (Polybrominated Diphenyl Ethers) Content

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)