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The background of the slide features a close-up photograph of a modern architectural interior. It shows curved, light-colored wooden panels and metallic, sculptural elements. A large, bright blue triangle is superimposed on the right side of the image, pointing towards the bottom right corner.

Architectural Finishes

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Architectural Finishes

Presented by: 3M Commercial Solutions Division
3M Center
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Description: Sometimes a design finish cannot be achieved within a certain budget or time frame. While not intended to be a substitute for real materials in every situation, architectural finishes mimic the aesthetics of natural and other materials. This course discusses the uses, manufacturing process, performance characteristics, selection considerations and proper installation techniques of architectural finishes.

Purpose and Learning Objectives

Purpose: Sometimes a design finish cannot be achieved within a certain budget or time frame. While not intended to be a substitute for real materials in every situation, architectural finishes mimic the aesthetics of natural and other materials. This course discusses the uses, manufacturing process, performance characteristics, selection considerations and proper installation techniques of architectural finishes.

Learning Objectives: At the end of this program, participants will be able to:

- identify appropriate uses of architectural finishes in projects where budget and time restraints are a concern
- define expected performance characteristics for architectural finishes, such as being lightweight, non-hazardous, flexible, and durable
- describe proper substrate and primer use and preparation for a proper installation, and
- explain the application process for a successful, lasting product, including the importance of cleaning and proper adhesion.



Introduction to Architectural Finishes

Introduction to Architectural Finishes

Architectural finishes are used by designers and architects around the world as a decorative material. These materials are available in a range of designs that mimic the aesthetics of natural and other materials at a fraction of the price, and offer excellent durability and performance characteristics.

The use of architectural finishes can give you almost unlimited creative freedom in new construction, and they are easily converted (cut) and applied on site for cost-effective refurbishment and repair options.

Architectural finishes can be used in a wide array of projects on walls, fixtures, elevators, doors, and furniture, and are found in a multitude of structures from airports and hospitals to retail and ships.



Architectural Finishes

As the name implies, architectural finishes help “finish” a surface when applied to a substrate. Architectural finishes have a wide variety of attributes including:

- off-site or on-site application in a controlled environment
- different types of finishes available, from opaque to clear, and
- flexibility of form, from rigid finishes to conformable finishes.

Conformable finishes are quite pliable. They are usually delivered as sheet goods, typically in a roll, and are hand-applied. Flexible finishes, on the other hand, are capable of being bent or flexed, but are susceptible to being influenced or changed. Plastic laminates are an example of a flexible finish.

CSI Categories: Architectural Surfacing

Within the CSI specifications, this product category best fits under Division 9 - Finishes. It will likely be associated with several other sections depending upon the substrate it is being applied to (i.e., doors, frames, gypsum board walls, MDO, MDF, etc.)

Located within Division 9: Finishes

Sections within Division 09- (Masterformat™ 2004 Edition):

- *10 Unassigned*
- *20 Plaster and Gypsum Board*
- *30 Tiling*
- *40 Unassigned*
- *50 Ceilings*
- *60 Flooring*
- *70 Wall Finishes*
- *80 Acoustic Treatment*
- ***90 Painting and Coatings***

CSI Categories: Architectural Surfacing

Under the Painting and Coating subsection, architectural finishes fit best under Decorative Finishing. There are many advantages to specifying this product, but the primary purpose is as a decorative coating over a substrate.

We have introduced architectural finishes, what they do, and where they fit in the CSI. Now, let's go back and discuss the history of the product and why it was originally developed.

Masterformat™ 2004 Edition

Division 9: Finishes

09 84 33 Sound-Absorbing Wall Units

09 84 36 Sound-Absorbing Ceiling Units

09 90 00 Painting and Coating

09 91 00 Painting

09 91 13 Exterior Painting

09 91 23 Interior Painting

09 93 00 Staining and Transparent Finishing

09 93 13 Exterior Staining and Finishing

09 93 13.13 Exterior Staining

09 93 13.53 Exterior Finishing

09 93 23 Interior Staining and Finishing

09 93 23.13 Interior Staining

09 93 23.53 Interior Finishing

09 94 00 Decorative Finishing

09 94 10 Architectural Surfaces

09 94 13 Textured Finishing

09 94 16 Faux Finishing

09 94 19 Multicolor Interior Finishing

09 96 00 High-Performance Coatings

09 96 13 Abrasion-Resistant Coatings

09 96 23 Graffiti-Resistant Coatings

09 96 26 Marine Coatings

09 96 33 High-Temperature-Resistant Coatings

History

The original purpose for the development of architectural finishes was for automobiles. The founding company that developed this high-quality product was formed in the 1930s and made high-quality, durable appliquéés that gave metal automobile parts the aesthetic appeal of the old world. Soon, its films were replacing burl walnut instrument panels on luxury cars. A few years later, the films migrated to car exteriors. Among other applications, they replaced the wood panels on the long taxis at train and bus stations. These were called station wagons or, informally, “woodies.”



History

This use of the product for faux wood grain applications continued for the automotive industry into the 1960s before styles changed. During this time, Japan adopted the product for use in many applications beyond the automobile for several reasons: the country lacked natural wood resources, the light weight of the material easily addressed earthquake design considerations, and the desire for surfacing refurbishment was high.



History

Manufacturing of this product was moved to Japan after the popularity of the woodies subsided in the U.S. Currently, all the major manufacturers producing this type of product are located in Japan.

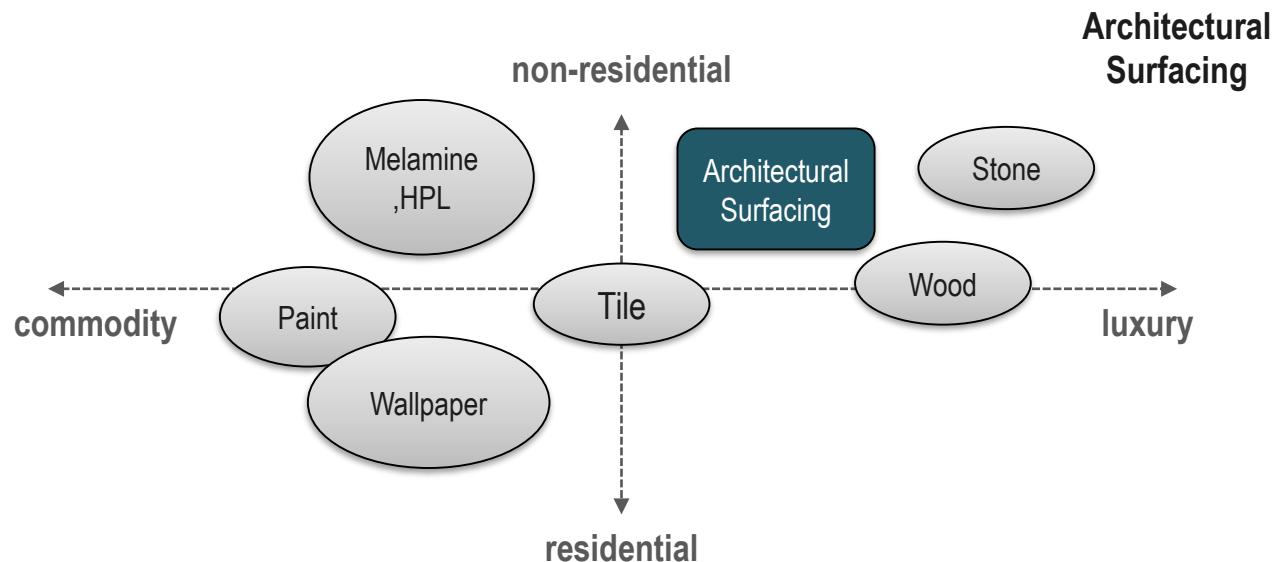
In the 1990s, the product was re-introduced into the U.S.



Why Use Architectural Finishes

Where do architectural finishes fit among the many other finish products today? While not intended to substitute for real materials in every situation, these finishes allow an architect or interior designer to achieve a design intent when budget and/or timing won't allow for more expensive or longer lead time materials, or to allow the useful life of existing finishes to be extended.

Architectural finishes are typically an update from high pressure laminate (HPL) and other faux finishes, and are generally intended for the commercial markets.



Benefits of Using Architectural Finishes

Selecting architectural finishes over alternative materials will depend on the situation. The many advantages are highlighted in the table below.

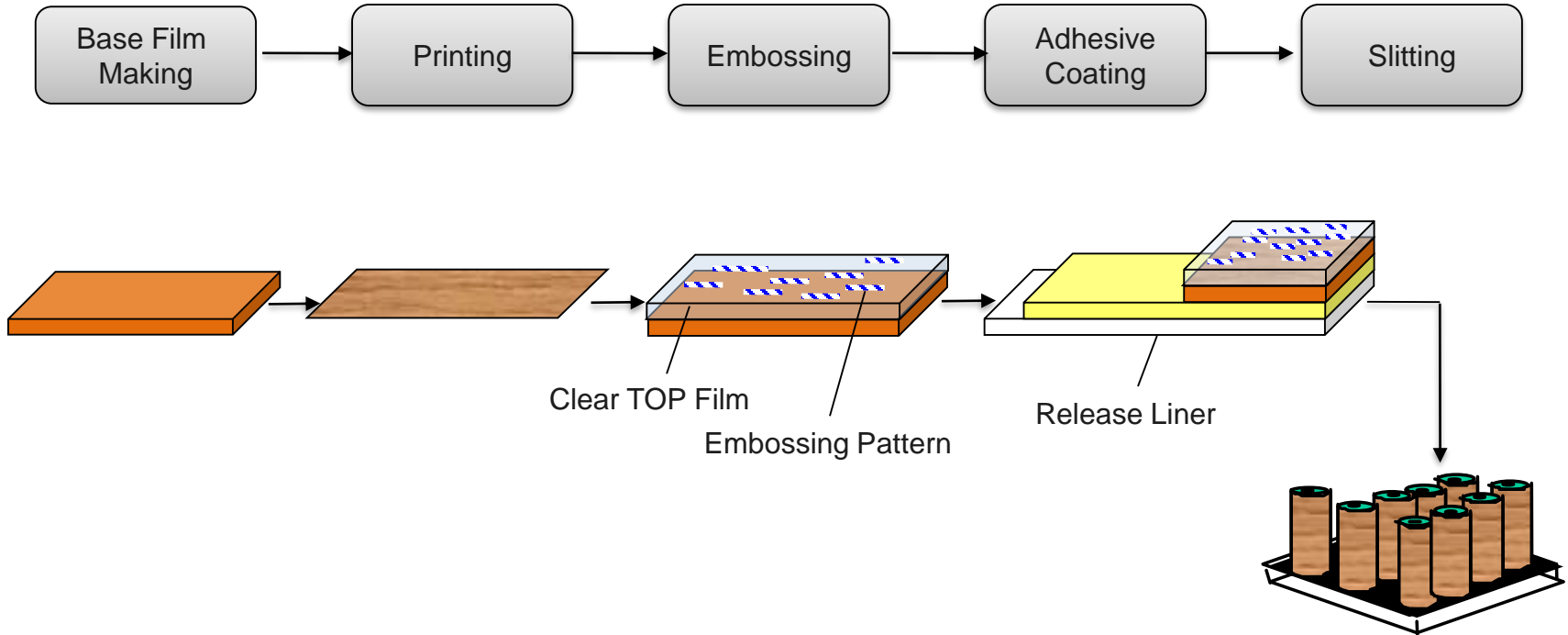
Features	Advantages	Benefits
Flexible film	<ul style="list-style-type: none">• Conformable• Repairable	<ul style="list-style-type: none">• Design creativity for many shapes• Scratches, mars, and dings can be patch-repaired onsite
Pressure-sensitive adhesive	<ul style="list-style-type: none">• Ease of installation	<ul style="list-style-type: none">• Quieter and faster refurbishments• Lessen landfill impact by refurbishing existing surfaces
Low odor/VOC	<ul style="list-style-type: none">• Limited smells/fumes	<ul style="list-style-type: none">• Can be applied during business hours
Embossed overlaminate	<ul style="list-style-type: none">• Textured feel	<ul style="list-style-type: none">• Differentiates from laminates and simulates real materials
Hundreds of available designs	<ul style="list-style-type: none">• Design flexibility on a budget	<ul style="list-style-type: none">• Match existing finishes, or achieve new design intents• Cost-effective alternative to variety of materials
Class A fire rating	<ul style="list-style-type: none">• Meets safety requirements	<ul style="list-style-type: none">• Peace of mind
Non-hazardous	<ul style="list-style-type: none">• Can be disposed of in normal trash	<ul style="list-style-type: none">• No hazardous material disposal cost
Light weight	<ul style="list-style-type: none">• Addresses weight limitations in certain applications	<ul style="list-style-type: none">• Enables new looks without cost of heavier materials

Manufacturing and Characteristics

The background of the slide is a complex, abstract geometric pattern composed of numerous overlapping triangles in various shades of blue and cyan. The triangles vary in size and orientation, creating a dynamic and modern visual effect. The text 'Manufacturing and Characteristics' is prominently displayed in the upper left quadrant in a clean, white, sans-serif font.

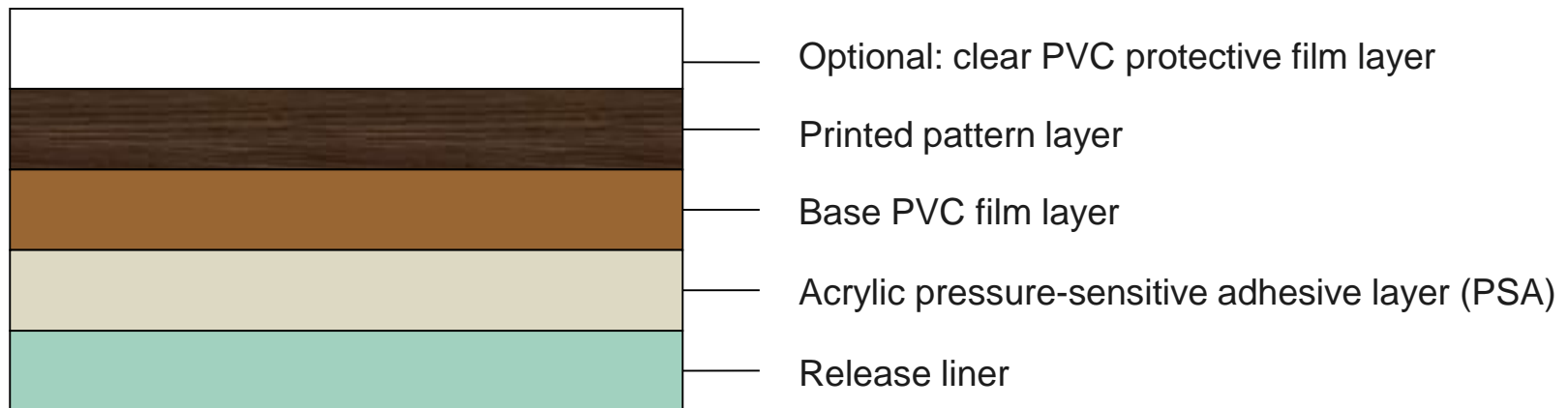
Primary Manufacturing Process

Architectural surfaces manufacturing is composed of these typical steps.



Architectural Finish Construction

Here is a view showing a cross-section of the typical construction. Each of these layers has unique properties to consider.



Characteristic	Typical Values
Material	Vinyl (most finishes)
Form	Generally 48" or wider; roll length may vary
Thickness	6–8 mils
Weight	Approximately 40–44 lbs

Product Composition: Base PVC Film Layer

Currently, most base materials are composed of vinyl due to its performance in fire, durability, and conformability. Some versions are offered in polyolefin. Each material has its own advantages and disadvantages.

Vinyl

- two simple building blocks—chlorine (57%) from common table salt—used in a closed process, and ethylene (43%) from natural gas. Less petroleum usage: 50% NaCl.
- good fire performance (meets NFPA requirements)
- durable
- efficient manufacturing processes
- conformable

Polyolefins/Polyalkenes

- less stringent disposal requirements
- less design choice
- less conformable

Product Composition:

Printed Pattern Layer and Film Layer

The printing and embossing will determine the look and feel of this material. For wood grains, for instance, it will determine how similar it looks compared to the original natural material, and will also determine its physical characteristics: UV resistance, abrasion resistance, stain resistance, etc.

Printed Pattern Layer

- for patterns, whether they match and how often they repeat is critical

Top Layer

- the composition and thickness of this layer will determine:
 - type of protection (UV, abrasion resistance, stain resistance, etc.)
 - the embossing pattern and depth

Installation

Proper installation is essential to the success of the product. If the substrate is not properly prepared, or the installation has trapped air bubbles, the installed product could be considered a failure. One trapped air bubble or any adhesive failure would reveal that the material is a substitute. Therefore, it is critical to set installation up for success and use a qualified installer.

Two components work together to ease the installation process:

1. Acrylic PSA (Pressure-Sensitive Adhesive)
 - noting patterns and how they match and repeat is critical
2. Air Bleed Technology/Release Liner
 - air bleed technology allows air to escape during application, minimizing the trapping of air bubbles

Expected Performance Life

Expected performance life is not the same as warranty and will vary depending upon exposure (review the expected performance life with the manufacturer). You can expect the following:

Architectural Substrate	U.S.	U.S. Desert Southwest
Exterior with UV inhibitors	4 Years	3 Years
Interior use (limited direct UV light exposure)	12 Years	12 Years

Almost all failures are a result of incorrect use of the material (i.e., installing on a ship below the water line) or poor installation (improper surface preparation, poor application, etc.). It is important to be aware of the limitations. Whenever possible, provide UV protection (as you would for fabrics). Many patterns and colors have UV protection, but all will last longer if UV exposure is limited. Warranties may be available in specific situations.

Abrasion Resistance: JIS K 7204

Since its inception, the Taber® Abraser, used to test abrasion resistance, has been used for quality and process control, research and development, and material evaluation. Used to test a wide spectrum of materials, the abraser (abrader) has been referenced in numerous standards and specifications and is frequently called a Rotary Platform Dual (Double) Head Tester.

Test method

- substrate: aluminum plate (1mm thickness)
- size of specimen: 100 x 100 mm (4"x 4")
- testing machine: Taber® Abraser (Abrasion wheel: CS-17, Loading weight: 1kg)
- cycles: 7,000 cycles

Test result

- material shows limited visual wear



Chemical Resistance

Architectural finishes are typically very resistant to everyday stains and chemicals, as you can see from the chart on the right. Review the manufacturer's technical data sheets if there are particular stains or chemicals of interest.

Chemical Resistance Test Method

- substrate: aluminum plate or acrylic plate
- size of architectural surface applied: 50 x 50 mm
- aging before testing: 72 hours at 23°C

Stain Resistance Test Method

- substance: coffee, tea, cola, milk, wine, ketchup, vinegar, olive oil, lemon juice, salt solution(1%), household ammonia(10%), soap solution(1%), formalin(36%), citric acid solution(10%)
- exposure time: 24 hours at 23°C

Chemical / Stain Agent	Exposure Time	Results
Water	24 hours	No effect
10% HCL	24 hours	No effect
10% NaOH	24 hours	No effect
Ethyl alcohol	24 hours	No effect
Ethyl acetate	5 minutes	Severe attack
MEK	5 minutes	Severe attack
Toluene	5 minutes	Severe attack
Coffee	72 hours	No effect
Tea	72 hours	No effect
Cola	72 hours	No effect
Milk	72 hours	No effect
Wine	72 hours	No effect
Ketchup	72 hours	No effect
Vinegar	72 hours	No effect
Olive oil	72 hours	No effect
Lemon juice	72 hours	No effect
Salt solution (1%)	72 hours	No effect
Household ammonia (10%)	72 hours	No effect
Soap solution (1%)	72 hours	No effect
Formalin (36%)	72 hours	No effect
Citric acid solution (10%)	72 hours	No effect

Heat, Humidity, Temperature

Architectural finishes are stable in a variety of environments; however, more extreme temperatures may challenge the product's stability.

Variable	Test Method	Test Results
Heat resistance	Product applied to aluminum plate and aged for 28 days at 65°C (150°F)	Minimal change to adhesion and film appearance
Humidity resistance	Product applied to aluminum plate and aged for 28 days at 40°C, 90% RH	Minimal change to adhesion and film appearance
Low temperature impact resistance	Product applied to aluminum plate; Gardner Impact Tester used at 12.7mm (5") and bob weight of 907g (2lb) at 0°C	No effect on the surface of the film
Service temperature	Product applied to aluminum plate and exposed to temperatures in range of 30°C to 65°C (-22°F to 150°F) for 12 days	No peeling or discoloration
Weatherability	Product exposed to UV light, heat, and humidity in a carbon arc weatherometer for 250 hours	No effect on film

Application Techniques

The background of the slide is a complex, abstract pattern of overlapping triangles. The triangles are in various shades of blue, ranging from a deep, dark blue to a bright, light blue. The pattern is non-repeating and creates a sense of depth and movement. The text 'Application Techniques' is centered in the upper half of the image, rendered in a clean, white, sans-serif font.

Substrates

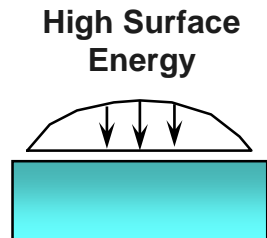
Architectural finishes are not complete in themselves, as they are designed to be applied to something. What that is will determine many of the characteristics, and the dependability of the product.

Consideration	Implication
Substrate is critical and integral to architectural surface	<ul style="list-style-type: none">• Architectural finish is not functional alone• Substrate of some type is required• Most surfaces will not meet fire test alone
Durability will depend upon the substrate	<ul style="list-style-type: none">• Denting, adhesion is a function of the underlying substrate• Proper substrate preparation required to prevent adhesive failure
Appearance of architectural finish will depend upon the underlying substrate	<ul style="list-style-type: none">• Need smooth (vs. textured) substrate
Sustainability	<ul style="list-style-type: none">• Substrate will contribute to the “degree of sustainability”
Porosity	<ul style="list-style-type: none">• Porous materials allow moisture or other contaminants to permeate the substrate and can cause adhesion failure or bubbling. Porous surfaces should be sealed prior to application.
Outgassing	<ul style="list-style-type: none">• Some substrates, paints, and primers may release trapped moisture or solvents from their surface. This can lead to adhesion failure or bubbles forming under the film. Substrates that are prone to outgassing include:<ul style="list-style-type: none">• Fresh paint/primer• Polycarbonate sheeting• Fiberglass• Fiber reinforced plastic (FRP)

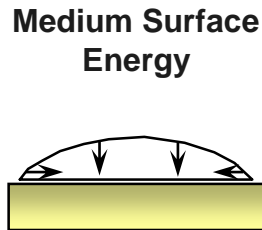
Substrates

Substrates can have different surface energies. A practical example is the use of non-stick coating in cookware, where the cookware has been lined with a LOW surface energy. Surface energy of the substrate is another factor that influences how well architectural finishes will bond. The surface energy of a material is related to its tendency to form bonds with another material.

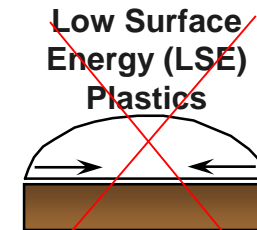
Some substrate materials may behave in a similar way as the non-stick cookware; they may not bond well with the adhesive on the architectural finish and the film may peel away from the surface with little force.



Copper, Aluminium, Zinc, Tin, Stainless Steel, Glass



PET (Polyester), PU (Polyurethane), ABS (Acrylonitrile Butadiene Styrene), PC (Polycarbonate), PVC (Polyvinyl Chloride)



PS (Polystyrene), PE (Polyethylene), PP (Polypropylene), PTFE (Polytetrafluoroethylene)

Substrates

Because low surface energy materials may suffer from low adhesion, some material, including low-VOC paints, may require additional preparation to ensure good adhesion.

What can be done?

- Film adhesion test: test to check the bond strength with the substrate.
- What to look for: an adhesion test result of 800 grams per inch or more is recommended.
- Test conditions: The substrate should be a recently cleaned, smooth surface that is located in an environmentally controlled area. Always select an inconspicuous area in case the substrate is damaged when the test strip is removed.

Substrate Performance and Quality

This table highlights the importance of a primer for many substrates.

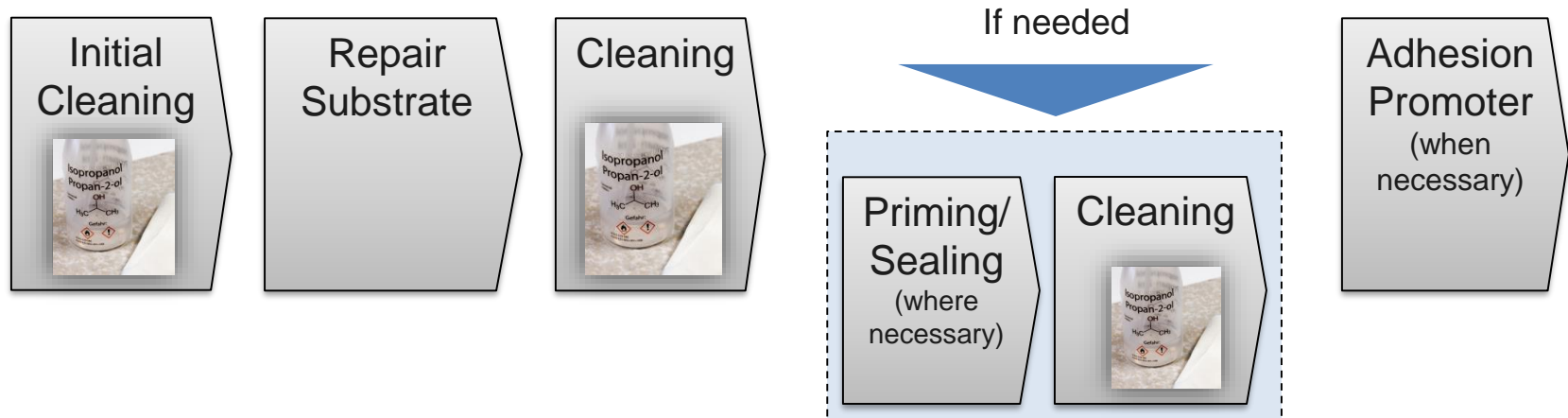
Another critical aspect of the substrate is the smoothness of the surface. Most architectural surfaces will telegraph the characteristics of the substrate.

Classification	Substrate	Adhesion (no primer) N/25mm (lbs/ in.)	Adhesion w/ primer N/25mm (lbs/ in.)
Wood	Luan Veneer	12 (2.7)	28 (6.3)
Wood	China Veneer	12 (2.7)	33 (7.4)
Wood	MDF	-	26 (5.8)
Boards	Plaster Board (gypsum board)	-	6 (1.3)
Boards	Silicate Calcium Board	-	24 (5.4)
Boards	Slate Board	19 (4.3)	39 (8.8)
Metal	Baked Enamel Steel Finish	18 (4.0)	29 (6.5)
Metal	Bonderized Steel Plate	28 (6.3)	42 (9.4)
Metal	Vinyl Chloride Steel Plate (Melamine)	42 (9.4)	30 (6.7)
Metal	Aluminum	25 (5.6)	-
Metal	Stainless Steel	27 (6.1)	-
Metal	Galvanized Steel Plate	24 (5.4)	39 (8.8)
Plastics	Acrylics	29 (6.5)	33 (7.4)
Plastics	ABS	25 (5.6)	42 (9.4)
Plastics	Melamine Surface	14 (4.0)	28 (6.3)
Plastics	Polyester Surface	24. (5.4)	30 (6.7)
Inorganic	Mortar	10 (2.2)	40 (9.0)
Inorganic	Glass	21 (4.7)	-

Surface Preparation

The easiest way to reduce the amount of surface preparation is to specify the right substrate in the first place. It is also very important that the substrate material is prepared correctly prior to application of architectural films. Ample time is devoted to cleaning, which helps to improve the bond strength between the substrate and the architectural finish. Priming/sealing may be needed if there is a porous substrate in place. Adhesion promoter is recommended on corners and other 3D areas.

Steps of proper surface preparation:



Common Substrate Issues and Solutions

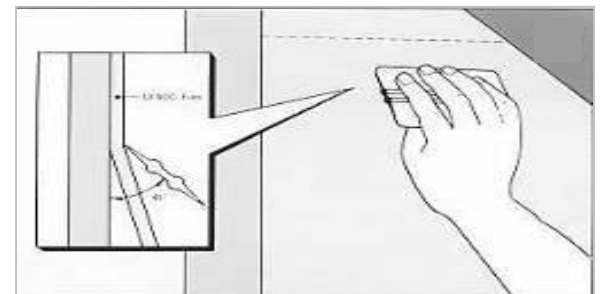
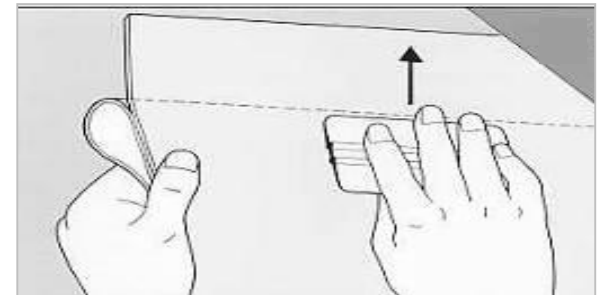
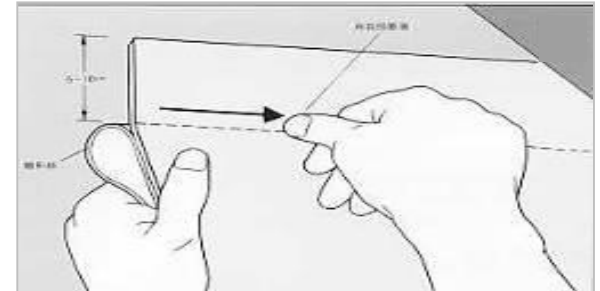
Here is a quick view of issues that can arise with various substrates, and the possible solutions to properly prepare the substrate.

Substrate	Related Issues	Possible Solutions
Drywall/Plaster Board/Gypsum Board/Sheetrock Level 5 finish required	Rough surface Low surface energy Porous Easily damaged	Putty/sand Prime Seal Careful handling
MDF	Porous Low surface energy	Seal Prime
Metal	Corrosion	Remove corrosion, prime and seal
Coated Steel	Greasy surface	Clean
High Pressure Laminates	Can be textured	Prime
Melamine	Can be textured	Prime
Wood	Textured Porous Low surface energy	Putty/sand Seal Prime
Veneer	Textured Porous Low surface energy	Putty/sand Prime
Mortar/Concrete	Texture Alkaline attack Porous Low surface energy	Putty/sand Seal Prime

Application Techniques: On-site Application

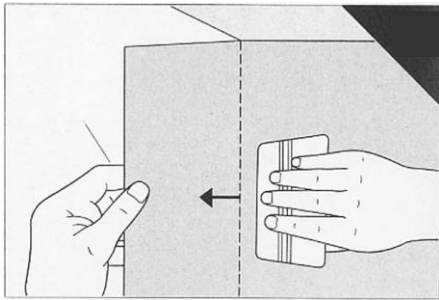
One of the biggest benefits of the material is the ability to install on site with minimal downtime and disruption.

The images to the right show the general steps to applying architectural finishes: the material is first pressed against the surface, then the release liner is removed as the material is squeegeed onto the surface.

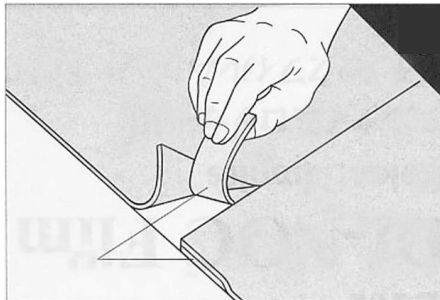


Application Techniques

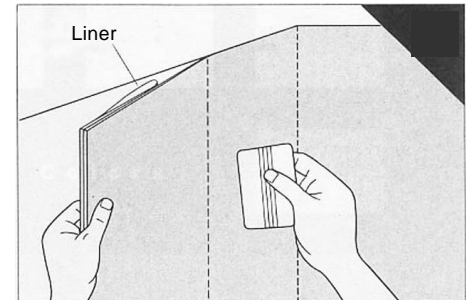
Several techniques exist for installers to properly apply architectural finishes in a variety of install scenarios. Qualified installers will be familiar with these techniques.



Outside corners



Double cut



Inside corners



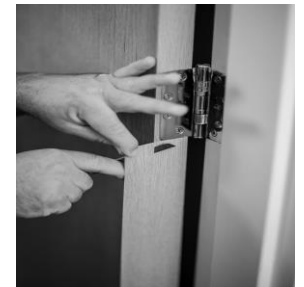
Wrap square corners



Columns



Complex curves



Doors

Product Cleaning and Maintenance

One of the benefits of using architectural finishes is the ability to keep the product clean and repair it in the event of a mar.

- Surface mars and stains: rub with a soft cloth and warm water and mild detergent
 - IPA or citrus cleaner for difficult stains
 - wet, non-abrasive cleaner, pH between 3–11
 - avoid strong solvents (i.e., graffiti remover, acetone, or thinners)
- Scratch: rub with a surface restorer (i.e., protectant or vinyl cleaner)
 - keep additional architectural finish on hand for repairs
- Tear: patch with material piece or replace full panel



Applications and Case Studies

Applications

Architectural finishes can be utilized in a wide variety of applications from fixtures, to walls, to ceilings in many different vertical applications.



Building interiors



Fixtures



Walls



Ceilings



Elevators



Doors



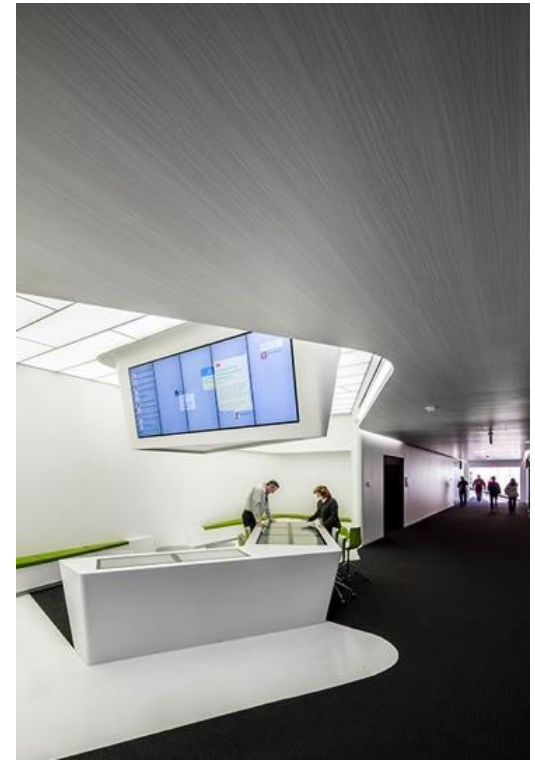
Columns



Furniture/Case goods

Applications

The left image shows a pantry/kitchen area where architectural finishes were used to cover the cabinets. On the right, architectural finish has been applied on the ceiling.



Applications

In the left image, you have a dining area with architectural finishes on the walls and ceiling. On the right is the entrance to a retail store where architectural finishes have been laser-cut to allow light to come through.



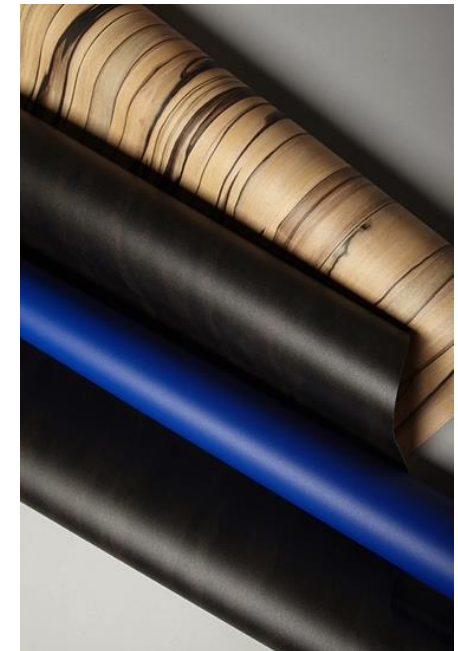
Applications

The image on the left is an example of where using real wood would have been cost-prohibitive; instead, architectural finishes can easily be applied to pre-shaped surfaces to create a stunning aesthetic effect.



Applications

Architectural finishes were used to surround the scoreboard; other materials might have added too much weight, while the architectural finishes allowed an updated look.



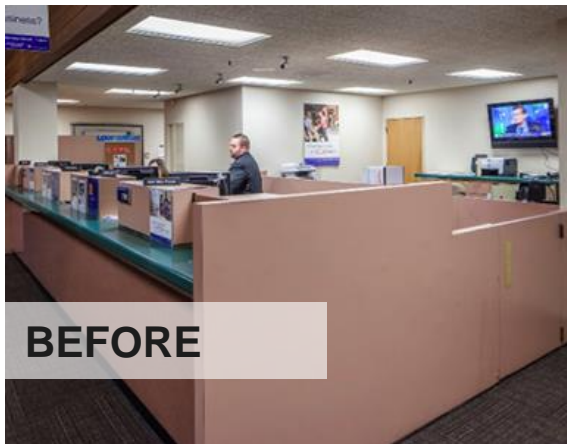
Applications

Dry erase applications are also possible depending on the manufacturer.



Applications

Here you can see the pink and green bank teller station was updated within the span of a weekend to this natural wood grain look.

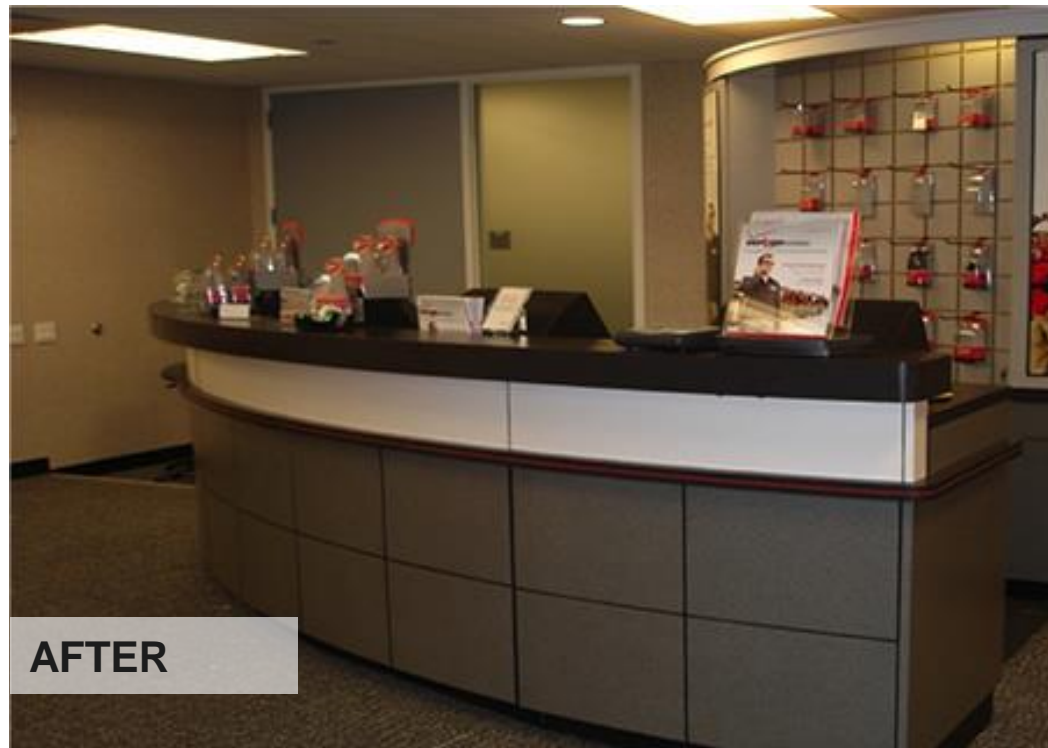


Applications

In this case, a company purchased a series of stores, and they needed to quickly get rid of the original blue associated with the old brand.



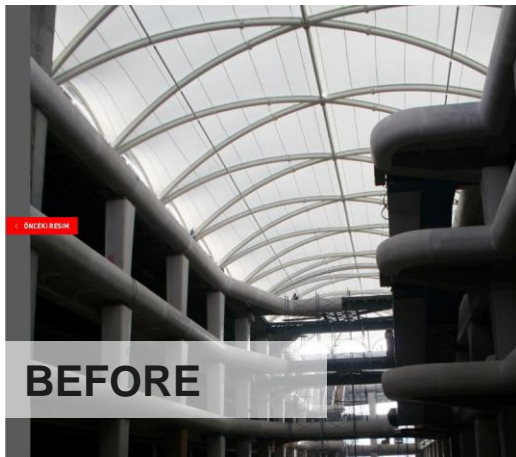
BEFORE (blue laminate)



AFTER

Applications

Here, the large-scale horizontal columns were covered with architectural finishes to warm up the space.



Hospitality Case Study

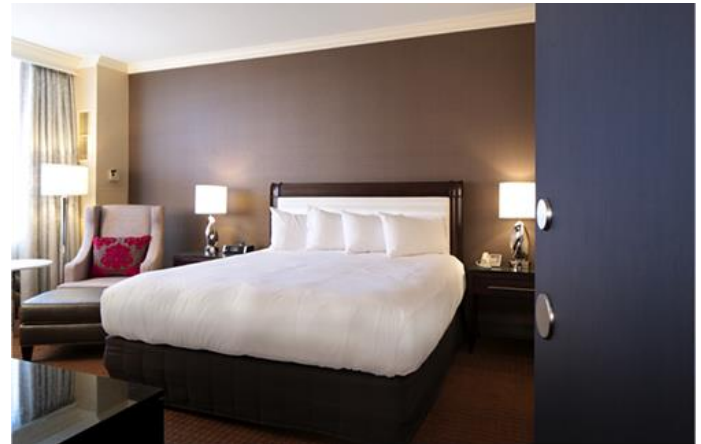
This is a hotel that was renovated in Minneapolis. The designer originally had a budget that wouldn't allow for new doors. But without updating the doors, the renovation simply did not feel complete. This project included about 2200+ doors, which when wrapped by architectural finishes, ultimately saved the client over one million dollars.

Project Scope: 832 guest rooms renovation

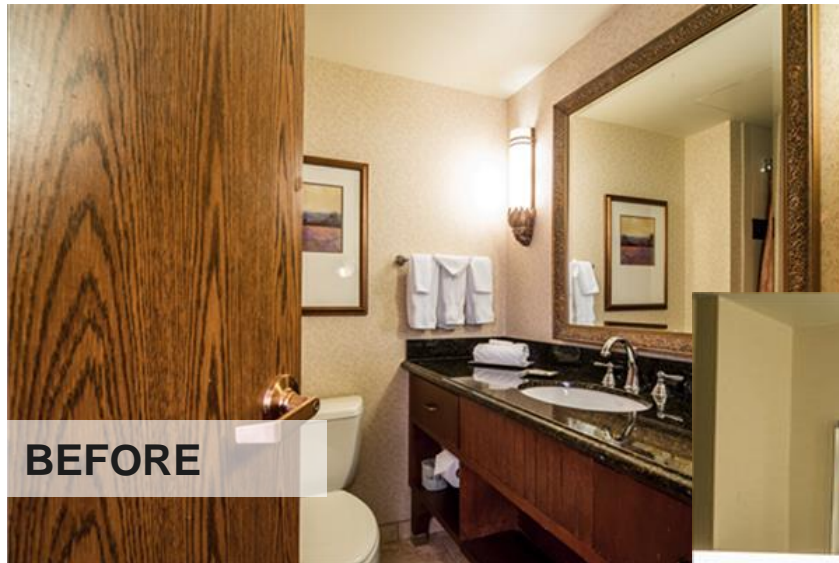
- 832 entry doors
- 832 bathroom doors
- 600+ adjoining doors
- 1600 closet shelves
- 2200+ total doors

Cost Savings:

- New door cost estimate: \$1,000
- Door refresh using architectural finishes estimate: \$500
- Total estimated savings for the project: \$1,000,000+

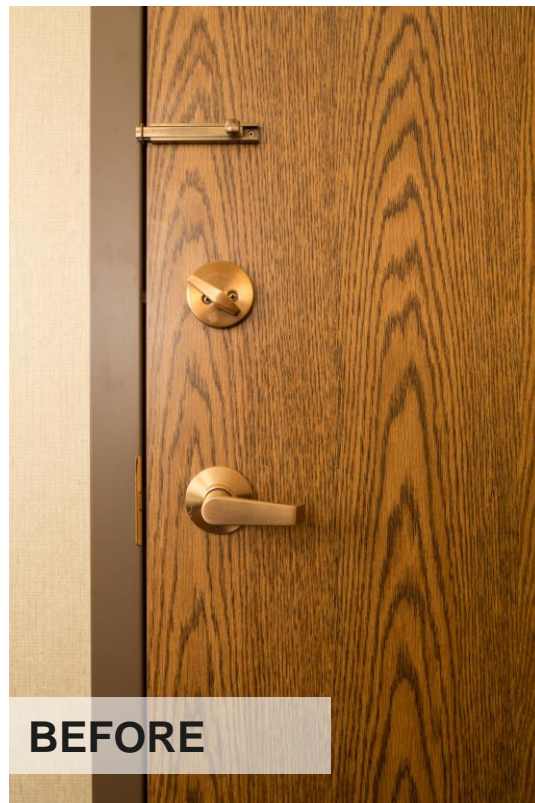


Hospitality Case Study



Hospitality Case Study

An up-close view of the door before and after the architectural finish was added:



Tokyo Midtown Project

This was a large-scale project in Tokyo where architectural finishes were used in multiple parts of the project to provide on-trend aesthetics at a fraction of the cost of difficult-to-source materials.

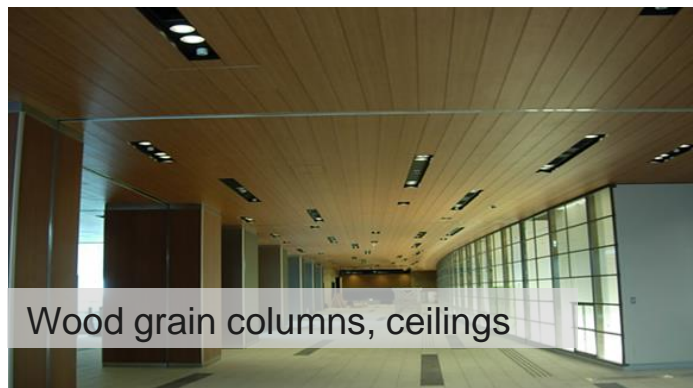


Tokyo Midtown Project

Several of the office public spaces used architectural finishes, from columns to ceilings, to wood grain “planks.”



Wood grain columns; opaque white



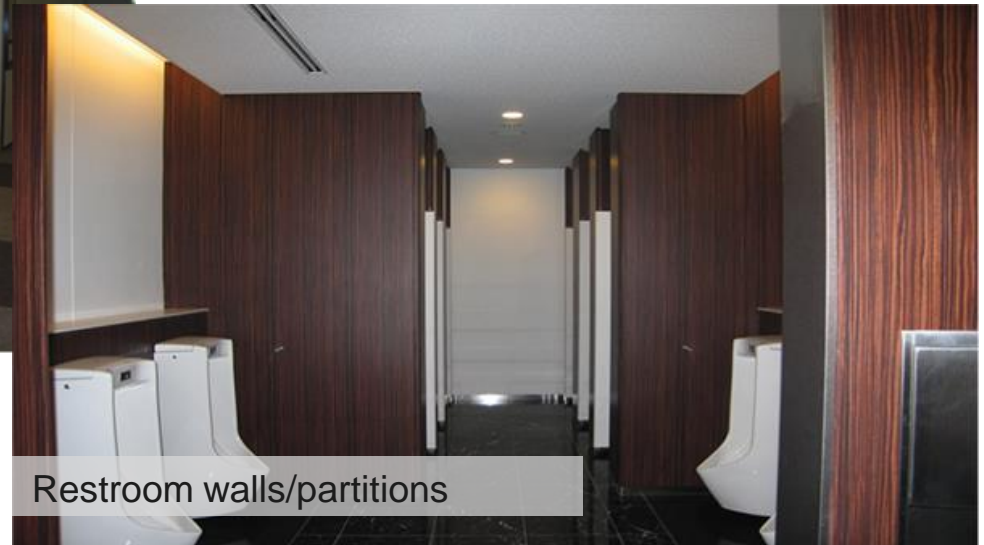
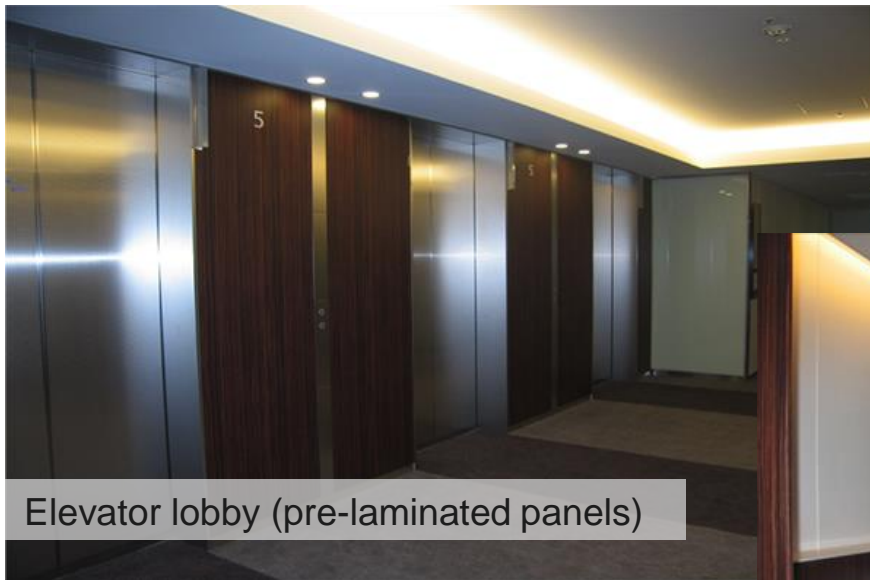
Wood grain columns, ceilings



Wood grain horizontal “planks”

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In this case, architectural finishes were used in the elevator lobbies, as well as in restrooms. Architectural finishes are generally very easy to clean, so are suitable for high-traffic areas where frequent cleaning may be important.



Course Summary

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Architectural finishes offer designers and architects a versatile material to meet many design challenges while being both aesthetically pleasing and cost- and time-effective.

These decorative materials can mimic the look of many natural materials, including wood and stone, at a fraction of the cost.

Architectural finishes must be applied to a substrate. The substrate material will have a great impact on the characteristics and durability of the finish. Remember, low surface energy materials may suffer from low adhesion.

Surface preparation is key to ensuring a strong bond between the substrate and the architectural finish material. Be sure to allow ample time for thorough cleaning during the application process.

Conclusion



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