A GUIDE TO HIGH PERFORMANCE
POLYURETHANE
UPHOLSTERY
FABRICS
WHAT IS POLYURETHANE AND HOW IS IT MADE?

Polyurethane, commonly referred to as ‘PU’, is a polymer that is considered to be a highly resilient, flexible and durable material. PU is very versatile and can be manufactured in various forms - to be hard like fiberglass, spongy as upholstery foam, robust and protective when used as varnish, elastic like rubber, or very sticky as an adhesive. Polyurethane is becoming increasingly popular as an upholstery material, as it is PVC free and offers a combination of unique benefits including durability, suppleness, breathability, and an attractive appearance.

Polyurethane Upholstery Fabric: How it’s Made

Phase I

- Fabric Backing
- Dipping: Prepares fabric to receive PU base.
- Coating Head
- STABILITY: The PU Base layer is adhered to the backing fabric.
- Coagulating: Thickens the PU base.
- Washing: Further solidifies the backing and the base and removes impurities.
- Drying: Completes adhesion of base to fabric.
- PU Upholstery Base Ready for finishing.
Polyurethane Upholstery Fabric: How it’s Made
Phase II

This schematic is an abbreviated overview of one method for manufacturing Polyurethanes. It has been condensed for the purpose of demonstrating the key points and basic flow of the polyurethane manufacturing process.
WHY USE POLYURETHANE?

Performance

• Strength & Durability:
When using high grade resins, only a thin PU coating is needed to provide very high abrasion resistance and toughness.

• Stain Resistance:
Using high grade PU resins will provide outstanding inherent stain resistance.

• Resistance to Cleaners:
High Performance PU’s with Cleangene technology offer resistance to many commonly used commercial cleaners and disinfectants as well as alcohol and bleach solutions. The material will withstand repeated cleaning without becoming brittle or discoloring.

Comfort

• Softness:
Polyurethane provides for a soft, supple seating surface.

• Breathability:
PU’s offer some breathability (vapor transmission) whereas PVC based faux leathers are not.

• Temperature Control:
High Grade PU’s will remain cool on the surface, even after being sat on for long periods of time.
WHAT ARE THE ENVIRONMENTAL BENEFITS OF PU?

Polyurethanes are preferred over PVC based faux leathers for several reasons:

- PU’s will decompose over time, whereas PVC is environmentally indestructible and will eventually end up in landfills.
- PU is incinerable, whereas vinyl and can release hydrochloric acid and other toxic compounds when burned.
- PU’s typically contain a significantly lower level of VOC’s (Volatile Organic Compounds) than PVC, resulting in improved indoor air quality.

Many manufacturers of contract quality Polyurethane are as attentive to environmental stewardship, as they are to improving the long term performance of their products. The following are benefits particular to PU’s from the maker of Encore by The Symphony Collection:

- Phthalate Free
- BPA (Bisphenol A) Free
- Lead & Heavy Metal Free
- Energy Efficient Production
- Water Efficient Production
- 99% of all Water and Raw Materials used in production is reclaimed and recycled.
WHAT MAKES A POLYURETHANE FABRIC SUITABLE FOR CONTRACT USE?

Not all Polyurethane upholstery fabrics are created equal. There are significant inherent performance differences between those made with lesser quality resins and higher quality ones. These differences can’t be necessarily be seen or felt.

The single most important factor in determining the quality of a PU is the type of resin that is used both in the skin and base. There are three basic categories of resin available:

1. Polycarbonate PU based Material
Higher cost, durable with high resistance to humidity, heat and light. Suitable for commercial upholstery applications. Will withstand 7+ Years Hydrolysis testing.

2. Polyether PU based Material
Mid-range cost, average resistance to humidity, heat and light. Suitable for some commercial applications. Will withstand 3-5 Years Hydrolysis testing.

3. Polyester PU based Material
Low cost, low resistance to humidity, heat and light. Not suitable for commercial upholstery. Will withstand 1-2 Years Hydrolysis testing.

The cost of the material is directly correlated to the quality of the resin that is used, as well as the other performance additives that are required to consider a Polyurethane suitable for commercial use. It is important that both the base and skin layer be made of high grade resin.

The photograph below shows a Hydrolysis related failure of a low-grade Polyurethane in a restaurant installation after 18 months of use.
WHAT IS HYDROLYSIS AND HOW DO WE DETERMINE RESISTANCE TO IT?

Hydrolysis resistance is the single most important factor in determining if a PU is suitable for commercial seating applications. Hydrolysis is the process by which humidity and heat breaks down the cell structure of a Polyurethane, resulting in a flaking, brittle surface. Warm weather and humidity can act as the catalyst for the degradation of the material, but even in an air-conditioned indoor environment, body heat and sweat can over time be sufficient to break down a poor quality Polyurethane.

Using high grade resins such as Polycarbonate, ensures lasting Hydrolysis resistance, extending the useful life of an upholstery fabric. The test standard which is used to measure the hydrolysis resistance is ISO 1419:1995 Accelerated Aging Test - or commonly referred to as the Jungle Test.

In the Jungle Test a sample of the material is placed in a controlled air-oven & humidity apparatus (pictured left). The material is subjected to relative humidity of at least 95% and a temperature of 70°C (158°F) for one week. Each week that the material endures in the apparatus without degrading is equivalent to one year Hydrolysis Resistance. The aged material is compared to the control sample for degradation of various physical properties.

A minimum of 5 Year Hydrolysis Resistance is recommended for any commercial upholstery application.
# CONTRACT UPHOLSTERY MATERIAL COMPARISON

<table>
<thead>
<tr>
<th></th>
<th>PU</th>
<th>PVC</th>
<th>Woven Textile</th>
<th>Leather</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Durability</strong></td>
<td>High Abrasion Resistance</td>
<td>High Abrasion Resistance with Specialty Coating</td>
<td>Low to Medium Abrasion Resistance</td>
<td>High Abrasion Resistance</td>
</tr>
<tr>
<td><strong>Stain Resistance</strong></td>
<td>Excellent Inherent Stain Resistance</td>
<td>Requires Specialty Top Coat for Good Stain Resistance</td>
<td>Poor to Medium (depending if treated or not)</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Resistance to Abrasive Cleaners</strong></td>
<td>Yes, when using Polycarbonate Resins</td>
<td>Limited resistance with Top Coat finish only.</td>
<td>Select Fabrics/Yarns only</td>
<td>No</td>
</tr>
<tr>
<td><strong>Breathability</strong></td>
<td>Some</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Seating Comfort</strong></td>
<td>Soft, Comfortable, Dissipates Heat</td>
<td>Traditionally firmer, tends to get hotter</td>
<td>Mostly Comfortable.</td>
<td>Comfortable</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>Medium to High (Low cost qualities typically not Contract Grade)</td>
<td>Low to Medium</td>
<td>All Price Levels</td>
<td>Very High</td>
</tr>
</tbody>
</table>

* This comparison chart reflects the typical properties of contract upholstery materials. There may be products available in each category that perform differently than outlined above.
TIPS FOR UPHOLSTERING WITH POLYURETHANES

It is important to note the upholstery methods for Polyurethane differ from vinyl but they can also differ from Polyurethane to Polyurethane based on the quality of resin, total weight and the backing fabric used.

A few things to remember when upholstering with Polyurethane...

Polyurethanes stretch more than vinyl when not upholstered correctly, may show a sagging or puddling effect. A few things that may assist in minimizing this would be to:

- Always use a good quality high density foam.
- Consider cutting the foam at least one inch oversize in both directions.
- Thick foam applications should have breathing holes to allow for maximum foam recovery.
- Consider wrapping the foam to assist the backing fabric to slide freely over the foam which will assist in recovery.
- Never railroad a Polyurethane.

Polyurethanes are thinner and lighter in weight than vinyl. Therefore they upholster differently around sharp corners or edges.

A few things to remember when sewing are:

- Avoid extreme folding of the material around tight corners or sharp radius’ without foam backing support. This may place undue stress on the PU film creating a potential wear point regardless of the abrasion rating.
- Consider using a minimum of six stitches per inch using a light ball tip needle.
- Consider double stitching key seam areas.

All manufacturing processes differ. These tips are offered as general helpful hints that should be considered prior to upholstering with Polyurethanes.
Polyurethanes that are made with polycarbonate resins are inherently very stain resistant. The best way to keep these materials looking great is to maintain them by cleaning regularly with soap and water. In the instance that stains or spills occur, and wipe them clean as quickly as possible.

For environments in which there may be extensive staining, or where harsh cleaners/disinfectants are regularly used, we recommend PU’s with Cleangene technology.

Cleangene features an advanced polymer system that offers the highest level of stain resistance and cleanability. This proprietary non-toxic technology is inherent to the material makeup, so it will not dissipate or weaken over time. Cleangene allows the use of undiluted isopropyl alcohol or high concentrations of bleach, as well as a variety of commonly used commercial cleaners, prolonging the aesthetic beauty and performance of the upholstery.

The following are Care Instructions for PU’s with Cleangene:

**Regular Cleaning and Maintenance**
Clean the soiled area with mild soap and water then rinse with fresh water and wipe dry.

**Food Stains / Oils**
Wipe affected area with a soft cloth using a non-abrasive cleaner, for example Formula 409 or Fantastik. Rinse with fresh water and wipe dry.

**Healthcare Stains**
Clean the soiled area with a 20% solution of household bleach and water. Rinse the cleaned area with fresh water after applying the bleach solution and wipe dry.

**Other Difficult Stains**
Clean the soiled area with 50% solution of Isopropyl Alcohol (Rubbing Alcohol) and water. Alternately, use a 25% solution of Bleach and water. Rinse the cleaned area with fresh water after applying the alcohol/bleach solution and wipe dry.

**Ink Stains**
Rub the marked area with undiluted Isopropyl Alcohol (Rubbing Alcohol). Rinse the cleaned area with fresh water promptly after applying the alcohol, and wipe dry. Note: To achieve the best results, it is recommended to clean the stain immediately. Removal of ink stains is not guaranteed, as this may depend on the type of ink, and the promptness of cleaning.
THE FOUR QUESTIONS TO ASK WHEN SELECTING A POLYURETHANE

What Type of Resin is it Made of?
The resin dictates the performance of overall performance/quality of the material. If the product is being used in a contract, hospitality, healthcare or other harsh environment a polycarbonate resin (in both the skin and base layer) is recommended.

What is the minimum Hydrolysis Resistance required for commercial upholstery?
Hydrolysis resistance is the single most important performance characteristic of a PU. For a Polyurethane to perform in commercial environments it must have a minimum of 5 year hydrolysis resistance in both the skin and foam layer of the product. The Hydrolysis Resistance should be determined by the Jungle Test.

How can the Material be Cleaned?
Polyurethanes that are manufactured with polycarbonate resins offer excellent stain resistance and excellent clean-ability. For the tougher stains they can be cleaned with a bleach or alcohol solution. Polyurethanes with Cleangene technology offer the highest resistance to cleaners.

What is the minimum lightfastness required for commercial upholstery?
Polyurethanes for commercial grade upholstery should have a minimum ultra violet resistance of 200 hours. Traditionally, less expensive Polyurethanes only meet the residential classifications of 40 hours.