

## STRIPPING AND CLEAN-UP

- Exercise extra care when stripping the formwork so that the textured surface is not damaged. Forms with architectural formliners require greater force to strip than smooth formwork.
- Formwork should be removed after at least 12 hours and stripped within 24 hours of concrete placement. More force may be required if the lapse time from placement to stripping exceeds 24 hours.
- Start stripping at the top of the form work. Slightly separate the form from the concrete and hold in this position for several minutes to allow the induced stress to diminish. Continue to separate the formwork from the concrete in stages until completely separated.
- Architectural Polymers formliners can be easily cleaned with household detergent and a stiff brush.

## FINAL FINISHING

- **Rubbing:** Remove seams and forming defects with a stone while concrete is still green.
- **Sandblasting:** Sandblasting may be used to roughen the surface, hide seams and forming defects and bring out the color of the aggregate. It will not hide discoloration from grout leakage.
- **Patching:** When patching tie holes or more serious forming defects, a close color match is crucial. Use the same materials used in the original mix and run several trials before working on the structure. Bad patches look worse than the original problem. Hire a consultant if in doubt.

## AVAILABILITY AND COST

- **Availability:** Architectural Polymers formliners are distributed through various concrete forming and accessory dealers. Contact Architectural Polymers to find a representative in your area.
- **Lead-Time:** Lead times will vary according to pattern, quantity and production schedule.
- **Cost:** Contractor cost will vary according to pattern, quantity and liner grade.

## TECHNICAL SERVICES

- Architectural Polymers distributors have the skill and knowledge to answer most questions. Architectural Polymers can also provide consultation during design, specification and product installation.
- Product brochures, formatted specifications, technical notes and additional information are available upon request.

|  | ABS Alloy     | HIPS Alloy   |
|--|---------------|--------------|
| <b>Tensile Strength</b><br>Yield (PSI) ASTM D638   | 5,100         | 2,500        |
| <b>Flexural Modulus</b><br>(PSI) ASTM D790         | 270,000       | 200,000      |
| <b>Notched Izod Impact</b><br>(ft-lb/in) ASTM D256 | 6.3           | 2.0          |
| <b>Vicat Softening Point</b><br>(°F) ASTM D1525    | 224           | 214          |
| <b>Heat Deflection Temp</b><br>(°F) ASTM D648      | 198 @ 264 PSI | 183 @264 PSI |

The following ACI Committee reports are recommended:

- ACI 117 "Specifications for Tolerances for Concrete Construction and Materials Commentary"
- ACI 301 CH 6 "Specifications for Structural Concrete"
- ACI 303R "Guide to Cast-in-Place Architectural Concrete Practice"
- ACI 309 CH 7 "Guide for Consolidation of Concrete"
- ACI 347 CH 5 "Guide to Formwork for Concrete"

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## Architectural Concrete Formliners - Specification Data & Job Site Guide

Architectural Polymers formliners are used to create texture to cast-in-place, tilt-up, and precast concrete. Simply attach the panels of formliner to the formwork or casting bed before placing the concrete. After allowing concrete to properly cure, strip the formwork and liner to reveal the textured concrete surface.

### Architectural Polymers manufactures formliners in three use ranges:

1. **Premium** - elastomeric formliner for 15+ uses
2. **ABS** - vacuum thermoformed polymer alloy for 2-5 uses .090 mil.
3. **HIPS** - single-use vacuum thermoformed polymer alloy 070 mil.

- Over 200 standard formliner textures can be customized for any project.
- Architectural Polymers ABS and HIPS vacuum-thermoformed formliners are trimmed straight and square to customer specifications.
- All Architectural Polymers vacuum-formed liners have a solid, void-free surface which are easy to strip, and repel moisture and discoloration. Significant undercuts are not possible.
- Form pressure over 1000 PSF may deform some deeper patterns.

Contact Architectural Polymers for specific recommendations.

### Typical Applications:

- Bridges
- Retaining walls
- Sound walls
- Highway Structures
- Commercial Landscaping
- Residential/commercial buildings
- Water/waste water treatment plants
- Federal, State and Local Infrastructure Improvements

## STORAGE GUIDELINES

Plastic formliners MUST be protected from EXTREME HEAT and/or EXTREME COLD. Permanent damage will result if plastic is exposed to freezing temperatures (below 32 degrees Fahrenheit) or direct sunlight and/or very high temperatures (above 95 degrees Fahrenheit).

## GENERAL INSTALLATION GUIDELINES

Architectural Polymers recommends a fullscale pre-construction mock-up to test placement rates, form pressures, specific concrete mix, slump, joint sealing, vibrating and stripping practices. The mock-up must duplicate the materials, methods, placement rates, form pressures and workmanship that will be used on the job.

- Formliners are shipped on 4' x 10' skids, covered and banded. Architectural Polymers recommends covering formliners if stored outside for long periods of time.
- The formliner material will lose impact strength and become more brittle at temperatures below 25°F. Exercise extra care under these conditions.
- Adverse affects will occur when concrete temperatures exceed 140°F. Architectural Polymers does not recommend utilizing formliners in these conditions.

## TRIMMING

- Formliners may need to be custom trimmed to fit the formwork on many jobs.
- Build a sturdy work table with an edge guide running the 10' direction and a rip fence or adjustable saw guide.
- A circular handsaw with a fine tooth panel blade and a rip fence or saw guide is recommended.
- Use a fine tooth panel blade with minimum set or a carbide tipped blade with 40 or more teeth.

For lighter gage liners, a sharp utility knife works well for trimming; score the liner and snap off the excess.

Miter the edge of the liner on the same angle if a liner butts against a chamfer or reveal strip to ensure a proper fit.

## MOUNTING

- Keep vertical joints plumb and on the same line. Keep horizontal joints level and in line at the same elevation.
  - Reveal strips or rustication are recommended where liner joints do not blend with the pattern. A properly sized rustication will enhance and compliment the pattern and overall appearance of the structure.
  - When mounting the formliner, make sure the correct side goes toward the formwork.
  - Formliners will shrink when the temperature drops, and expand when the temperature rises. The liner will typically change 1/16" in 10ft. with a 10°F change in temperature. Formliner movement can be minimized with proper fastening.
- The formliner may expand with a large increase in temperature. Spray a fine mist of water on the liner before placement to shrink the liner to its original size. If possible the liner should be fastened at the warmest time of the day.
- Nails or screws should be placed on 12" to 24" centers that are distributed evenly over the sheet. Place outer fasteners within 2" of the liner edge. Attachment points should be randomly placed to avoid a consistent pattern that may appear obvious in the finished concrete. Screwing through the valley of the liner will help hide fastener marks. Nailing through the peak of the formliner, although not generally recommended, will also help hide fastener marks. Patterns with deeper relief and more texture require more fasteners. Less screws are required than nails since screws have more holding power. Use the least amount of fasteners as possible to keep HIPS formliners positioned.
  - **Screws:** Have the best holding power, are easy to use and can be easily removed. The minimum size recommended is #8-18 x 1" bugle head self-drilling and tapping screws. For steel or wood forms, self-drill and tap the flat head flush with the liner. A screw gun with an adjustable torque setting can also be used.
  - **Nails:** Nails have good holding power and are easy to install. 7D or larger cement coated or ring shanked nails installed with a pneumatic nailer and pressure regulator are recommended.
  - **Staples:** Small staples used with a pneumatic stapler and pressure regulator are easy to use and hide in the pattern. They have much less holding power and should be used on 6" to 12" centers.
  - **Pop Rivets:** Require more work than self drilling screws, but have good holding power on metal forms.
  - **Wooden Dowels:** Screw or nail the liner to the 1/2" wooden dowels inserted in the concrete where the liner is attached to the concrete casting bed on tilt-up or precast jobs. The dowels easily drill out and patch upon completion of the job.
  - **Construction Adhesive:** Construction adhesive can be used on tilt-up jobs to adhere ABS/HIPS formliner to concrete slabs. The formliner and concrete must remain clean and dry during installation. Keep the concrete surface dry after initial installation, as moisture between the liner and concrete can break the adhesive bond. To help maintain the bond, place sealer at the formliner joints.
  - **Double-Sided Carpet Tape:** Double-sided carpet tape provides an easy way to secure the formliner to the casting bed on tilt-up jobs. The tape should be centered on the formliner seams for most patterns. 1/32" – 1/16" carpet tape is recommended. The formliner and concrete must be clean and dry.
  - **Backup Strips:** Backup strips should be installed on patterns with ribs wider than 1 1/2", or a depth of 1 1/2" or greater to prevent deflection from the pressure of the concrete. Confirm the need for backup strips on the mock up pour. Use wood or styrene foam insulation board between the liner and formwork.

## SEALING

- To prevent localized water loss and subsequent discoloration of the concrete, all formliner joints and tie holes should be sealed. Grout leakage will make stripping more difficult and may cause damage to the liner.
- Neutral cure silicone sealant, once cured, is flexible, has good adhesion and will not discolor or stick to the concrete. It is recommended for cast-in-place jobs.

## FORM BOLTS, TIES AND BAR SUPPORTS

- Tie spacing should be a multiple of the formliner pattern repeat.
- Tight fitting holes may be cut with a hole saw or drilled.
- Patching and filling of holes is eliminated with the use of reinforced fiberglass rod ties. The rods are snapped off and ground flush with the concrete after stripping.
- Ties located in the "valley" of the concrete may be less obvious, however, patching tie holes in the "peak" of the concrete is easier.
- The leg spacing of the bar supports should match the pattern repeat of the formliner, with bar supports or spacers resting against the portion of the liner that is in contact with the formwork.
- To minimize rust stains on the finished concrete, use plastic or plastic tipped supports and spacers.
- Use thin 1/4" plywood strips to prevent deforming the patterns when walking on precast and tilt-up work. The plywood strips distribute the load on the formliner and are easily removed through the bar mat. The concrete itself will distribute the load during placement. Walk on the reinforcing steel rather than the liner surface, if permissible.

## RELEASE AGENTS AND BOND BREAKERS

- Architectural Polymers formliners are made from nonabsorbing, rigid compounds that do not bond to the concrete.
- Architectural Polymers recommends using an approved release agent. The proper use of a release agent will aid in stripping, speed up clean up between pours and improve the surface appearance of the concrete.
- Architectural Polymers 2550 Form Oil is available for this purpose. Some release agents may damage the liner and cause subsequent failure.
- Apply release agent before each use at recommended rates, as over application may produce surface voids.

## CONCRETE MIX DESIGN

- Use concrete from one supplier, making sure that all ingredients come from the same sources, to ensure uniformity of color and texture. To avoid bug holes, avoid using overly sandy or high air entrained mixes.
- Slump should be 4 to 6 inches. The higher slump provides easier filling of pattern details.
- To prevent honeycombing and chipping in ribbed textures, use aggregate that is smaller than the width of one rib.
- Use an elephant trunk to minimize aggregate separation. Avoid dropping the concrete directly against the liner, as this may cause surface abrasion or deformation and result in a defect in the finished concrete.
- Pumping the concrete into the forms will typically reduce air voids in the surface of the concrete, however, it also raises the form pressures significantly which may cause damage to the liner.
- Using a plasticizer will minimize air voids. To keep form pressures at an acceptable level, the placement rate may have to be reduced.
- High pour rates may cause more air voids and create excessive form pressures, which may damage or deform the formliner.
- Thoroughly vibrate concrete to achieve good consolidation, minimize air voids and eliminate lift lines. Concrete lifts should be less than 24 inches. Typically internal vibrators are used to loosen the liner from the formwork. External vibrators will also work; however, contact between the vibrator and formliner may cause damage to the liner. In addition, under and over vibration may cause defects in the concrete surface.
- Remove foot prints, standing water and airborne dirt and debris before placing concrete with precast and tilt-up.
- Heat curing beds may harm the formliner. Contact Architectural Polymers for specific recommendations.