

## Architectural Form Liner Installation Guide For Vacuum Formed Rigid Form Liners



### Typical Applications Include:

- Residential/commercial buildings
- Water/waste water treatment plants
- Prisons
- Schools
- Airports
- Parking garages
- Exposed foundations
- Bridges
- Retaining walls
- Sound walls
- Planters
- Corporate signs

See page 4 for additional  
instructions for Stone patterns:  
S328, S439, S440, S454, S460  
and S477

**Southern Metal & Plastic Vacuum Formed Form Liners** are used for texturing tilt-up, cast-in-place or precast architectural concrete. Sheets of form liner attach to the formwork or casting bed prior to placing the concrete. Following placement and normal curing time, the form work and liner are stripped, leaving a textured concrete surface.

- Southern Metal & Plastic Vacuum Formed Form Liners are thermoformed rigid polymer alloy sheets, engineered for lightweight and ease of handling at the job site.
- More than 80 standard patterns are available. Custom designs will be considered. Call Southern Metal's with specific details.
- All patterns are available in at least two use ranges:

**Single Use** - designed for tilt-up or cast in place jobs where the form liner will only be used once.

**Medium Use** - Intermediate use form liner designed for 2-10 uses under normal job site conditions.

- Some vacuum formed liners are available in a third use range:

**High Use** - designed for 10-25 uses under normal job site conditions. Significantly more uses can be expected in precast applications.

- Southern Metal & Plastic Vacuum Formed Form Liners are interchangeable on the same job. Allowances need to be made for thickness differences between liner grades.
- Form liner sheets are trimmed straight and square to a nominal 4 ft. X 10 ft. size (see Catalog for actual dimensions).
- All Southern Metal's vacuum formed liners have a hard void free surface that makes the liner easy to strip and which will not absorb moisture or cause discoloration. Form liner size cannot exceed a nominal 4 ft. X 10 ft. Significant undercuts are not possible. Form pressures greater than 1000 PSF may deform some of the deeper patterns. Contact Southern Metal's for specific recommendations.

### INSTALLATION GUIDELINES GENERAL

- Southern Metal & Plastic requires a full scale pre-construction mock-up to test specific concrete mix, slump, placement rates, form pressures, joint sealing, vibrating and stripping practices. The mock-up must duplicate the materials, methods, workmanship, placement rates and form pressures that will actually be used on the job. Failure to complete the pre-construction mock-up will void all warranties.
- Form liners are shipped covered and banded to 4 ft. X 10 ft. skids. Although all Southern Metal & Plastic form liner compounds are UV stabilized, the form liners should be covered if stored outside on the job site for long periods of time.
- At temperatures below 25°F, the liner material will become more rigid and will lose impact strength. Use extra care under these conditions.
- Concrete temperatures in excess of 140° F will adversely affect the material properties of the form liners. Southern Metal & Plastic doesn't recommend the use of form liners in these applications.

### TRIMMING

- Form liners will need to be custom trimmed to fit the formwork on many jobs.
- A sturdy worktable should be built and outfitted with an edge guide running the 10 ft. direction and an adjustable saw guide or rip fence.
- A circular handsaw with a fine tooth panel blade and a rip fence or saw guide is recommended. In most cases a table saw will be too awkward.
- Use a fine tooth panel blade with minimum set. A carbide tipped blade with 40 or more teeth also works well.
- A sharp utility knife works well for trimming lighter gauge liners; score the material and snap off the excess.
- If a liner butts against a chamfer or reveal strip, miter the edge of the liner on the same angle for proper fit.

## MOUNTING

- Keep vertical joints plumb and on the same line. Horizontal joints should be kept level and in line at the same elevation.
- Rustication or reveal strips are recommended at liner points that do not blend with the pattern. A properly sized rustication will compliment the pattern and can enhance the overall appearance of the structure.
- When mounting the liner, make sure that the correct side goes toward the formwork. All Southern Metal & Plastic liners have a tag indicating the form work side.
  - Form liners will expand with an increase in temperature and will shrink when the temperature drops. As a rule of thumb, the liner will change 1/16" in 10 ft. with a 10°F change in temperature. Proper fastening minimizes form liner movement. The liner may "grow" with large increases in temperature. A fine spray of water on the liner prior to placing the concrete will cause it to shrink to its original size. The liner should be fastened during the warmest part of the day if possible.
  - Screws or nails should be placed on 12" to 24" centers that are evenly distributed over the sheet. Outer fasteners should be placed within 2" of the liner edge. Attachment points should be random; a consistent pattern may appear obvious in the finished concrete. Nailing through the peak of the form liner (valley of the concrete) will help hide fastener marks, however this practice is not generally recommended. Screwing through the valley of the liner (concrete peak) is more practical and results in a better job. Patterns with more relief and texture require more fasteners. More nails are required than screws since screws have more holding power. Use as few fasteners as possible for Single Use form liners to keep the liner positioned.
  - Screws: Easy to use, screws have the best holding power and are easily removed. Bugle head self-drilling and tapping screws #8-18 x 1" are the minimum size recommended. Self-drilling and tapping, the flat head fits flush with the liner, and may be used for steel or wood forms. A screw gun with adjustable torque setting is also recommended.
  - Nails: Easy to install, nails feature good holding power. 7D or larger cement coated or ring shanked nails are recommended. A pneumatic nailer should be used with a pressure regulator.
  - Staples: Small staples (approx. 1/8" wide x 3/8" deep) are easy to use and easily hidden in the pattern. They have much less holding power and should be used on 6" – 12" centers. Use a pneumatic stapler with pressure regulator.
  - Pop rivets: Feature good holding power on metal forms but require more work than self-drilling screws.
  - WOODEN DOWELS: On tilt-up or precast jobs where the liner is attached to the concrete casting bed, screw or nail the liner to 1/2" wooden dowels inserted in the concrete. The dowels are easy to drill out and patch when the job is complete.
  - CONSTRUCTION ADHESIVE: On tilt-up jobs, construction adhesive can be used to attach the form liner to concrete slabs.



The concrete and the form liner must be clean and dry during installation. After initial installation, keep the concrete surface dry, as moisture between the plastic and the concrete can break the adhesive bond. Sealing at the form liner joints will aid in maintaining this bond.

- **DOUBLE-COATED FOAM TAPE:** On tilt-up jobs, double-coated foam tape provides an easy way to secure the form liner to the casting bed. On most patterns the tape should be centered on the form liner seams. Carpet tape 1/32" - 1/16" is recommended. Both form liner and concrete must be clean and dry.
- **BACKUP STRIPS:** To prevent deflection from the pressure of the concrete, some form liner patterns will require additional support. Generally patterns with ribs wider than 1 1/2", or a depth of 1 1/2" or greater should have back-up strips installed (see Southern Metal & Plastic literature for recommendations). The need for back-up strips should be confirmed from the mock-up pour. Wood or styrene foam insulation board should be used between the liner and formwork.

## SEALING

- All form liner joints and tie holes should be sealed to prevent localized water loss and subsequent discoloration of the concrete. Grout leakage will make stripping difficult and may damage the liner.
- Neutral cure silicone sealant is recommended for cast in place jobs. Once cured, it is flexible, has good adhesion and won't discolor or stick to the concrete.

## FORM BOLTS, TIES AND BAR SUPPORTS

- Tie spacing should be a multiple of the form liner pattern repeat.
- Tight fitting holes may be drilled or cut with a hole saw.
- Reinforced fiberglass rod ties work well with architectural form liners. After stripping, the rods are snapped off and ground flush with the concrete. Patching and filling of holes is eliminated.
- Ties located in the "valley" of the concrete may be less obvious. Patching tie holes located in the "peak" of the concrete is easier.

- Bar supports or spacers should always rest against the portion of the liner that is in contact with the form work. The leg spacing of the bar supports should match the pattern repeat of the form liner.
- Supports and spacers should be plastic or plastic tipped to minimize rust stains on the finished concrete.
- Some deeper patterns may deform when walked on in pre-cast and tilt-up work. When placing the bar mat, workers should walk on strips of 1/4" plywood to distribute the load on the form liner. The thin plywood strips are flexible enough to pull out through the bar mat. The concrete itself distributes the load during placement. If permissible, walk on the reinforcing steel rather than the liner surface.

#### RELEASE AGENTS AND BOND BREAKERS

- Southern Metal & Plastic form liners are made from rigid non-absorbing compounds that will not bond to the concrete.
- Although not required, liners should be used with a Southern Metal & Plastic approved release agent. Proper use of a release agent will aid in stripping, improve the surface appearance of the concrete and speed clean up between pours.
- Southern Metal & Plastic 7000 RELEASE AGENT is available for this purpose. Some release agents may cause cracking and embrittlement of the liner material with subsequent failure.
- Apply release agent at recommended rates. Over application may produce surface voids.
- Apply release agent before each use.

#### CONCRETE MIX DESIGN

- For uniformity of color and texture, use one concrete supplier, making sure that all ingredients come from the same sources.
- Recommended slump is 4 to 6 inches. The higher slump allows easier filling of pattern details.
- Avoid overly sandy or high air entrained mixes as they tend to be "sticky" and can promote bugholes.
- For ribbed textures the aggregate should be smaller than the width of the rib. Oversize aggregate can cause honeycombing and chipping on the ribs.
- Use an elephant trunk or treemie for placing concrete to minimize aggregate separation. Dropping the concrete directly against the liner may cause surface abrasion or deformation and result in a defect in the finished concrete.
- Pumping the concrete into the forms from the bottom will generally reduce air voids in the surface of the concrete. This method will also raise the form pressures significantly, which may damage the liner.
- The proper use of a plasticizer in the mix will minimize air voids. The placement rate may have to be reduced to keep form pressures at an acceptable level.
- High placement rates may create excessive form pressures, which can deform or damage the form liner. High pour rates may cause more air voids.



- Keep concrete lifts less than 24 inches. Thoroughly vibrate concrete to achieve good consolidation, eliminate lift lines and to minimize air voids. External vibrators can loosen the liner from the formwork; internal vibrators are normally used. Contact between the vibrator and the form liner may damage the liner. Under and over vibration may also cause defects in the surface of the concrete.
- Foot prints, standing water and airborne dirt and debris should be removed before placing concrete with pre-cast and tilt-up panels.
- Elevated temperatures encountered with heated curing beds may harm the form liner. Contact Southern Metal & Plastic for specific recommendations.

#### STRIPPING AND CLEAN-UP

- The force required in stripping forms with architectural liners is greater than smooth formwork. When applying the extra force needed, care should be taken so that the textured surface is not damaged
- Formwork should be broken back after a minimum of 12 hours and stripped preferably within 24 hours of concrete placement. Extending the time from placement to stripping can increase the force required.
- Begin stripping at the top of the formwork. Separate the form from the concrete slightly. Hold in this position for several minutes to allow the induced stress in the form to diminish. Continue to separate the formwork from the concrete in stages until final separation.
- Southern Metal & Plastic form liners are easily cleaned with household detergent and a stiff brush.

#### FINAL FINISHING

- Rubbing: Seams and forming defects may be removed with a stone while the concrete is green.
- Sandblasting: Many jobs call for sandblasting to roughen the surface and bring out the color of aggregate. Sandblasting may also hide seams and forming defects but will not hide discoloration caused by grout leakage.
- Patching: When patching tie holes or more serious forming defects, a close color match is critical. Use the same materials used in the original mix and perform several trial runs before beginning work on the structure. If in doubt, hire a consultant. Bad patches look worse than the original problem.

## Supplemental Installation Instructions For #S328, #S439, #S440, #S454, #S460 and #S477 Stone Form Liner Patterns

Please note that the #S328, #S439, #S440, #S454, #S460 (see note #2 below for special instructions) and #S477 patterns have special features that result in a finished concrete wall that looks as though it was built using individual stones. This gives the end product a more natural looking appearance. With this in mind, the above patterns do require some special care and attention when being installed in comparison to other plastic form liner patterns that are offered.

Please refer to the installation guide for Architectural Form Liners for complete information addressing the care and use of your Form Liners. In addition to those detailed instructions, the following directions provide additional information to improve the performance of the #328, #439, #440, #454, #460 and #477 form liner:

1. The #S328, #S439, #S440, #S454 and #S477 patterns are “pattern-matched” from left to right and top to bottom. In other words, when two form liners are butted side-to-side or top to bottom, the stones at the perimeter of the form liner appear as though they run continuously through the form liner joint between adjacent form liners. This eliminates the feature of having a long, continuous grout line around an entire form liner perimeter, common with many stone patterns. That long, continuous grout line draws attention to form liner joints, effectively creating a “grid” pattern around each individual form liner, and creating an unnatural looking stone layout. The #S328, #S439, #S440, #S454 and #S477 patterns eliminate that unsightly “grid” feature. With this in mind, ALL #S328, #S439, #S440, #S454 and #S477 liners must be fastened to the forms in the same orientation (i.e. one liner cannot be mounted to the form right-side-up and then the next liner in sequence be mounted to the form upside-down). This keeps those “pattern-matched” perimeter stones continuous through all form liner joints. These joints are difficult to see in the finished wall, which can be very difficult (if not impossible) to achieve with most plastic form liners.
2. There is not necessarily a designated “top” or “bottom” to the #S328, #S439, #S440, #S454 and #S477 form liners, but they must always be used in the same orientation in which the first form liner is fastened to the forms.
3. The #S460 pattern is unique in that it has only (2) matching stones on each of the four sides. This is different than the other “pattern” matched profiles that have all of the stones around the perimeter matching. This feature provides a more random look to the finished surface as the panels are allowed to be rotated 180 degrees and still maintain the match points on the (2) perimeter stones on each of the four sides. With the #S460 only the grout lines at the (2) stones on each of the four sides will need to be supported from sheet to sheet as the grout lines will be away from the form. The entire perimeter will also need supported as is typical for the non-pattern matched patterns.
4. In order to keep the “pattern-match” feature continuous at all form liner joints, it is important that the form liner NOT be cut/trimmed on an edge where another liner will butt up to it. This will distort the pattern and the location where the next abutting liner is intended to butt up to the previous liner. This may result in grout lines that do not match up at form liner joints. Stone textures may also appear inconsistent through the improperly cut form liner joint.
5. It is imperative to seal all form liner joints with an appropriate caulk or sealant. It is also important to seal any form liner penetrations, such as form ties or weephole pipes, in order to prevent concrete bleeding. Essentially, any location where concrete may bleed shall be sealed. This procedure is recommended with any plastic form liner pattern, but worth mentioning again.
6. If the form liner is held short of the top of the form or not ran entirely to the bottom of the form, it is necessary to use a closure strip at the top or bottom of the limits of the form liner. The closure strip must be at least 1” deep (for the #S454), 1 1/8” deep (for the #S477), 1 1/2” deep (for the #S328, #S439 and #S460) and 2” deep (for the #S440) to prevent concrete bleeding between the form liner and form. It is also highly suggested to seal the joint between the form liner and closure strip to prevent concrete bleeding. This procedure is recommended with any form liner pattern, but worth mentioning again.
7. It is highly suggested to use a large diameter backer rod to bridge between the grout lines located at form liner joints. This backer rod will help seal the joint as well as provide additional support for the grout lines at the perimeter of the liner, which are essentially not in contact with the form face. This can also help line up the grout lines on adjacent liners.
8. Following the above steps, along with the instructions provided in the installation guide for architectural form liners, should result in an extraordinary looking decorative concrete wall!

Should you require additional technical support, please contact Southern Metal & Plastic for assistance.



## AVAILABILITY AND COST

- Availability: Southern Metal & Plastic form liners are distributed worldwide through an extensive network of concrete forming and accessory dealers. Contact Southern Metal & Plastic for the name of a dealer in the area.
- Lead-Time: Lead times will vary with order quantity, pattern and production backlog. Smaller orders for popular patterns can usually ship in one to two weeks. Allow a minimum two to four weeks for larger orders and six weeks for custom patterns.
- Cost: Contractor cost will vary with order quantity, pattern and choice of Single Use, Medium Use or High Use form liners.

## TECHNICAL SERVICES

- Southern Metal & Plastic distributors have the knowledge and ability to answer most questions. Southern Metal & Plastic will also assist with design, specification and product installation questions.
- Additional information, product brochures, 3 part CSI formatted specification, and technical notes, is available upon request.

The following ACI Committee reports are recommended:

ACI 117; "Specifications for Tolerances for Concrete Construction and Materials and 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"

Material ABS Alloy or HIPS Alloy

Tensile Strength - Yield (PSI) ASTM D638 5,100 2,900

Flexural Modulus (PSI) ASTM D790 270,000 300,000

Notched Izod Impact (ft.-lb/in) ASTM D256 6.3 2.1

Vicat Softening Point (°F) ASTM D1525 224 210

Heat Deflection Temp (°F) ASTM D648 198 @ 264 PSI 183 @ 264 PSI

Form Liner Weight Range (lb/ft<sup>2</sup>) 0.33 – 0.82

Fastener Pull Through Strength 2056 1263 (lb/fastener/in of material thickness)

Fastener Fatigue 173 1 (# of cycles to failure @ 165 lb/fastener)

## WARRANTY

Southern Metal & Plastic warrants its products will be free from defects and will perform as stated in this literature, provided the application and construction practices used are per our recommendations and Job Site Guide instructions and provided actual job construction duplicates mock-up materials, methods, workmanship, placement rates form pressures, joint sealing and stripping practices. If our product does not meet the published product specifications and our customer gives notice to us before installing the product, we will replace the product without charge or refund the purchase price. Product replacement or refund are the buyer's sole remedy for breach of warranty or negligence and we will not be liable for any indirect, consequential, special or resultant damages. To the best of our knowledge, the information contained herein is accurate and reflects average test values. Final suitability of any information or material is the sole responsibility of the user.



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