



# form+function

News & Information from Hamilton Form Company

## Self-Stressing Architectural Casting Tables

Architectural tables are not normally designed to resist 1,000 kips or more of prestress force. Steel tables built for structural products are not normally designed for high quality architectural finishes. It's difficult to do both with one table; until now.

Typical self stressing tables are designed so that the skin and stiffeners carry the stressing load. As the table is stressed, the skin shortens due to compression forces. As the stress is released, the table flexes. If topped with wood and fiberglass, this flexing will eventually crack or warp the casting surface. To overcome this problem, Hamilton Form designed a self-stressing casting table frame that carries the prestress force in the substructure.

The substructure is made up of back to back channels with stressing bars that run through the channels. Bars are not welded to the channels so they float independently. Load is transferred through the bars, not the channels. Once the frame is installed, wood 2x4s are bolted to the top and decked. The frame can be topped with wood and fiberglass or other smooth material. The deck doesn't carry prestress force and moves independent of the frame to protect it from cracking or warping. The result is a smooth surface that lasts and lasts to cast architectural panels as well as structural panels with a seamless architectural surface.

Jacking abutments can be located under the table to save floor space. Bars transfer the longitudinal stress between the abutments. Counter weights and floor anchors must be used to

resist overturning forces. The table can be designed for heavily stressed spandrel loading on the outside edges. Sliding jacking plates that can accommodate various strand placements add flexibility and reduce set-up time.



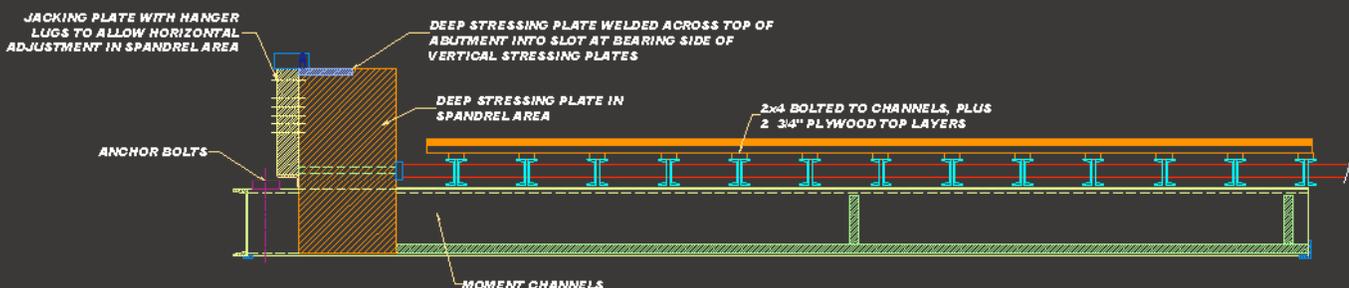
*Hamilton Form recently delivered a 16'-0" self-stressing casting table frame to Shockey Precast Group. The frame is topped with plywood and fiberglass for a smooth, seamless casting surface.*

Most tables are built in 40-foot long sections. Extra wide tables are built in 2 halves that are joined together when installed. Bar couplers are used to tie the stressing bars

together at the joints. Because the table can handle heavily stressed panels, the precaster has the ability to pour structural panels such as L-beams or spandrels with an architectural finish as well as typical architectural panels.



*Sliding jacking plates adjust for different strand patterns to save set up time.*



**Shockey Precast Group / Fredericksburg, VA**  
**Contributed by: Dennis Ripley**

# Mobile Work Stations Improve Productivity at Shockey Precast Group

When setting up casting tables for architectural products, set-up crews at Shockey Precast gather the tools they need and take them to their work area. Tools are usually kept at the end of the table making them easy to reach. Occasionally, a tool or piece of equipment is needed that wasn't brought to the table. Someone in the set-up crew goes back to the shop to retrieve it.

A line employee at the Shockey Precast Group in Fredericksburg, VA, observed this process and suggested building a mobile work station for each set-up crew. The station would house everything the set-up crew needs. If the work stations were built on wheels they could be moved around the plant and used wherever needed. A well organized, mobile work station would eliminate the frustration of having to stop in the middle of a set-up in order to go back to the shop and hunt around for tools or hardware.

The idea was taken to management and quickly approved. The work stations were built on wheels with drawers where tools and hardware could be organized and a flat top that can be used as a work surface. The work stations help employees be more productive because they don't have to look for tools or hardware they need. Tools are placed in such a way so they can be easily reached when needed. The morning crew replenishes the cart.

The mobile work station adopted by Shockey is a great example of a process improvement idea driven from the bottom up. Anyone trained in 5S knows that walk means waste. Eliminating the necessity of walking from the work area to the tool shop for missing tools or equipment is a great example of how waste can be eliminated from the workplace. Keeping tools needed for a job convenient, orderly and replenished is a great example of how the 5S system can help improve productivity.

When the 5S system becomes part of a company's culture, improvements start flowing from the bottom up. We'd like to thank the Shockey Precast Group for sharing this process improvement idea and congratulate them on creating a culture of continuous improvement.



## Organization in the Workplace: The 5S System

The 5S system, originated in Japan, is a successful and widely accepted approach to organizing the work place. An organized environment is easier to work in, improves productivity and helps create a sense of ownership in the work place.

### 5S stands for:

- 1. Seiri** Sorting: Go through all the tools, materials, etc., in the plant and work areas and keep only essential items. Everything else is stored or discarded.
- 2. Seiton** Straighten or Set in Order: Arrange tools, equipment and parts in an order that promotes work flow. Keep tools and equipment conveniently located to maximize efficiency.
- 3. Seisj** Shining: Keep the work-place clean and neat. At the end of each shift, make sure the work area is cleaned up and everything

is put in place. Cleanliness and order should be part of the daily work, not an occasional activity initiated when things get too messy.

- 4. Seiketsu** Standardizing: Standardize work practices so that everyone knows exactly what his or her responsibilities are to keep things neat and orderly. Be consistent.
- 5. Shitsuke** Sustaining: Once the previous 4S's are established, they become the new way to operate. Maintain the focus on this new way of operating. Don't allow a gradual decline back to the old ways of operating.

A sixth "Safety" is sometimes added. Purists, however, argue that adding it is unnecessary since following 5S correctly will result in a safe work environment.

# What Is Rust? And what you can do about it.

Rust, like everything else in the world, is made up of chemicals, and chemicals are made up of atoms. The formation of rust is actually a chemical reaction. A chemical reaction occurs when atoms join together or break apart to form new combinations of atoms. Two things are necessary for this reaction to occur: oxygen and moisture. When iron combines with oxygen, it forms iron oxide, or rust. Because oxygen and moisture are readily available in the atmosphere, if no preventive measures are taken, steel, which is primarily made up of iron, will rust.

As steel rusts, it puffs up because iron oxide is a larger molecule than iron. The puffing causes cracks and voids that expose more metal to the environment, resulting in more rust. The rate of rusting is usually higher in the first year of atmospheric exposure than in subsequent years, but can increase significantly depending on the degree of pollution and moisture in the air. The real issue is that once rust is formed, there is mobile oxygen in the metal, and the oxygen can move deeper into the metal causing further rust.

### Some things cause steel or iron to rust faster than others:

- Water will cause iron and steel to rust faster. Water is necessary to facilitate transport of the electrons. Iron will rust in air after a long time, since there is moisture in the air, but the presence of water speeds the process.
- An electrical conductor helps chemical reactions, like rust, occur faster. Salt water accelerates rust faster because salt water is a better electrical conductor than plain water.
- Similarly, water lower in PH will contribute to more rapid rusting than high PH water. This is important because in areas where acid rain is more prevalent, metals will rust faster than in areas with pure rain water. Pure rain water has a pH of about 5.6 from dissolved carbon dioxide, a normal constituent of air; whereas, acid rain can be as acidic as to have a pH of 3. Acid rain is not only a problem in urban areas because winds can blow polluting gases from industry and car exhaust great distances before they return to the earth as acid rain.
- Like most chemical reactions, heat also speeds the process. Concrete creates heat as it hydrates, making the environment in a precast plant perfect for rust to develop.

- Dissimilar metals rust faster than single metals because of electrochemical reactions. Steel rusts faster than iron because steel is made up of iron and other metals. Joints between dissimilar metals can also rust very quickly.

All of this illustrates the importance of having a rigorous program in place to protect steel forms from rust, because we have yet to find a precast plant where steel forms are not exposed to air, moisture and heat.

### Rust Protection

Rust inhibitors and protective coatings for steel are available from several sources. These coatings form a protective barrier on the surface. Some release agents are formulated with rust inhibitors, but these may or may not be concentrated enough to prevent rust. It is best to discuss options and the pros and cons of different formulations with one of these sources.

When concrete cures it shrinks. It is not uncommon for condensation to occur between the form and the concrete. This is a prime area for rust to occur if the metal is not protected. Remember, whenever the surface of the form is exposed to air and moisture, it is vulnerable to oxidation. That means exposed steel surfaces need to be protected.

### Why Now?

From time to time, we have heard of steel forms that have been in service for a long period of time, when suddenly rust appears on a section of the form. If this happens in your plant, start a systematic investigation to determine the cause of the rust. Look for changes in the product, material or process that may have triggered the rust. Have you changed the release agent you use? Have you changed mix materials? Have you added steam or heat? Any of these changes may have triggered a reaction that can cause rust.

You should also check for chlorides, acids and other contaminants. Contaminants may have been introduced from any number of sources: admixtures, contaminated water, chemicals in compressed air used in production, or even airborne particles outside the plant. In testing a section of form where rust suddenly occurred on a form that had been in service for many years, chlorides (salts) were detected on the metal. Salt could have been introduced through aggregates because the quarry cut into a vein of salt. Trucks or railcars used in hauling the aggregates could have been contaminated

from a previous load of road salt. Recycled wash water could have contained salt. The mix water could have been treated with a water softener or other treatment. If rust suddenly appears, something probably occurred that introduced a contaminant in the process and the steel started to rust.

### Cleaning Rust

A number of different strategies can be used to clean rust from steel. Below is a list of some options. Before you do any of these, make sure you research the method and proceed with caution to protect your investment.

### Sanding

Surface rust can be cleaned from steel. A light brushing with sand paper, a steel brush or steel wool will usually clean surface rust. But be careful when removing rust. Use only soft, fine grain sand paper or use rubber sanding materials. Be especially careful when using power sanders or grinders. Do not use "hard rock" grinding disks which will cut into and damage the steel surface.

If you do sand or brush the surface of your form, be aware that this type of cleaning "activates" the metal and makes it more prone to rusting. Immediately after metal is cleaned, it is essential that some form of rust proofing is applied to protect the metal.

### Shot Peening

A technique used to refine or repair steel surfaces that will also remove rust is called shot peening. This process can be used to improve the metal finish and durability of a form surface after installation, before it goes into service. The process uses small beads or "shot" to blast the metal surface. Each piece of shot that strikes the metal acts as a tiny hammer that creates a small dimple in the material. In order for the dimple to be created, the metal must yield in tension. Below the surface, the metal tries to restore the surface to its original shape. Overlapping dimples redistribute the surface creating a highly stressed uniform surface high in compressive strength. Uniform bead blasting helps blend steel seams and imperfections and work-hardens the surface. Shot peening too hard or uneven will damage the surface of the metal. If you are considering shot peening use an experienced, trained professional. Shot peening is not a do-it-yourself job.

## What is Rust (continued)

### Bead Blasting

Bead blasting using materials other than shot can be used to clean and remove rust from older forms. If you decide to bead blast, only use non-abrasive materials. Some precasters have used crushed corn cobs with good results. Do not use a material such as walnut shells that can stain. If your form requires a heavy cleaning, you could try light sand blasting, but be very careful, sand cuts into steel and can easily pit and damage the surface.

Any type of blasting will remove some good metal as it cleans and removes rust. After any blasting, the metal is exposed, making it essential to apply some form of rust protection immediately afterwards.

### Acid Etching

A chemical technique for removing rust is etching with phosphoric acid. Some rust cleaning products contain phosphoric acid. A common product which contains phosphoric acid is the soft drink Coca-Cola. Phosphoric acid has a unique property of dissolving iron oxide quickly while etching iron very slowly. A unique advantage of phosphoric acid is that it leaves a fine coating of iron phosphate behind which helps prevent rust. Additional protection however, is still required.

Any type of acid treatment must be taken with extreme caution. Acid cleans rust;

then slowly attacks the bare metal. Many times because of time constraints, language barriers or simple errors, acids are left on the forms and cause deep pitting and etching that ruins the smooth surface of the form and makes the form likely to have performance issues during its usage.

In addition, because of harm to underground water supplies, it is not acceptable to rinse any caustic chemical into the ground where it could be absorbed by underground water supplies or run off into a lake or stream. Before using any product, check the ingredients.

### A Word to the Wise

No matter what process you use to clean rust, be careful. Anything you do that removes material from the form will affect the finish. Be careful that you don't create heat when sanding, buffing or using abrasives on your form. Heat distorts metal. Bead blasting can be effective in cleaning your form, but if it is done too hard or unevenly, it will destroy the surface of the form. Be cautious whenever you work on the surface of a form.

### An Ounce of Prevention

The best solution is to protect your forms from rust before it occurs. Talk to chemical suppliers about the best rust inhibitor products for your plant. Different products work better in different areas of the country. Variations in

temperature and humidity, atmospheric contaminants, elevation, seasonal changes and the processes used in your plant should all be considered when making a product choice.

Finally, always make sure forms are properly cleaned and maintained. Apply a good long-term rust protective coating to your forms before storage. Never store forms filled with concrete. It's easy for condensation to form between the form and the concrete and that will accelerate rust development. If rust does develop, begin a systematic investigation of all possible sources of the cause - and eliminate it.

### RESOURCES

#### Find out More about Rust and How to Deal with It

An excellent article written about rust on steel forms was published in the Concrete Producer Magazine; May 2007. Go to [www.concreteproduceronline.com](http://www.concreteproduceronline.com) and search for the article: Formwork Rust: Reasons and Prevention.

A great website with detailed information about all sorts of rust is The Corrosion Doctors. Go to [www.corrosion-doctors.org](http://www.corrosion-doctors.org)

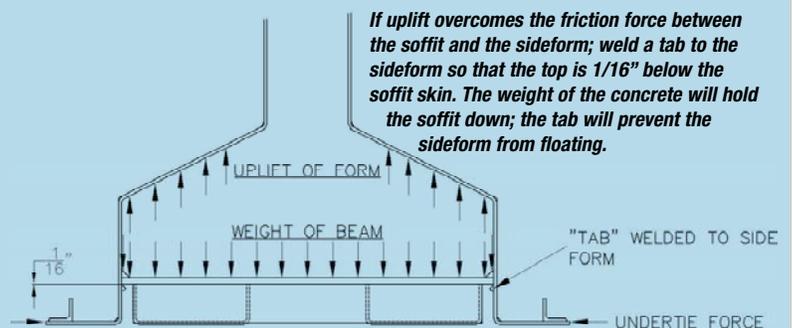
Cresset Chemical Company makes rust removal products and products which can be applied to protect forms for storage. Contact your local sales representative or go to [www.cresset.com](http://www.cresset.com) for more information.

A.L. Patterson carries a number of different rust inhibitors, form oils and release agents. Go to their website [www.alpatterson.com](http://www.alpatterson.com) or call 1-800-332-7090.

## Simple Solution for Uplift Problems

It's not uncommon to experience lift problems on bulb tee sideforms, especially on beams that are 48" or more deep. When concrete flows under the leg of the sideform, it creates an upward force against the sideform, making it want to lift up. The amount of force increases on deeper beams. Under ties are used under the soffit to hold the sideforms together. Friction between the sideform and the soffit will usually prevent uplift. If you are using under ties and still experiencing some floating of the form due to uplift, your form set-up may need a little help.

A simple solution is to add tabs to the sideforms to stop the uplift. Weld a 2" long tab to the side of the sideform on 5'-0" centers. The tab can be made out of a square bar, a piece of chamfer or a round bar. The tab should be placed so that the top of the tab is 1/16" below the bottom of the soffit skin.



If the sideform tries to float upward, it will be restrained as soon as the top of the tab makes contact with the bottom of the soffit skin.

## Reliable and Easy to Use Prestressing Strand Tensioning

Strand tensioning equipment that is reliable and easy to use is a valuable asset. Hamilton Form offers a variety of stressing jacks, power units and positioning frames that are durable, easy to use and will deliver years of trouble free service. Our most popular is the PS4500 stressing jack/tensioning unit and power unit. The F25 hoist and frame completes the package.

- The PS4500 **Tensioning Unit** is a fast action, durable, pull type stressing jack used for typical half-inch and half-inch special strand. Designed for single stroke tensioning on long line forms, the PS4500 will quickly and efficiently pull and return strand. It is available in 24, 36, 48 and 60-inch strokes and includes a magnetic torpedo level that can be used to ensure that the jack is level and pulling straight.
- The P4500-950 **Power Unit** has a flow capacity of 4.1 GPM, 10HP motor and a large 18 gallon capacity tank. The controls are simple, fast and easy to operate. Initial and final tensioning gauges are large and easy to see. Hoses are equipped with high-pressure quick disconnects.



The PS4500 Tensioning Unit with P4500-950 Power Unit and Frame.

The P4500-950 power unit is skid mounted and can be transported by a motorized vehicle in the yard; or with an optional cart and casters.

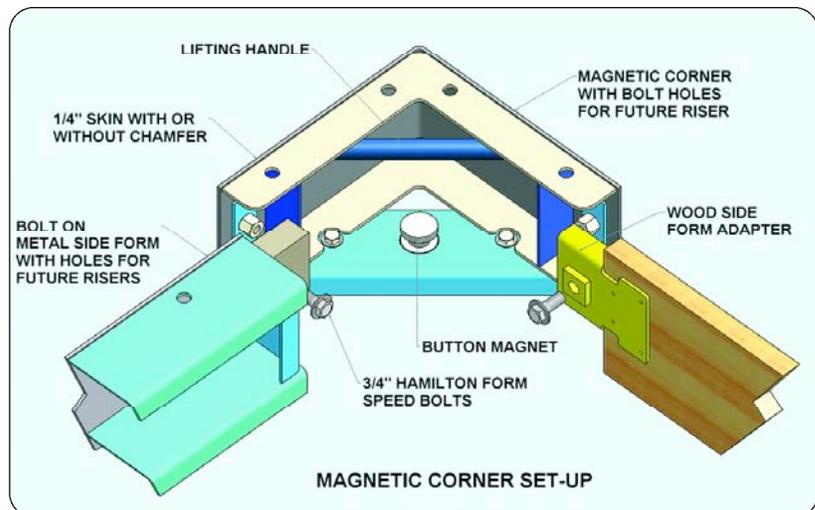
- The F25 **Positioning Hoist and Frame** simplifies the stressing operation at the end of the bed. A chain hoist lifts the jack, making positioning easy and safe. The power unit is conveniently mounted to the side of the frame. The frame moves on dual wheel casters, so that it's easy to relocate for use on multiple beds.

## Durable, Labor Saving Alternative to Wood Block-Outs

Hamilton Form's magnetic steel corners are the easy to use, durable alternative to wood. Steel corners are always square and true and cast a high quality product. Powerful button magnets hold the corners in place. They set-up and break down easily and last for years. Using steel corners instead of wood eliminates the cost and hassle involved in building and then disposing of wood.

The corners can be used with either steel or wood side rails depending on the flexibility and durability required. Corners are typically made 18" x 18" or 24" x 24" and can be made up to 12" high. Metal rails can be attached or a wood side form adapter can be ordered.

For a durable, labor saving, quality window block-out call Hamilton Form Company: 817 590-2111 or e-mail [sales@hamiltonform.com](mailto:sales@hamiltonform.com)



Steel corner with button magnet



Chamfer can be added to top, bottom or both

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**Bill Flenner**  
**Equipment Division**  
**Supervisor**

Bill Flenner has been shaking things up at Hamilton Form for almost 2 years now. Bill is

the supervisor of the Equipment Division. In a short time he has enhanced, upgraded and expanded the capabilities of the Division. Under Bill's direction Hamilton Form has invested in new CNC machines, upgraded its plasma cutting capabilities and computerized several processes to help improve quality and productivity. As supervisor, Bill oversees every piece of equipment built at Hamilton Form; from Tarp and Utility Carts to Stressing Equipment, Cleaner Machines, Depressor Pins and even Hydraulically Operated Forms. Bill has over 25 years experience. The diversity of the product line is both challenging and fun for Bill.

Bill has been married to his wife Belinda for 30 years. They have one son and one daughter; two grand-daughters and one grandson. In March of 2009 the family is expecting another addition to the Flenner family.

On weekends, you may find Bill riding his Suzuki Cruiser, cooking barbeque and enjoying time with his family. On Saturdays Bill joins a church organization in cooking and delivering food to the homeless in the Fort Worth area.



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