BRICKING SOLUTIONS
A DIVISION OF BROKK

Operations & Maintenance Manual

Econ - O - Ring

V. Sept 2010

SUMMARY OF OUR MISSION

BRICKING SOLUTIONS IS ALL WE DO

The most important issue in today's world of kiln maintenance is safety. This guide will introduce the most advanced equipment available for safe and efficient rotary kiln bricking maintenance procedures. We believe it will give you some concepts and ideas on how to reduce some risk of the demanding tasks of removing and relining rotary kilns along with increasing productivity.

Quality rotary kiln refractory maintenance revolves around easy access, rapid tear out, and efficient installation. If any part of this circle is missing, you're losing valuable days of production. At Bricking Solutions, our goal is to minimize kiln downtime by creating products that improve the safety, speed and quality of every step in your maintenance process. With the Bricking Solutions maintenance system, your kiln is back on line sooner and turning profits longer.

We take pride in designing, engineering and building everything we sell. We do everything possible to make sure our products are the best in the industry. All our products meet and exceed the following criteria:

1) Increase safety, productivity, and efficiency;
2) Added, tangible time savings;
3) Measurable return on customer's investment.

By maintaining close relationships with installers, contractors, plant designers, and refractory manufacturers, we adapt our products as their needs evolve. These efforts help us to constantly improve our bricking system and your refractory maintenance process. We are committed to listening to our customers while striving to make their jobs easier and safer. Bricking Solutions refractory maintenance products can be found in the cement, lime, pulp and paper, steel, incineration, and chemical industries of over 70 countries. Each product is unique to that customer's needs; each is offered with in-depth consultation and training; and each one is backed with a customized parts inventory. Throughout the world, wherever safety, speed, and quality are priorities, you'll find Bricking Solutions.

On the following pages you will find an operational and maintenance manual that discusses the advantages of using our product line with special focus on the bricking machine you purchased. It will help you quickly understand the principles of the machine and how to reap the rewards of a safe, fast, and efficient brick installation as well as some proven concepts on kiln maintenance and access.

Bricking Solutions has contacted many experts in the field of kiln maintenance and asked them to contribute their ideas and concepts. Further, we would like to encourage anyone who reads this guide to contact us with their ideas. Our goal is to convey ideas we and many others have used with great success. Please contact us with any questions or ideas at TOLL FREE: 800-621-7856, TELEPHONE: 360-794-1277, FAX: 360-805-2521, or E-MAIL: info@brickingsolutions.com.

WELCOME TO THE BRICKING SOLUTIONS' FAMILY

Thank you for choosing a Bricking Solutions bricking machine! We know if used correctly it will increase your work productivity. This operations and maintenance manual contains descriptions and instructions for your specific bricking machine custom designed for your particular kiln. Keep the operations and maintenance manual as well as the assembly and disassembly guide protected and available for your operators for future reference.
Note Before Using A Bricking Machine:

It is the responsibility of the owner/employer to ensure that the masons can assemble and use the machine safely. Before starting the machine assembly, both the supervisor and masons must read and understand the operations and maintenance manual or have a Bricking Solutions trained technician assist your team for a smooth start. Within this manual, we will cover:

1. Safety instructions to prevent personal injury and damage to the machine.
2. What the machine is intended for and what it is not equipped to deal with.
3. How to use and operate the bricking machine.
4. Basic maintenance, troubleshooting, and repair of bricking machine components.

MANUFACTURER'S CONDITIONS

Bricking Solutions reserves the right to change the specifications and instructions of the machines without prior warning. The machine must NOT be modified or repaired without written permission from Bricking Solutions. The owner takes responsibility if the machine is modified after delivery from Bricking Solutions and without written permission from Bricking Solutions. Modification may cause new risks to the masons, machine, and surrounding area, i.e. a reduction in rigidity or defective protection. It is the responsibility of the owner to specify the modifications to be carried out and to contact Bricking Solutions for approval before starting any such modification. Please call us toll free at 800.621.7856 or at 360.794.1277 to speak with a factory trained technician.

BRICKING SOLUTIONS WARRANTY CONDITIONS

- The warranty will only apply if the equipment is used and maintained according to the safety and maintenance instructions given in the operations and maintenance manual as well as the assembly/disassembly guide.
- Irrespective of local guarantee requirements and unless otherwise agreed, Bricking Solutions' guarantee period for new standard products is 12 months from the date of first installation use or maximum 18 months after the date of shipment from Bricking Solutions, whichever comes first. To claim warranty, the parts in question must be sent to Bricking Solutions.
- Bricking Solutions' liability to a customer for any claim related to product defects shall be limited to the refund of the purchase price or replacement of the defective part. In cases where gross negligence or faulty design is the cause, Bricking Solutions will also reimburse the freight, import duties, and labor cost.
- Bricking Solutions' obligation shall not apply to parts which are not Bricking Solutions originally supplied parts, nor cover any product which has been subjected to accident, alternation, abuse, misuse, or normal wear and tear.
- Bricking Solutions' liability does not cover defects, which are caused by faulty handling, faulty maintenance, faulty repair, problems related to dirt/water/particles in the system or poor electric power or air supply.
- Bricking Solutions' guarantee period for spare parts is 12 months from date of installation or maximum 18 months from date of shipment, whichever comes first.
- Bricking Solutions will dismantle the defective part and install the new part only if this operation requires special knowledge. If such special knowledge is not required, Bricking Solutions has fulfilled its obligation in respect of the defect when the repaired or replaced part has been delivered to the customer.
- Bricking Solutions' liability does not cover normal wear and tear, nor damage, or breakdowns caused by lack of maintenance or improper handling of any products.

INDEMNITY, WAIVER OF LIABILITY, & ASSUMPTION OF RISK

Bricking Solutions is a manufacturer of bricking machines and associated equipment used for refractory maintenance in rotary kilns. Bricking Solutions' equipment is for commercial use only and is intended for a sophisticated user who already has thorough and complete knowledge and expertise with equipment used for refractory maintenance, working in dangerous environments (indoors and outdoors), equipment, working with hydraulic and mechanical tools, federal state and local safety laws and regulations, and in work in environments classed as "confined space."

Buyers of Bricking Solutions' equipment shall not rely on Bricking Solutions' skills or judgment to select, provide, or recommend appropriate equipment or training for the use of Bricking Solutions' equipment. The information and training that Bricking Solutions provides is of a broad general nature and is not a complete or comprehensive guide to the equipment. The information Bricking Solutions provides is not a substitute or replacement for appropriate training in equipment operation, and it is not a substitute or replacement for the manuals, warnings, and instructions supplied by Bricking Solutions.

The purchasers and uses of Bricking Solutions' equipment knowingly and voluntarily assume all risk associated with the equipment and with the information and training provided by Bricking Solutions, including but not limited to the risk of property damage, economic harm, bodily injury, and death. As part of the agreement to purchase and/or use Bricking Solutions' equipment and/or training, the purchasers and users of Bricking Solutions' equipment and Bricking Solutions training agree to release Bricking Solutions and its officers, directors, employees, agents, and assigns for all claims of any kind or nature (including, without limitation, property damage, bodily harm, economic harm, and death) arising out of the information or training provided by Bricking Solutions. The purchasers and users of Bricking Solutions' equipment and Bricking Solutions' training also agree to indemnify, defend, and hold harmless Bricking Solutions and its officers, directors, employees, agents, and assigns from any and all claims.

DISCLAIMERS:

Bricking Solutions hereby expressly disclaims all warranties of the fitness of the information and training it provides for a particular purpose and expressly disclaims all warranties of merchantability, express and implied. Bricking Solutions also hereby expressly disclaims all warranties, express and implied, that may arise from the course of dealing or usage of trade. There are no warranties which extend beyond the description on the face hereof. The information and training provided by Bricking Solutions is "as is," and "with all faults" as those terms are used in the Uniform Commercial Code.

ENGINEER'S CERTIFICATION OF MANUFACTURING STANDARDS

P.O. BOX 1081
2120 HEWITT AVE
EVERETT, WASHINGTON 98206-1081

Diversified Design Inc.
PROFESSIONAL ENGINEERS AND DESIGNERS

12/9/2005

To whom it may concern:

Subject: Engineer's certification of manufacturing standards compliance by Bricking Solutions.

This letter is to serve as certification that Bricking Solutions equipment is manufactured in accordance with the following standards and procedures:

1) The specifications for each product produced dictate the standards and procedures used during each phase of manufacturing, for fabrication and machining to final assembly, inspection and testing. Most of these standards fall under ASME (American Society of Mechanical Engineers) classification..
2) The majority of Bricking Solutions products are fabricated from high-grade aluminum and they use the specifications for design of aluminum structures by the Aluminum Association Inc. as guidelines for fabrication procedures.
3) All welding of their aluminum components are performed by certified welders and all welds conform to AWS (American Welding Society Specifications) AWS-D1.2 "structural welding code/aluminum".
4) Bricking Solutions has a "Director of Quality Assurance" who has the responsibility for proper and correct documentation of all phases of purchasing, design, production, inspection, testing and shipping of every product produced.
5) Bricking Solutions design and engineering group works jointly with manufacturing, sales and an independent contract "licensed certified professional engineer to take into consideration the customer's product requirements, specifications and final product design including engineering, calculations and risk assessment for safety considerations.
6) Bricking Solutions product warning labels and manuals meet the criteria outlined in the American National Standards Institute (ANSI) standards ANSI Z535.1 through Z535.4 and consider all risk assessment for safety considerations required under the harmonized standards of the European communities allowing self certification under NIST SP951 and the application of EC conformity labels.

For any questions concerning this kindly contact the undersigned.

Yours Truly,

Vern L. Lindberg P.E.
Engineering Manager

Dec. 9, '08

VERNE L. LINDBERG
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

Expires: 11-6-2010

05/25/2010

INSPECTION & REPAIR OF ALUMINUM FABRICATION WELDS

In response to the question from Lafarge on how to inspect and repair our aluminum bricking machine frames please consider the following:

1. First be very careful and do not expect Aluminum to react like steel. They are two different animals and aluminum though as strong as steel it is 3 times as flexible. Therefore the design, fabrication, welding and repair of aluminum structures can be very challenging.
2. Welding and inspection should be in accordance to AWSD1.2 -2008 an internationally recognized and used standard. Welding and Inspection should be done by a certified welder or under the supervision of a certified inspector guided by the AWS standards.
3. Inspection:
   a. Unlike steel, aluminum welds cannot be inspected with a mag-flux process. A die penetrate process can be utilized. Care should be taken to clean the area thoroughly before applying the chemicals used in this process. Any cracks or defects (inclusions, contaminants, etc.) will be highlighted in red.
   b. Visual inspection by an experienced or certified welder is another option. The inspector looks for obvious cracks or heat distortions. Craters at the beginning of or ending of a weld can be inspected for stress cracks. Cracks with in the crater are ok; crakes extending outward from the creator indicate a defect. Visual separation between the weld material and base material is another indication of a defect and can often be found at the beginning or end of a weld.
4. Repair:
   a. As a rule of thumb conservative aluminum experts will recommend that you do not repair aluminum defects. They recommend that the defected piece be discarded. The reason being that the heat of a repair welding procedure tends to reduce the strength of the aluminum in the area of repair (for example a structure with a 3:1 Safety Factor may be reduced to a 2:1 Safety Factor or lower)
   b. If the repair is decided upon, the type of aluminum to be repaired (6061-T6) must be determined by contacting the original manufacturer.
      i. The correct filler material is ER5356 3/64” in diameter.
      ii. Then prep for repair – use new cutting wheels or abrasive wheels to avoid contamination of the repair area by wheels that may have been used on other materials. This will reduce the chance of porosity or inclusions. Also remove all traces of paint or other residue. Degrease the surface to be repaired with Baltane or an equivalent solvent.
      iii. Always remove the old weld. Never weld new filler over an old weld.
      iv. Always start the repair weld ahead of and continue past the area to be repaired to avoid new cracks.
      v. If the structure is fabricated from tubular material avoid welding across the face of the tube except at designed joints where the effects of welding across the face have been taken into account. Weld tubes on edges as welding across the face weakens the tube.
      vi. Inspect visually per AWS when the repair is completed.

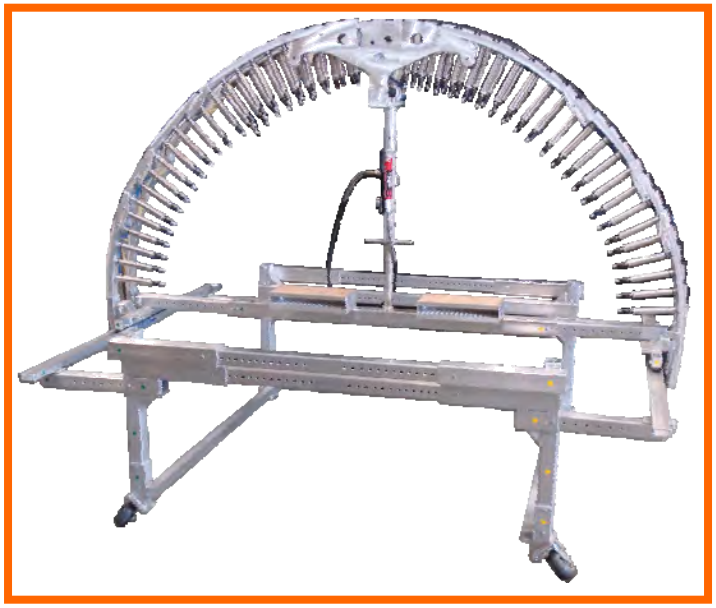
This dissertation is meant to be a guideline only and any repair or inspection should be done in accordance to the standards of AWSD1.2-2008 by someone certified. Please contact us toll free at 800.621.7856 or at 360.794.1277 to speak with a factory trained technician before making any repairs.

GENERAL

The following safety instructions cover those matters that are absolutely essential to know and follow when working with a Bricking Solutions machine and equipment. Before using the machine, we strongly recommend both the supervisor and masons must read and understand the entire Bricking Solutions manual or seek OEM training.

IN THE EVENT OF AN ACCIDENT

- The employer has the responsibility of making a plan, and training all operators, to deal with an accident situation.
- Do not resort to panic. React quickly and effectively to save lives and only then to prevent material damage.
- Learn First Aid. You could save lives!
- Create a checklist for actions in event of an accident
- Get an overview of what has happened, if anyone is hurt and if anyone is still in the area of the accident.
- Alert the emergency services as soon as possible.
- Be prepared to supply detailed information.
- Give First Aid
- Appoint someone/several people with good local knowledge to meet the emergency service vehicles, unlock doors and show the way for the emergency service personnel.



- Ensure that any casualties are accompanied to hospital
- Secure the scene of the accident
- Contact supervisors
- Contact subordinates
- Establish the cause of the accident, write and file a report with the proper authorities
- Take action to prevent future accidents
- Always inform Bricking Solutions of accidents whether the machine was directly involved or not.

RESPONSIBILITIY OF SUPERVISORS AND MASONS

- Ensuring that National and local laws, safety regulations, precautions and other instructions are followed when the machine is used. This may include special protective equipment.
- That the masons have the relevant training and experience to carry out the duties safely. This can be achieved through product training by experienced Bricking Solutions personnel, using good judgment, reviewing manuals, and supervising personnel.
- That no one is permitted to enter the kiln without the correct training and protection. There is a risk of accident and injury.
- That the machine is only used for the intended purpose.
- That the machine is used in a safe manner.
- That the masons are informed of the nature of the kiln and machine.
- That personnel with access to the kiln are aware of and have access to protective equipment.
- Ensure that there is enough personnel to cover shifts and kiln down time with equipment training.
- Report all accidents and safety incidents.

REQUIREMENTS OF THE MASONS

- The masons must learn the function, characteristics and limitations of the machine or other equipment under safe conditions.
- Use common sense to avoid incidents and accidents.
- The masons must stop using the machine or equipment in the event of a hazardous situation. Ensure that the machine or equipment cannot be used by mistake and inform the supervisors. The machine must not be used until the safety hazard has been removed.
- The masons must not be under the influence of alcohol, narcotics or anything else which may affect reaction times or judgment.
- The masons must use personal protection equipment appropriate to the work.
- The masons must ensure that the machine or equipment cannot be used by unauthorized personnel.

PROTECTIVE EQUIPMENT

The masons and supervisor must evaluate what protective equipment is required. The following equipment is only an example. The following is recommended as basic protection:

- Eye Protection
- Hard hat
- Ear Protection
- Thick overalls
- Protective gloves
- Safety footwear
- Meet your company requirements

RISK FACTORS BEFORE AND DURING OPERATIONS

The identification and prevention of any risks and of defining the relevant risks, before and during operations, is the responsibility of the operational supervisors and the masons. Experience of working with the machine, safety precautions are important for ensuring that work is carried out without exposing personnel or equipment to risk.

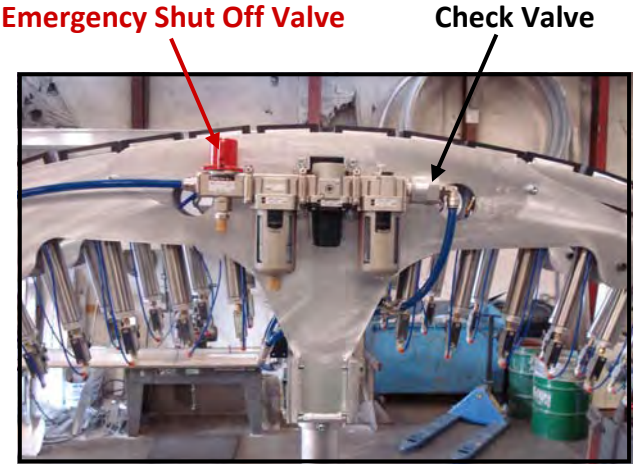
The following is a summary of possible risk factors. The aim is to introduce the supervisors and masons to a way of thinking which anticipates risk factors so that they can identify possible risks and take any precautions necessary to prevent injury or damage.

- Personal injury can be avoided by strict awareness of the risk.
- Risk of personal injury. Never carry out repairs on the machine without the necessary training. Call for technical support or service.
- Only trained service personnel may carry out work. Personal protective equipment and the appropriate safety equipment to mechanically secure machine components must be used during maintenance or service.
- A complete understanding of all maintenance, repair, and assembly manuals.
- All repairs are to be done by Bricking Solutions unless approved by manufacturer. Special aluminum alloy requires specific weld filler material or possible failure may occur. Call for technical services immediately - 360.794.1277.
- Risk of allergic reaction. Repeated skin contact with chemicals such as the lubricator or grease can cause allergic reaction. Avoid skin contact. Use protective equipment.

ASSEMBLY SAFETY RISKS

The machine should be inspected at least 2 to 3 months prior to each use in the kiln. This should be accomplished by the people responsible for the bricking machine and the installation of the brick. It is important to go through the machine and inspect it, making sure it is in top working order. One way to ensure this is to fully assemble the machine at the plant. Apply air to the machine testing each pneumatic and hydraulic function.

- Use clean & spacious location, undercover if possible.
- Locate & read the assembly manual supplied with the machine and understand its full instruction.
- Locate and inventory all tools, hardware, & spare parts in stock. Do not use any unauthorized hardware or parts not supplied by manufacture.
- If previously used, clean all components of mortar or buildup missed during disassembly.
- Take notes on any missing hardware and damaged parts needing replacement or needing repair.
- Take the necessary action for the above by ordering or replacing parts.
- Use the Color Coding System found in the assembly manual and machine labels when assembling the machine to ensure proper setup.
- Important to stage components in proper order to ensure they enter the kiln sequentially and facing the correct direction. In the kiln looking toward burn floor at components entering kiln, the green and yellow markings should be advancing toward assembly area.
- All castor wheels must be perpendicular to the frame to allow the frame to roll up and down the kiln.
- Castor hardware should be tightened when installed and recheck all hardware at the start of each shift.
- Arch Trolley Rail should be loose until all hardware is in place then tighten all hardware and rechecked at the start of each shift.
- Do not operate the machine until all machine hardware is tightened. Overloading, improper assembly, or alterations to the frames may cause serious injury.
- Prior to men or equipment accessing machine, all machine hardware should be installed and tightened.
- Use caution when installing arch if you do not have a customized fork truck bracket to install the arch. Components can be assembled in pieces on the machine.
- Use extreme care when installing the arch. Carelessness could result in damage to the master value, filter/regulator, emergency shut off valve or check value causing the cylinders not to work properly.
- There are many areas during the set up of the machine where your fingers can get pinched. Please be aware of your hands and other personnel's hands while setting up the equipment.
- Update and reapply warning labels and stickers if they loose appearance or disappear.
- Follow each step in the assembly guide and assemble the machine completely. If you are unsure, contact manufacturer immediately at 360-794-1277 or 800-621-7856.



MOVING OR ADJUSTING THE MACHINE RISKS

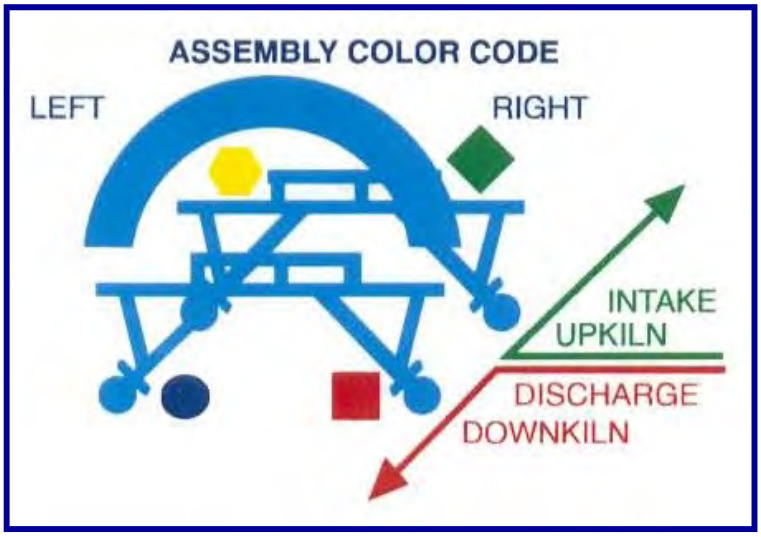
- There is a risk of dropping the machine because of incorrect lifting method or incorrect lift. Check that the fork lift is approved for the weight of the machine.
- When lifting the machine for adjustment or transporting be sure everything thing is secure to avoid damage or personal injury. Make sure all brick, tools and personnel are off of the machine and be sure personnel are clear from machine area.
- Personnel should NEVER be on or near the machine while its being moved. This could result in serious injury or death.

- Before moving the arch visually inspect the path of travel for any obstructions and have them removed. Then verbally announce “ALL CLEAR” to prevent injuries during the movement of the arches.
- Personnel on kiln floor need to verify that everything is out of castors path to allow for easy movement.

WHILE WORKING / OPERATING MACHINE

- Do not operate the machine until all machine hardware is tightened. Overloading, improper assembly, or alterations to the frames may cause serious injury. Always check tightness of fasteners before each shift.
- The machine is not load rated. Overloading may result in damage to machine or serious injury.
- Key mason should always be aware of pinch points on cylinder heads and jacks and call “CLEAR HANDS” before cylinder movement.
- Risk of personal injury to masons or other personnel from falling objects. Incorrect operations or an unexpected brick or tools falling can cause serious injury.
- All personnel need to be aware of head clearance on the machine and all safety features.

Machine Color Coding Labels



Machine Color Coding Label

Down-kiln frame—Right hand side

Down-kiln frame—Left hand side

Up-kiln frame—Right hand side

Up-kiln frame—Left hand side

Machine Warning Label

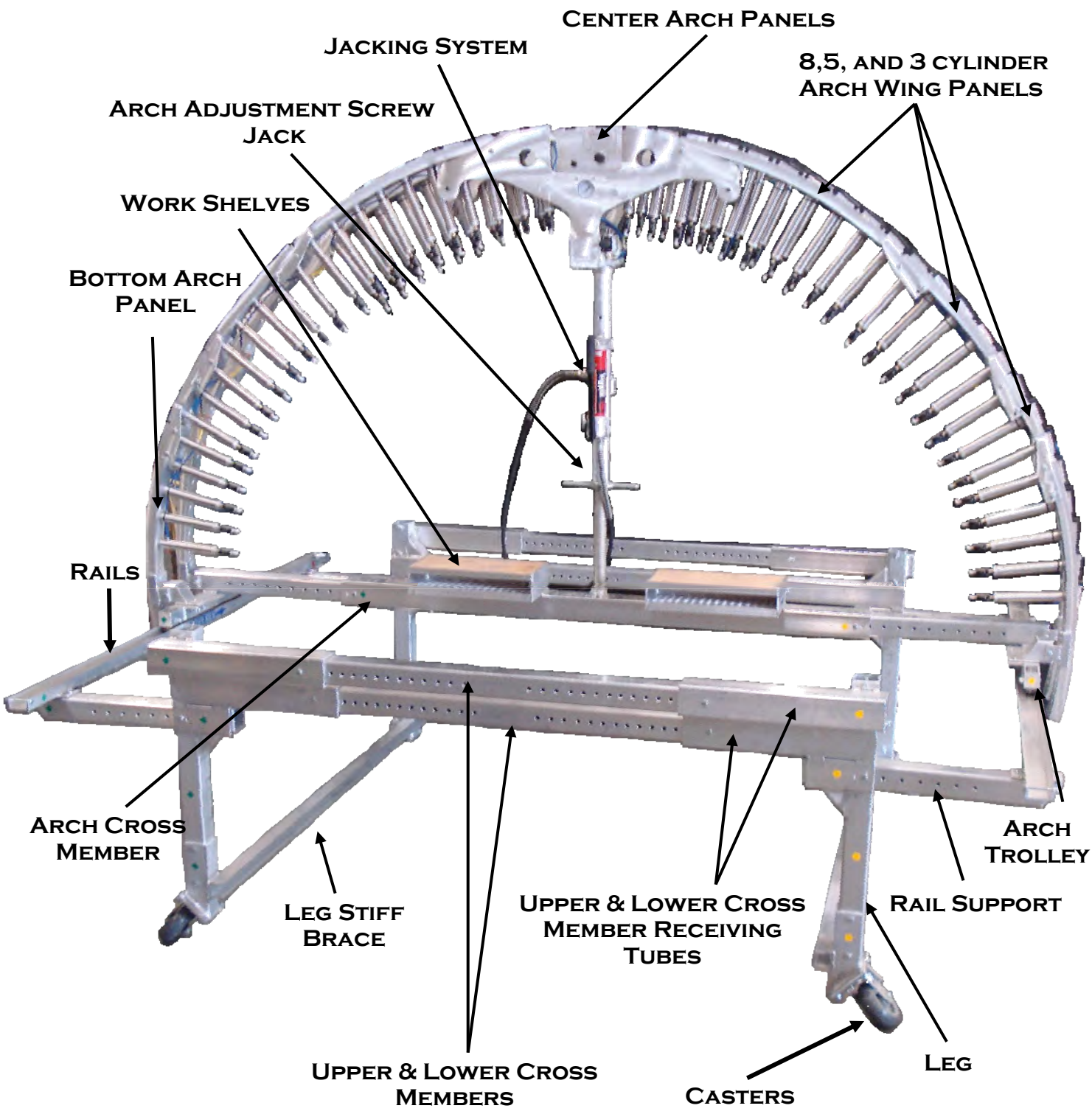
Pinch Point Label

Note before using the machine!

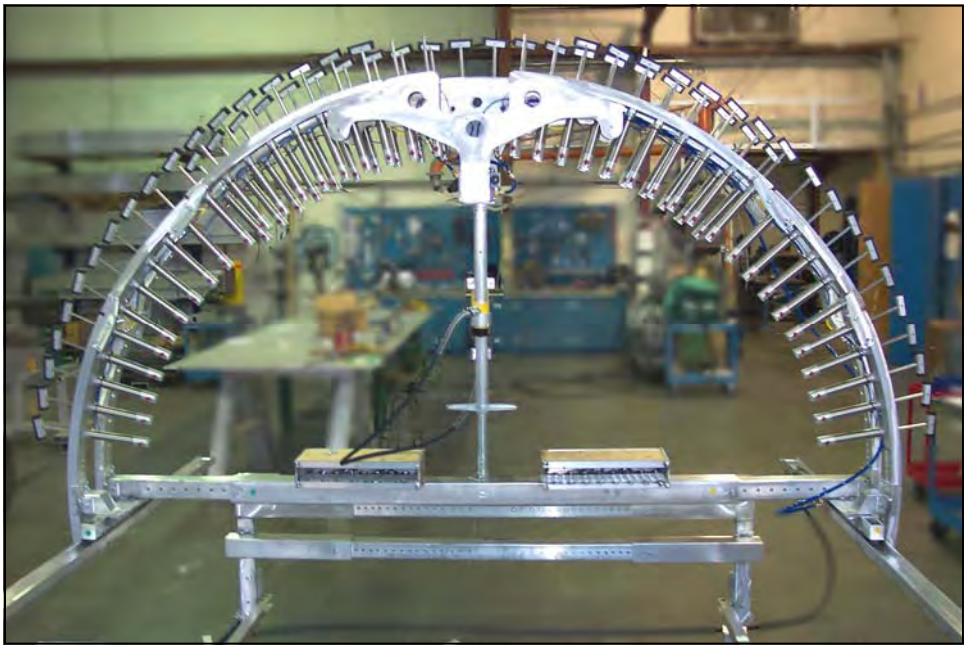
It is the responsibility of the owner / employer to ensure that the masons can assemble and use the machine safely. Before starting the machine assembly, both the supervisor and masons must read and understand the Bricking Solutions manual so that they understand:

1. **The safety instructions which apply to the machine**
2. **What the machine is intended for and what it is not equipped to deal with**
3. **How to maintain, use, and operate the bricking machine**
4. **How to follow the instructions to prevent personal injury & damage to the machine**

Econ-O-Ring Anatomy



Kiln Diameter	Adjustable to kiln specifications
Cylinder Maintenance	Quick-connect fittings and exposed cylinders allow for cylinder change out in under 20 minutes or cylinder bypass during an outage
Cylinder & Bumper Protection	Cylinders remain flush with solid brick shelf on the arch until deployed
Machine Castors	360 degree swivel with a lock pin
Time Required to Assemble	1-2 hours with minimal experienced crew
Safety Check Valves	Automatic to insure a loss of plant air pressure does not result in loss of cylinder pressure for a short time
Arch Movement	7 ft (2m) moves along a rail system mounted to the frame and parallel to the kiln.
Brick Lining Installation Productivity	Approximately 1 meter per hour under ideal conditions
Keying Tools included with machine	Hand controlled hydraulic spreader jack
Minimum Air Pressure	6.33 kg/sq. cm. (6.21 bar) (90 psi)
Maximum Air Pressure	8.33 kg/sq. cm. (8.27 bar) (120 psi)
Minimum Air Volume	0.28 cubic meters per minute/ 10 cubic feet per minute



PRE-USE MACHINE SET UP

BEFORE WORK

There is a risk of damage caused by insufficient machine maintenance and inspection. The machine must be maintained in a condition which does not expose the masons or other personnel to danger or accidental damage. Daily checks when in use and regular service must be carried out according to the Bricking Solutions instructions. The machine must be kept clean. The signs and stickers must be visible and legible. Any faults must be remedied. Avoid using the machine until the fault has been remedied.

PRE OUTAGE MAINTENANCE AND SERVICE

A pre outage inspection is the best way to have a successful outage. Review the pre outage checklist in the following pages to ensure machine is in good working order prior to use. The machine should be set up and tested for use 2-3 months prior to outage. If something is not working properly or there is missing hardware, there will still be time to get what you need. The maintenance to the Filter/Regulator is a key item. If this systems is not working the machine will not work and kiln production will stop. Refer to the Maintenance, Troubleshooting, and Repair section for a maintenance schedule that will reduce kiln down time, keep your machine in proper working order, and reduce the risk of accidents or injuries or unnecessary down time.

Field service by Bricking Solutions factory trained technician can be scheduled for a site visit to your plant for service and training. Contact Bricking Solutions or your local Bricking Solutions Representative (to locate your representative, visit our Agent Network at www.brickingsolutions.com) to schedule one at your site - 1-360-805-1277 or 800-621-7856. If you have any questions about your machine, parts, or components, call technical service.

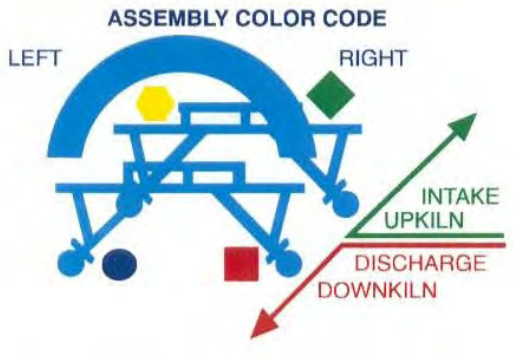
MACHINE REQUIREMENTS

Minimum air pressure	6.328 kg/sq.cm	90 psi
Maximum air pressure	8.440 kg/sq.cm	120 psi
Air volume	0.28 cubic meters per minute or 10 cubic feet per minute	
Electrical source for lights only		

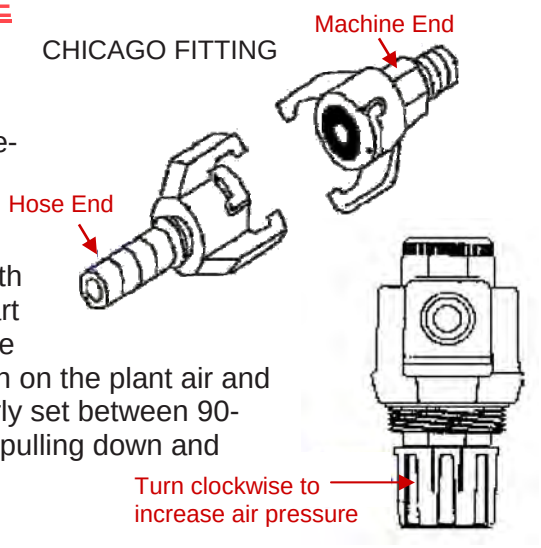
As each bricking machine is adjustable to meet the needs of each unique kiln, please make certain to refer to your individual machine's Assembly/Disassembly Guide for more detailed illustrations and instructions.

PREPARING FOR PRE USE MACHINE ASSEMBLY

- All components are color coded to assist in proper assembly. Refer to the Assembly Color Code sticker as shown here.
- The nuts and bolts of the frame are to be attached loosely until components are assembled.
- One to two workers should be assigned Quality Assurance task of tightening all hardware.



HOOKING UP AND TESTING AIR SUPPLY TO MACHINE

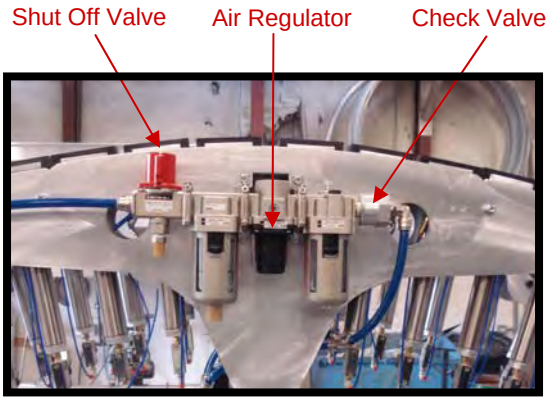


Before plugging in any air device, make sure there is no dirt, debris, or water in the lines. When hooking up the air supply, make sure to bleed the air from the compressor & air line to remove any unwanted debris and water. The machine requires a minimum of 90 psi (6.21 bar) and a maximum of 120 psi (8.27 bar).

Attach plant air or compressor using Chicago fitting with safety pin. The fittings can be found attached to the trolley cart on the down kiln side of the machine. Make sure all hands are clear of cylinders by using a warning call, “Clear Hands.” Turn on the plant air and check the pressure gauge making sure the pressure is properly set between 90-120 psi (6.21-8.27 bar). The air pressure can be adjusted by pulling down and turning the valve stem on the air regulator.

To prevent pinched fingers and injury when activating the master valve up or down, make a verbal announcement to *“clear hands”*.

TESTING CYLINDERS AND FILTER-REGULATOR SYSTEM



The Filter-Regulator system is the most important component of our bricking machines. Never run the pneumatic system without this system working properly as this will shorten the life of the pneumatic cylinders. Without preventative maintenance and basic repair knowledge, their failure can result in a work cessation. Always keep spare parts available.

CHECK VALVE IS REQUIRED. The Check Valve will stop the cylinders from retracting if the plant air is lost for a short time. This will prevent the cylinders from loosing air and keep brick from falling thus preventing injury. Note the air shut off valve next to the regulator can be twisted down at anytime and will stop the flow of air to and from the pneumatic system without turning off the air supply at the compressor. Always make a warning call “Clear Hands” while test the pneumatic systems. Extend each cylinder individually by activating the cylinder toggle switch.

Keep all hoses and cords off the kiln floor. Do not extend or retract cylinders when air is off. If machine air pressure drops below 80 psi, remove unkeyed brick until air is reconnected. Make certain everyone working with the machine knows the location of the shut off valve in case of an emergency. Prevent pinched fingers & injuries when activating the master valve up or down by verbally announcing “CLEAR HANDS”.

Make sure everyone working with the machine knows the location of the shut off valve in case of an emergency.

PRE-USE INSPECTION CHECKLIST

AREAS TO INSPECT	PRE USE CHECKLIST
Machine frames	Inspect welds for cracks, stress, and distortions before each use. **Any machine five years or older should be dye pen tested every year.** Ensure all warning labels, color coding labels, and capacity labels are visible and in good condition. All ID/OD tubes (legs, out riggers, trolley rails, etc.) are inspected for stress, cracks, and distortions.
Machine castors	Check castor base for cracks. Be sure the tread is in good condition. Check all pins are in good working conditions. Castors should be free of debris to ensure they rotate freely. Oil castors well.
Arches	All parts should be checked for cracks, stress, and distortions. All ledges should be fairly straight and free from major gouges.
Cylinders & Rubber Bumpers	Be sure all cylinders are in good working order, retract freely, and free from leaks. Cylinders should be cycled 3 to 5 times prior to use. Toggles should be free from damage and distortions. All bumpers should be free from major gouges from shims and be in good condition. All air lines must be cleaned and free from debris and water.
Filter & Regulator	Check Filter & Regulator for leaks.
Keying Jack	Hoses and fittings should be free from leaks, damage, and debris. Gauges should work properly. Hand pump should be in good working order. Swivel feet should be free from cracks and damage.
Arch Trolley Systems	Check rails, trolleys, and arch connect adjustment plates, for cracks, stress, and distortions. Rail tracks should be free from major gouges. Trolley wheels should be in good condition.
Plant Air System	Before plugging in any air device, make sure there is no dirt, debris, or water in the lines

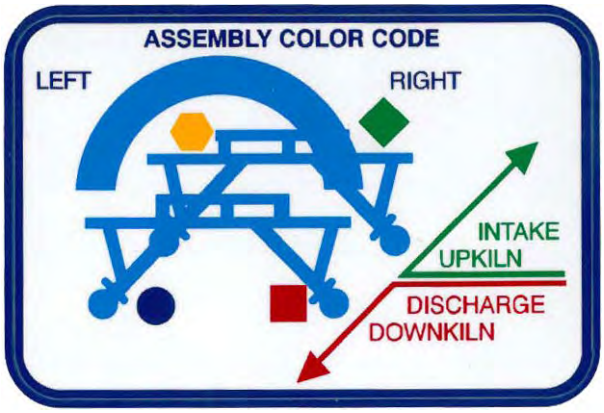
STAGING THE MACHINE FOR ASSEMBLY INSIDE THE KILN

Follow the color coding system throughout assembly. For easier setup, line up all left hand components on the left side of the burn floor (blue/yellow). Line up all the right hand components on the right hand side of the burn floor (red/green). Follow the assembly manual closely. Note, if some of the components come pre-assemble adjust the components according to the setup chart in the assembly manual and skip forward in the manual. Do not tighten hardware until each step is complete. The setup chart is an approximate guide which matches the inside brick diameter to the adjustment holes in each section of the machine. This chart is to be used as a reference guide only. Each kiln is unique and will require adjustments to the setup chart for a precise fit.

Refer to assembly manual for further instruction.

ARCH HEIGHT

When the bricking machine assembly is complete, roll the bricking machine toward the down kiln end of the new brick. The distance between the top of the machine arch and the kiln should be adjusted to the height of the brick being installed plus a maximum of 2-3 inches (76.2mm) of clearance.



INSTALLING THE FIRST RING

- Position the frames as close to old brick work or castable as possible and secure the machine.
- The crew then positions the arch in bricking position and locks it into place with a bottom cylinder on each side. Each wing mason should work at the same rate of speed as they move up toward the center; this will keep the arch better balanced.
- The mason will rest the brick on the top of the arch ledge and push the brick tight against the retaining ring and the brick next to it.
- The mason will then activate the cylinder toggle raising the cylinder and forcing the brick's cold face against the kiln shell.
- Use a raw hide hammer to tap the brick in place making sure all the angles are uniform and the brick's cold face is tight against the kiln shell. Continue this process moving up toward the key zone.

It is important to stage the machine in the proper order to ensure the components enter the kiln in sequence and facing the correct direction. Remember to follow the color code system.

SHIMMING THE NEWLY KEYED RING

- Use a pneumatic shim driver gun with steel shank and shim driver head. The shim driver head has a recess running the length of its face allowing for the shim to rest securely inside the recess.
- Place the shim up toward the kiln shell and use a hammer to start the shim; once it is inserted, use the shim driver gun. Apply consistent ample pressure to the gun, pointing toward the brick and angled slightly up towards the shell.
- Squeeze the trigger on the shim driver gun and as the shim slides in between the brick, move the gun upward towards the kiln shell so it is parallel to the top of the shell. Continue this until the shim driver head contacts the brick. Finish driving the shim with a hammer.

MOVING THE ARCH

- Locate the master valve knob and announce “ALL CLEAR.” Push inward or pull outward so all the center cylinders will drop at once. The hydraulic jack will support the un-keyed row. The remaining cylinders can be lowered one at a time.
- Now move the arch one row of brick towards the up kiln end of the kiln by pulling each side of the arch and rolling the Arch Trolley Cart on the rail system one brick row up kiln.
- Place the down kiln arch under the un-keyed row of brick making sure it is centered. Push, or pull each valve to extend the cylinders to hold the last keyed row of brick.
- The down kiln arch is supporting the un-keyed row of brick and is ready for the key mason to install the last bricks and key out the row.
- Having the wing masons begin bricking on the open up kiln arch, while they are doing this, the key mason is using the neutralized cylinders to install the remaining key zone brick with the down kiln arch.
- Repeat the process until the Arch Trolley Cart has traveled to the end of the work deck.

KEY BRICKS – CUTTING OR NOMINAL KEY BRICKS

Keying speed will depend not only on the skill of the masons, but also on the type of bricking being installed. If RKB is used, there are ways to speed up the keying as the key brick must be cut according to the available remaining space. Half size bricks may be cut in advance to avoid waiting time for cut bricks needed when keying out. VDZ sizes are the most complicated to key because neither the cold nor hot face measure is adequate to determine brick combination. A “cheat sheet” can be prepared in advance as follows:

1. Mark a keying section corresponding to 10 full size bricks and using a cold face diameter. Place the 10 bricks in proper combination. First and last brick must be as near to 90 degrees to the imaginary shell as possible. Mark combination on paper.
2. Combine standard and key bricks until you find the correct combination to correspond with the 10 full size bricks minus 2mm and mark on paper.
3. As in #2, combine standard and key bricks until you find the correct combination to correspond to the 10 full size bricks minus 4mm and mark on paper.
4. Continue until you reach the combination for 9 full size plus 2mm. Mark all on paper, color code, and make available to the keying masons.

The process above is a tedious job requiring patience and first class bricking skills. It will only work if there are two types of prefabricated key bricks available.

When ISO sizes are used, before keying the first ring, mark 1030mm down from the top of the kiln on each side, corresponding to 10 standard bricks for each wing mason. Check how the 1030mm mark relates to full size or to whatever size key bricks are available. If mortar is used, add a few mm to the 1030 to compensate for the mortar joints. Check how the installed brick-work relates to the 1030mm mark and how it relates to available key bricks. Use this to establish a "cold face" keying pattern. Once the first ring is keyed, this pattern can be used for subsequent rings, if the masons are able to follow the cold face line.

ROTATION OF THE KILN

- The bricking machine must be completely emptied of brick ancillary equipment and personnel.
- Lower the arches to keep from catching and damaging brick work or machine parts. The arch trolley must be tied off to prevent movement.
- The castors must be rotated and locked perpendicular to the kiln axis.
- The machine must be visually watched during kiln rotation to prevent overturning.

MOVING BRICKING MACHINE IN KILN

FOR EACH MOVE OR ADJUSTMENT YOU MUST **ALWAYS** SECURE ARCH TROLLEY.
Secure trolley to fixed component of machine using rope or cable so the trolley will not be able to advance during movement or adjustment, for safety of men and machine. **Think safety!**

MOVING BRICKING MACHINE IN THE KILN OVER NEW REFRACTORY

- Key out the last row of brick and lower the arch with the hydraulic jacks to insure clearance. Unload brick and make certain tools and equipment are safely stored so they won't fall during the machine move.
- All personnel must be off machine. Verify arch is tied off and not able to move and that all leads for air and electric are long enough for the required move.
- Gather the personnel required for the move and check that the machine wheel path is clean and clear of obstructions and that the ladder is elevated as to not damage new brick or the ladder. Position your personnel facing in the direction of travel, and in unison push slowly into the next refractory installation zone.
- Release arch trolley and roll to new starting location. Restock the machine with brick and tools.

MOVING BRICKING MACHINE IN KILN OVER OLD REFRACTORY

SECURE ARCH TROLLEY

- Key out the last row of brick and lower arch with the hydraulic jacks to insure clearance. Unload brick and make certain tools and equipment are safely stored so they won't fall during machine move.
- All personnel must be off machine. Verify arch is tied off and not able to move and that all leads for air and electric are long enough for the required move.
- Gather personnel required for the move, more effort is required to provide clean and clear wheel path. This may require the aid of forklift using tips of forks against top of frame tube or fork truck bracket. Push slowly and consistently to move machine into work area. Make certain machine wheel path is clear of obstructions so wheels will roll on advancing machine. Don't allow binding of wheels or damage may occur.
- Release arch trolley and roll to new starting location. Restock the machine with brick and tools.

MOVING BRICKING MACHINE IN KILN OVER RETAINING RING

SECURE ARCH TROLLEY

- Key out the last row of brick and lower arch with the hydraulic jacks to insure clearance. Unload brick and make certain tools and equipment are safely stored so they won't fall during machine move.
- All personnel must be off machine. Verify arch is tied off and not able to move and that all leads for air and electric are long enough for the required move.
- Slowly move machine toward retaining ring. Using wood wedges, place the wedge against retaining ring so caster will roll up and over retaining ring slowly. Aid of a forklift may be required to make this transition. Place the tips of forks against the top of frame tube. Push slowly and consistently to move the machine into the work area. Make certain machine's wheel path is clear of obstructions so wheels will roll on advancing machine. Don't allow binding of wheels or damage may occur.
- Check all hardware for tightness.
- Release arch trolley and roll to new starting location. Restock the machine with brick and tools.

IF MANUALLY MOVING MACHINE

- Gather all personnel and assemble all members along down kiln side of both machine frames
- Assign one man to conduct move
- Following the directions from the lead person, slowly and steadily move the machine to the predetermined position.
- Assign a few spotters to watch and inform lead person to hold movement in event of interference and to advise when to resume machine move.
- Check all hardware for tightness.
- Restock machine, release arch, and commence with brick installation.

USING HYDRAULIC JACK TO MOVE ARCH

- Always, but especially if the brickwork is installed with mortared joints, place the jack relatively near the back of the brick, i.e. near the previously keyed ring. This is to avoid the mortar being pressed out of the joints on the uphill side. If this occurs, there will be problems fitting the key brick, as the width on the downhill side will be narrower than on the uphill side.

- Observe that the only purpose of the hydraulic jack is to hold the bricks in place while the cylinders are lowered by the "Master Valve" so the arches can be moved one row forward. The jacking pressure shall be enough to hold the bricks safely in place but not so high that damage to the bricks occur. Jacking pressure has no influence over final installation quality. Quality is always determined by the skill of the masons working the rig.
- Once both wing masons have brought the brick up to the top, the key mason will install the long jack.
- Watch the cylinder rods; they can be damaged over time by being subjected to the jacking force. This flexing may bend the rods (only when they are overextended), but most of the damage is done to the rubber O-ring at the top of the cylinder. The rod will be forced into the O-ring and will pinch the O-ring against the cylinder base wearing the O-ring out and causing the cylinder to leak.
- The long jack has two rectangular swivel feet at either end of the jack.
- The swivel feet must be rotated to be perpendicular to the kiln shell. Raise the jack up until the swivel feet rest against the kiln shell and the swivel feet are centered on both ends of the brick to be jacked.

THE STEPS OF BRICKING THROUGH TRANSITION (CONICAL/TAPER)

Always make safety your team's first priority

- When using a fork lift to elevate the machine always secure the frames to the fork truck to avoid slipping or loss of control. Always secure the Arch Trolley Cart before attempting any movement.

Before starting to adjust the machine or lowering the arch to its lowest position for the required conical taper transition section, complete the following:

- Secure arch trolley so it cannot roll during machine adjustment.
- Once this is done have crew remove any tools left on machine to avoid fall hazard's during machine re-positioning.
- All brick and crew must be removed from machine deck before the machine is ever moved

Storage of the Econ-O-Ring

Thoroughly clean the machine from mortar or build up to extend the machine's life.

When placing items into storage make a note of what is damaged and what needs to be replaced. If any warning stickers are damaged please call us for replacements. Be sure these items are in stock for your next outage. All items are kept in stock but depending on your location transit time could be up to a week with customs.

All machine parts can be rinsed with water.

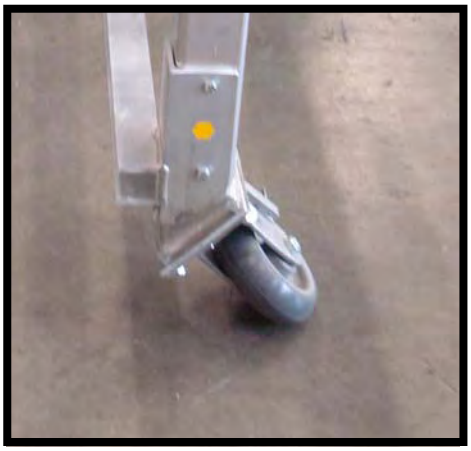
Always check levels of oils in all pumps, jacks, and filters before using the machine and before placing into storage. Store all components and hardware preferably away from dust and heat.

CONTACT US AT 360-794-1277 TO REQUEST AN ONSITE PRE-OUTAGE MACHINE EVAULATION AND SERVICE OR TO ORDER PARTS

Econ-O-Ring Maintenance

AREAS TO CHECK	PRE OUTAGE	AFTER EACH SHIFT	AFTER USE
Air Supply	free of dirt, debris, water in lines; bleed air from compressor & air line	repeat per outage checks	normal maintenance should be followed
Pneumatic Cylinders & Hoses	test 2-3 times; run each cylinder individually; use silicone spray on cylinder rods; check hoses for leaks, cracks, fatigue	repeat per outage checks	use silicone spray on cylinder rods; check hoses for leaks, cracks, fatigue
Filter and Regulator System	adjust air flow	Check for functioning properly	replace filter every other outage or if excessively dirty
Castor Wheels	free of stress or fractures; pin is working properly; apply grease for proper lubrication of bearings	check that the pin is locked and the castor is in proper position parallel to the kiln	free of stress or fractures; pin is working properly; apply grease for proper lubrication of bearings
Frames	free of cracks or bends; all hardware is tight	free of cracks or bends all hardware is tight	free of cracks or bends
Rails	free of sagging or alignment deformities; channel is clear of debris	all hardware tight after each move; free of sagging or alignment deformities	free of sagging or alignment deformities
Arch Trolley Cart	all hardware tight; cart, stabilizer post, adjustment plate free of fatigue, cracks, damage; mover cart stop in place	all hardware tight (each move); cart & stabilizer post free of fatigue, cracks, damage	cart & stabilizer post free of fatigue, cracks, damage
Arches	all hardware tight; free of damage	all hardware tight; free of damage	free of damage
Rubber Bumpers	all in place and all hardware tight	all in place and clean with no build up	rotate bumpers for even ware; replace if large gouges are present
Long Jack	working properly	keep hydraulic fluid full	working properly

PARTS ON HAND AT ALL TIMES



- Depending on experience, call technical services
- Toggles for Cylinders (TS108)
- Check Valve (CV004)
- Filter & Regulator system (ASM500)
- Two (2) spare cylinders (AC004)
- ASME Grade 5 Fasteners or equivalent

CASTOR WHEELS

MAINTENANCE

- Check castor body for any stress and replace if fractures exist
- Grease should be applied before each usage to ensure proper lubrication to the bearings
- Verify breaking system available

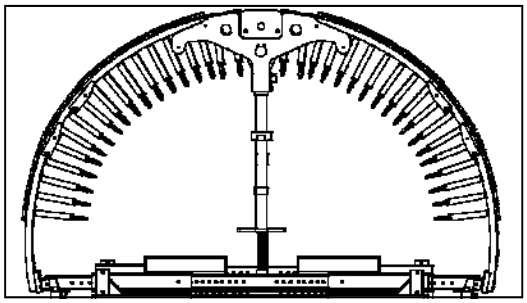
TROUBLESHOOTING

- If the wheels do not respond after a greasing, bearings are damaged and the wheel needs to be replaced
- If the castors become difficult to rotate, clean the debris and fill with grease.

****IMPORTANT****
All four castors must be locked parallel to the kiln axis while the bricking machine is in use.

ALUMINUM ARCHES

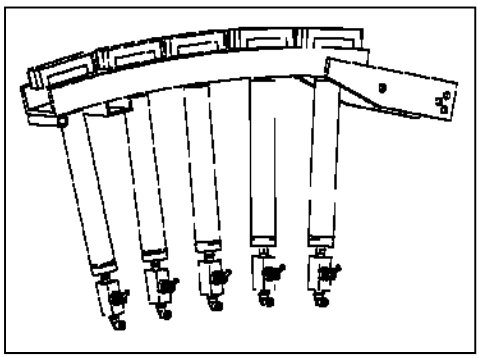
MAINTENANCE



- Check arch at the beginning of each shift.
- Check all hardware tightness at the beginning of each shift.
- Use only ASME Grade 5 hardware or equivalent for assembly.

PNEUMATIC CYLINDERS

MAINTENANCE

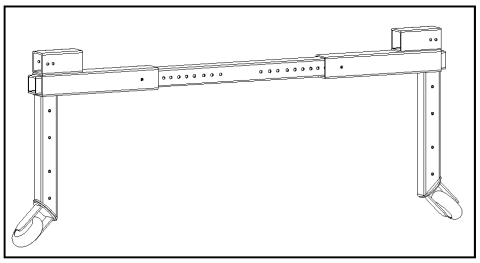


- The use of silicone spray or similar light weight lubricant on the cylinder rods may also help in keeping the rod and o-ring lubricated.
- Replace the cylinder and make sure all the hose fittings and hardware are secure.
- Replace quick connects if cracked or leaking.
- Replace hoses if cracked, damaged, or if leaking.

TROUBLESHOOTING

- If the cylinder leaks in other areas, it will need to be re-placed.

FRAMES



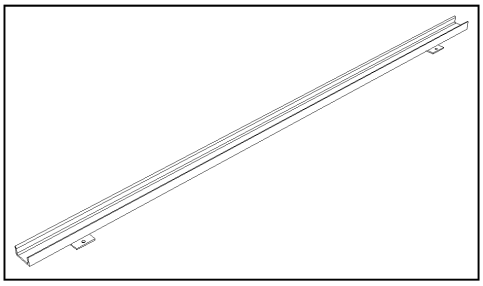
MAINTENANCE

- Check all frame components for cracks and bends at the beginning of each shift. If found, report damage to supervisor.
- Check hardware tightness at the beginning of each shift.
- Use only ASME Grade 5 hardware or equivalent for assembly.

REPAIR

- Replace if bowed, twisted, or sagging.
- All repairs are to be done by the manufacturer.
- Do not reinforce the deck system unless you have notified the manufacturer.
- Do not assume that if you reinforce the deck frames you will be able to load more weight onto the machine.

RAILS



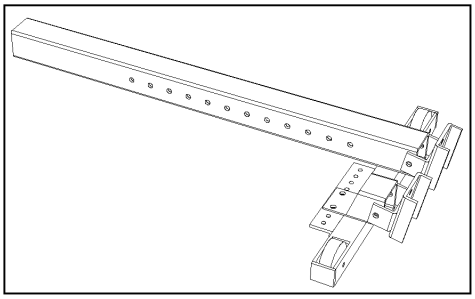
MAINTENANCE

- The aluminum rails on the machine need to be kept clean of any debris since the wheels of the trolley cart will be rolling over the rail tracks.
- A wire brush can be used to clean the rails clear of debris.
- Check all hardware tightness at the beginning of each shift.
- The rails should be inspected for any sagging or distortions. If noticed, inform manufacturer.

REPAIR

- If the rails sag when not under load more than 1/2” / 13 mm, they need to be replaced.

ARCH TROLLEY



MAINTENANCE

- Check all hardware tightness at the beginning of each shift and all components in place.
- Check the cart, stabilizer post, and base plate for any fatigue, cracks, or damage at the beginning of each shift.
- Replace arch adjustment plates if bent or sagging.

REPAIR

- The arch trolley wheels are made of steel.
- By removing the axle, the wheels can be lifted free and examined.
- The bushing may be worn and in need of replacement or require cleaning or lubrication.
- Replace any wheel that has a damaged V-groove.
- If wheel won’t turn, the axle may be pitted or worn and need to be replaced or cleaned.

Overloading, improper assembly, or alteration of the frames can cause serious injury to personnel.

RUBBER CYLINDER BUMPERS

MAINTENANCE

- Keep the rods clean of any material build up.
- Lubricate the rods before each use and prior to storage with silicone lubricant.

REPAIR

- The rubber cylinder bumper can be removed by un-screwing the cap screw on the back center of the bumper. Remove the old bumper and install the new bumper. Reinsert the cap screw and tighten firmly.

PNEUMATIC HOSES

MAINTENANCE

- Bleed all hoses at the beginning of each shift.
- Check all hoses for leaks and fatigue.
- Always have spare lengths of hose available.

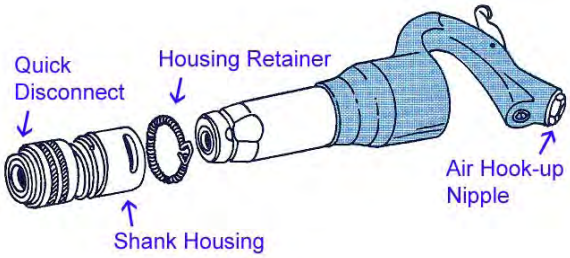
TROUBLESHOOTING

- They will become brittle if exposed to heat for long periods of time, and will begin to crack and eventually begin to leak.

It is important to replace leaking cylinders right away since the bad cylinders will suck dust and debris into the pneumatic system and create wear in other cylinders.

KEYING JACK ASSEMBLY

- Operation of the hand pump operates the long jack, by pumping hydraulic fluid from the hydraulic pump to the cylinder, and the jack extends. NEVER fully extend cylinder, damage may occur.
- Pushing the other valve releases the pressure to the jack by allowing air to run down the air hose to an air cylinder or piston, which pushes down on the release valve.
- This air cylinder works in a plunger fashion, pressing down on the release valve of the hydraulic pump.
- This is located under an aluminum block, which is clamped to the blue hydraulic pump.



Always wear eye protection.

MAINTENANCE

- For any air appliance, keep the supply hose capped to prevent dirt from entering the system.
- Thread all components tightly.
- Check QC fittings and replace if cracked.
- Check hoses and reset or replace if damaged.
- It is critical to stock a complete long jack unit since the keying process relies on the long jack.
- It is important to keep the hydraulic fluid full at all times and cylinders must be fully retracted.
- To fill the pump with fluid, unthread the end cap at the rear of the pump and fill with hydraulic fluid.
- Keep the swivel feet tightly threaded since they are tapered pipe threads or damage will occur.
- Replace the swivel feet if they are damaged, otherwise they may fracture and cause injury.
- Keep the extension tightly threaded since they are tapered pipe threads or damage may occur.
- Replace the extensions if damaged.
- The long jack pressure should be determined by the installer or refractory provider.

TROUBLESHOOTING

- If the cylinder slows, check the pump for the proper fluid levels.
- If there is not enough air pressure, check to make certain air pressure at the long jack is gauged between 90-120 psi (6.21-8.27 bar).

Management, production, engineering, purchasing, maintenance, and operations departments should be brought together to devise a maintenance program. If the plant is using an outside contractor they should also be advised of the schedule and plans for the outage. A plan should always address the long term needs of material, equipment, and labor. These long lead items can be critical if not handled properly and the plant may have to compromise due to short term planning.

Management needs to address many problems, assign an appropriate budget, and empower the individuals to implement the necessary changes to correct these problems. The continued education of personnel will increase productivity and safety. Gathering all the information and researching how to increase kiln production will better prepare the plant to find sound solutions. It is important to understand what is the best equipment and material available due to the capital intensity of hundreds of thousands of dollars in refractory being used annually in the relining of the kiln.

Organizing the burn floor

Once the shutdown begins the kiln will need a cooling down period of 12 to 24 hours. Cool down time varies with kiln diameters, amount of coating, draft control, and kiln length. During this period, it is important to begin staging the materials and double checking supplies.

Safe & efficient kiln access

We have discovered many plants have limited access into the kiln. These small doors and burn floors lend to many disadvantages and slow down the job of bringing the kiln back on line quickly. A large access into the kiln will allow for the use of a forklift for transporting pallets of brick, a loader for removal of rubble, and easier access for the bricking machine. With the hood door open and the burn pipe rolled back, a kiln ramp can be installed.

FEATURES & BENEFITS OF A CUSTOM ALUMINUM ACCESS RAMP

- Full access ramps & Personnel Ramps Supports 15,000 lbs (6810kg) with 3:1 safety factor
- Lifting lugs maximize forklift installation
- Bolts connect modular sections for easy assembly
- Bridge section is mounted on castors for easy manual maneuverability to the door
- Install in less than one hour
- Lightweight 6061 T-6 aluminum construction
- 3/8” (9mm) non-skid diamond plate decking
- Removable guard rails
- Radius nose matches kiln diameter
- Stackable design for easy storage
- Designed wide enough to allow demolition equipment into kiln
- Optional heavy duty fall guards

Planning for new refractory installation begins

It is critical to install the brick perpendicular to the axis of the kiln. If the bricks are not placed in the proper alignment, the chance for premature brick failure will greatly increase. Producing a continuous laser light parallel to the kiln's axis intercepted by a rotating penta-prism device, the Radialign refracts the laser line perpendicular onto the kiln shell's circumference. Points along the kiln can then be marked and used as exact references for brick installation as well as setting a new nose ring.

Supplying brick to the masons

Transporting brick on a pallet not only speeds up refractory installation, but also avoids potential injury and fatigue to workers as well as possible individual brick damage. The Port-A-Trac modular system allows the transport a full pallet of brick or two into the kiln and under the bricking machine platform. Best used for smaller kilns or when there is no fork truck access under the bricking machine. This eliminates the need for prestocking the kilns and allows tops and bottoms to be installed simultaneously for a faster and a higher quality installation.

Another way to supply brick to the masons

Transportation of material into and out of a rotary kiln or furnace is critical to the speed of a maintenance operation. Conveyor systems reduces worker fatigue. Made of lightweight aluminum with hydraulic drive motors, conveyor sections are easily handled and assembled. The conveyor eliminates the need to drive mobile equipment over new or old brick, reducing chances of damage to good brick due to vibration or weight of the vehicle.

FEATURES AND BENEFITS OF A RADIALIGN™

- Ensures precise placement of each row of brick which is vital for longer refractory life
- Assembled and ready in less than 30 minutes
- Durable transport storage container
- Standard with rechargeable batteries and A/C adapter
- Speeds up installation by reducing installation corrections and alignment
- Use laser to set the retaining rings

FEATURES AND BENEFITS OF A PORT-A-TRAC

- Modular aluminum track can be built to any length
- Most commonly used with 3 - 5ft (1.5M) sections and 2 - 10ft (3M) sections utilizing a "leap frog" method following the pace of the bricking machine
- Multiple transfer carts run along same track
- Lightweight track easily assembled and manually moved as brick work progresses
- Optional power winch

FEATURES AND BENEFITS OF A CONVEYOR SYSTEM

- Use in Cooler, Kiln, & Cyclone
- Reduces or eliminates brick damage due to handling
- Lightweight aluminum modular sections
- Lengths up to 200 ft (60M) and widths of 12" (305mm), 20" (508mm), and 30" (762mm) available
- System can be set up on the ground, springboards, or elevated on standard adjustable legs
- Belt sections easily assembled
- Interchangeable sections
- Rigid tension connection
- Great for kilns with limited access
- Variable speed control & reversible

BRICKING SOLUTIONS
A DIVSION OF BROKK

Safe inspection of brick

There's no way of knowing what kind a job lays ahead when you open the kiln. The inside of a kiln during an outage is a hostile and dangerous environment. When cooling down, coating in the burn zone cools at a different rate than the brick and kiln shell. This causes separation and cracks causing coating to fall without any warning. There's a great risk when going into a kiln for inspection, but with a safety inspection cage, those risks are greatly reduced.

Removal of coating and brick

This is a very dangerous task because coating build up can be very unstable and unpredictable. Coating thickness will vary from kiln to kiln. Utilizing an access ramp Brokk demolition machines provide safer, more precise, and quicker refractory tear out than other methods.

Removal of debris and mucking the kiln

The Muck-It Bucket's radiused bottom was custom made to allow full surface contact the hardened radiused front edge helps to penetrate rubble decreasing machine and operator impact making it the most efficient and safest method for removing debris.

FEATURES & BENEFITS OF A SAFETY INSPECTION CAGE AND TUNNEL SYSTEM:

- Designed/certified by an independent licensed engineer
- Rated for 250 lbs (113.5kg) dropped from 24 inches (61cm) with 3:1 safety factor
- Shock absorbed columns increase safety
- Open air construction for ease of inspection
- 5ft width cages easily carried by 2 people using flip-up handles
- Shoulder harness standard for increased stability
- Adjustable legs for varying surfaces and thickness of coated kiln
- Fabricated from 6061 T-6 aluminum
- Several vehicle transporter options for larger cages and tunnel systems are available

FEATURES & BENEFITS OF A BROKK TEAR OUT MACHINE:

- Remote control provides a safe work area
- Electrically powered reduces hazardous fumes
- Designed for confined spaces
- Lightweight to fit in most elevators
- Multiple accessories for every job
- Articulated arm reduces chances of kiln shell or good brick damage
- Meets International Standards

FEATURES AND BENEFITS OF A MUCK-IT -BUCKET:

- Universal quick-hitch for most models of skidsteers (custom hitches available)
- 1/2" Wear plates on sides and bottom ensure long life
- Radiused bottom matches curvature of shell for more efficient loading
- 1/2" T-1 hardened Steel beveled leading edge increases life and strength
- Increased cubic capacity for faster muck out
- Radiused leading edge to penetrate rubble and reduce impact

FOR MORE INFORMATION ON BRICKING SOLUTIONS PRODUCTS PLEASE CALL 800.621.7856 OR EMAIL AT INFO@ BRICKINGSOLUTIONS.COM

Bricking Solutions Quality Assurance Statement

Bricking Solutions assures you that all of our products are designed and constructed to the highest industry standards. Bricking Solutions has made a commitment to listen to our customers, continue to upgrade product materials, and product development. We are dedicated to continuing to find ways for man and machine to perform at peak productivity, for maximum efficiency, and ultimately profit.

We at Bricking Solutions are pleased to have you as a customer. We are always available to answer your questions. Please contact us by phone **800-621-7856** or fax: **360-805-2521**
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