



BRICKING SOLUTIONS – REACHING NEW HEIGHTS

- By Randy DeCoteau Feb 16, 2016

Bricking Solutions has been involved in building and designing equipment used for refractory installation in rotary kilns for mainly the Cement and Lime industries for approximately the past 50 years. With the advent of preheat towers and the calciner refractory installation, critical path moved from the kiln to the towers. The primary method of refractory installation in the tower was to erect scaffolding and devise ways to move scaffolding and materials through small man access doors. This installation method is both hard on the workers, unsafe confined space work, and inefficient and expensive.

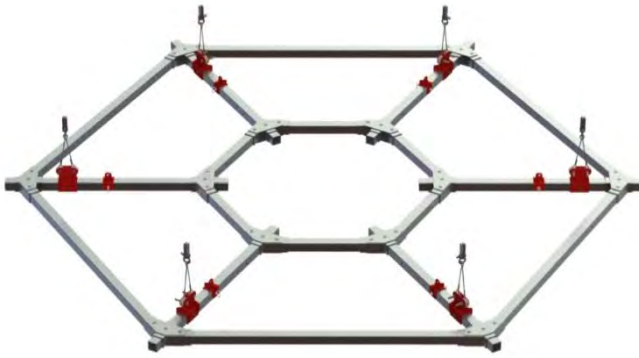
In recognition of a declining emphasis on the refractory installation in horizontal kilns and of the inefficiency and danger of current methods of refractory installation in towers, Bricking Solutions set about discovering a better way or better equipment for the installation of refractory in process towers.

We observed the use of custom or “homemade” suspended platforms manufactured by and used by some installation contractors in Europe, Canada, and the USA and began conceptualizing a product to lower cost and to meet international safety, design and manufacturing codes. We also saw a need for an adjustable platform that could be used in more than just one in plant vessel as an additional way to lower costs.

The Multi-point Suspended Platform – A New Product

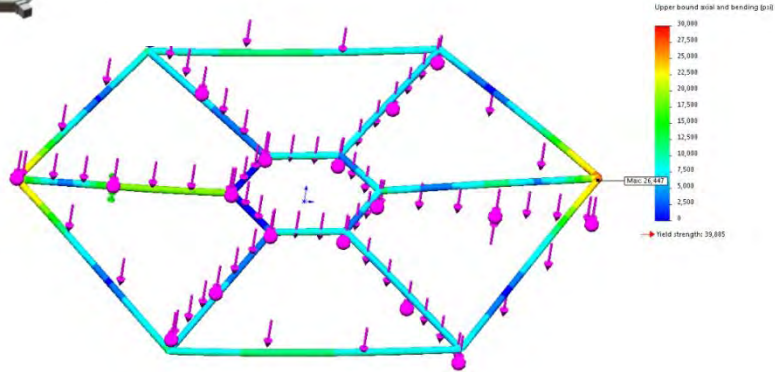
A new product was needed, a powered work platform to facilitate the inspection, maintenance, and refractory installation in vertical vessels. The feasibility study included the market analysis, safety regulations (OSHA, ANSI, CSA, EN), and our manufacturing tools and materials. Our design criteria:

- 6,000 lb. [2,700 kg] capacity – necessary to hold brick pallet, men, and materials when relining a vessel
- Compatible with Electric climber hoists – for elevator-like speed – customers have a wide variety to choose from – some already had them
- Modular parts – interchangeable and symmetric when possible for ease of assembly
- Lightweight and small – must be carried through the smallest vessel access doors (22 in. [560mm] square or 24 in. [610mm] round) – parts under 45 lbs. [20kg].
- Assembled by pins; no fasteners – simple and safe is best – proper torqueing of fasteners is not required
- Perf-o-grip deck – adequate load support – debris will not accumulate – operators can see through the deck when descending
- Outriggers for stability – for the best stability when working
- Manufacturing leveraging our core competencies (fabrication of stock and custom 6061-T6 aluminum structural material)



The platform project utilized our best design tools. The general arrangement of parts and operation were resolved in detail with solid modeling software. Architecture is a hexagonal pattern of aluminum 6061-T6 tubes locked together by pins into reinforced joint support weldments. The tubes have no weld for strength (welding on heat treated aluminum reduces its strength; opposite of steel). Since the structural tubes are nested, forces are transferred directly from one tube to the next.

Load cases were determined from our initial Failure Modes and Effects and Analysis. Finite Element Analysis further optimized the design to meet the weight, capacity, and the structural safety factor required by code.



The deck panels were fabricated from Perf-o-Grip grating which provided an excellent working surface and adequate load support. The panels are allowed to float as the platform deflects to isolate forces to the structural members and prevent binding of the panels.

The guide wheels were attached to the lower side of the structure. These wheels were manually applied by lever and spring loaded to ensure contact with the wall. This provided an incredibly stable working platform.

Additional features were added including a removable center section with an inner handrail to allow material handling through the center. And an outer hand rail when the platform was away from the wall.



The Multipoint Suspended Platform

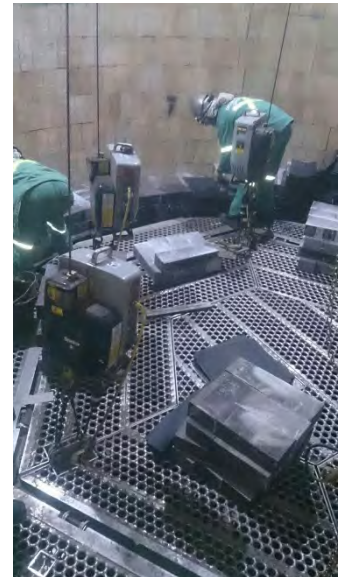
Four platforms were built in various sizes and uses in a cyclone, lime kiln, copper dust box and shaft, and a copper furnace. Each was commissioned on site.

A 19 ft. fixed platform was used in a stage 4 cyclone in Lafarge British Columbia to install the dip tube. Initial installation takes part of a day as the rigging anchor points must be installed. This particular job had some complications with the powered hoists but the complete installation still only took a day and a half. Assembly of the platform takes about an hour and disassembly even less. Furthermore, the elevator feature of the platform accelerated the material handling. In all, the crew saved four to five days.



A 21 ft. platform was used in a lime kiln in Idaho. Installation of rigging and platform assembly took a day. This customer also used cable reels for power which kept the platform clear for men and equipment. The vessel was 90 feet tall inside; the platform could travel from the bottom to the roof in two and a half minutes. With the rigging anchors installed, the customer can assemble and inspect or repair any part of their vessel in hours.

A 17 – 21 ft. adjustable platform (early version) was used in Moppani, Zambia to reline a copper converter. It replaced a steel platform that was several times heavier and not nearly as mobile. This platform also used an overhead trolley system to traverse along the long axis of this irregularly shaped converter.



Each of these early platforms performed exceptionally. In addition, shortcomings were noted:

- Platform diameter was fixed and could not change to meet changes in vessel shape
- Platform could not maneuver in asymmetric locations
- Outriggers had limited range, 5.5 in. [140mm]; a vessel could have varying coating thickness and wall irregularities outside this range
- Organization of platform parts – ends up in a heaping pile of aluminum after the first use
- Fit of parts were not as easy as it should have been – manufacturing challenges
- Custom platforms were time consuming to design and difficult to build – more manufacturing challenges

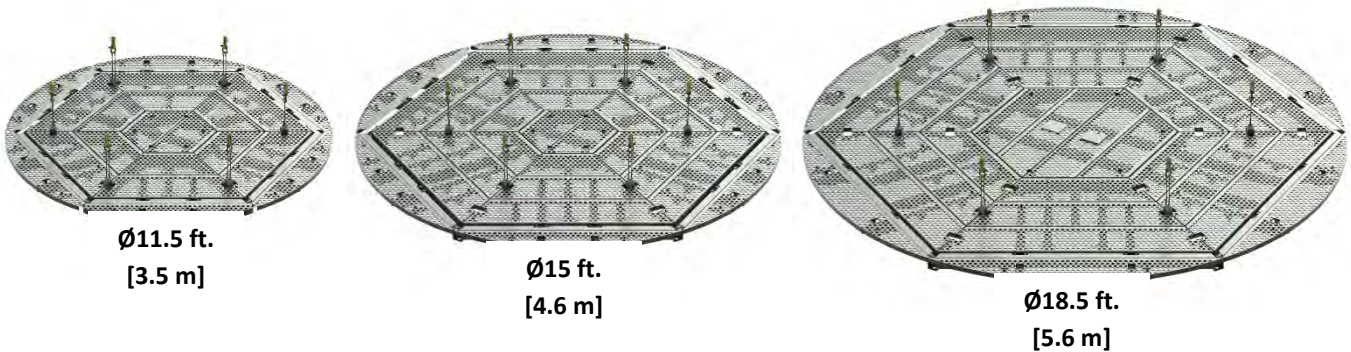
Our second generation platform would address these issues.

The EZ Lift Platform – The Second Generation

Initial platforms were labor intensive and a challenge to fabricate. New tools and practices were needed to build this product in order to meet desired quality and efficiency. Standardizing platform models to facilitate dedicated tooling and standard manufacturing work was the first step.

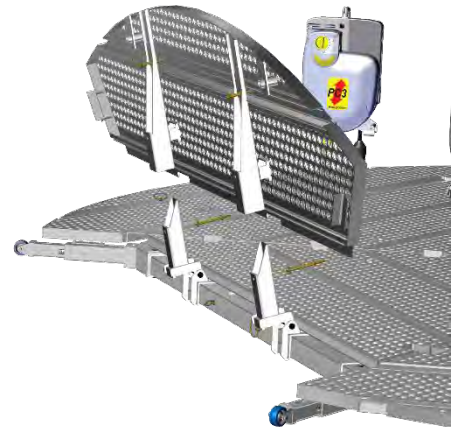
The platform structures were sized according to standard panels which were now oriented tangentially instead of radially. Any platform size could now be changed to the next larger or smaller size by changing a set of structural tubes and a set of deck panels. This would allow our customers to configure the platform for multiple vessels. We had three standard sizes.

Platform Standard Size~



Customers frequently requested a platform that could adjust in diameter while suspended. In response, we developed an outer set of panels that can be replaced with a different size while suspended. The panel sizes could extend the diameter of one configuration to the size of the next, providing a continuous range of sizes for a perfect fit in any vessel. We also added smaller and larger configurations to expand this range. Our standard platform sizes:

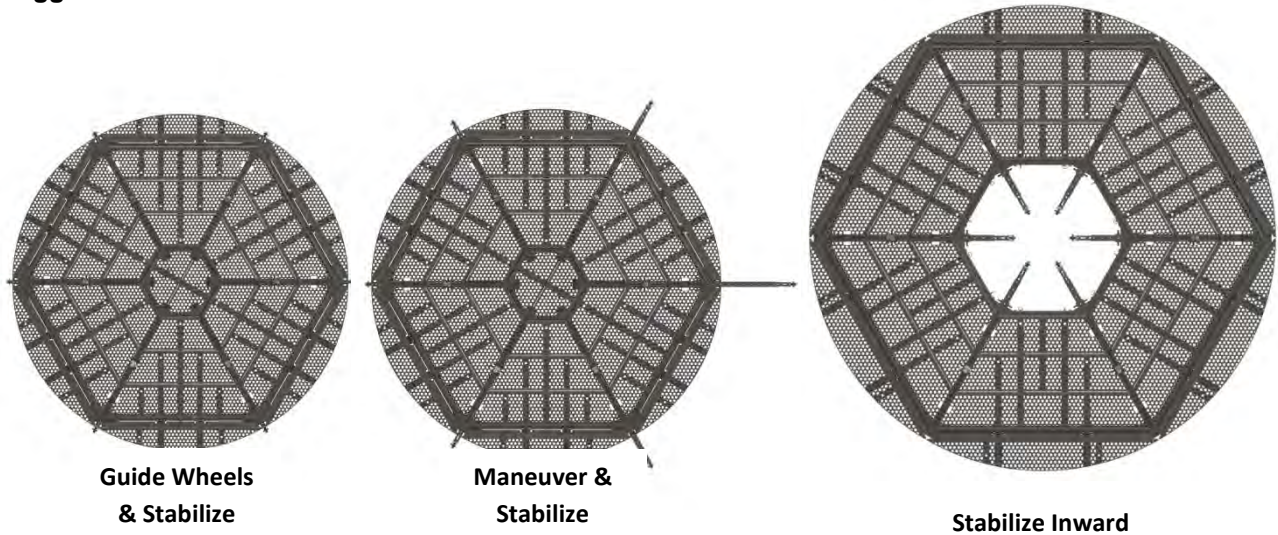
- A Ø8.0 ft. – Ø11.5 ft.
- B Ø11.5 ft. – Ø15.0 ft.
- C Ø15.0 ft. – Ø18.5 ft.
- D Ø18.5 ft. – Ø22.0 ft.
- E Ø22.0 ft. – Ø25.0 ft.



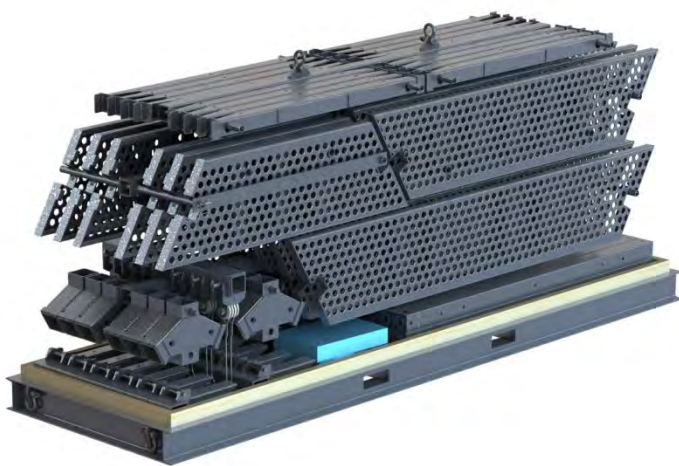
Many vertical vessels have an asymmetric or irregular shape. In the past, we had attempted in the past to build custom sized panels to fit. But for our latest product we opted to keep a circular shape, maintaining standard panels, and provided the platform with maneuverability instead.

The result – outriggers, integral with the structural members, that extend up to 40 in. [1.0 m]. The platform operators could extend these outriggers using a speed wrench to push the platform off the wall to any feature in the vessel they desired. Some customers preferred to guide off of a central structure such as a pipe, so the outriggers can also be installed backwards and function toward the center of the platform.

Outrigger Orientation



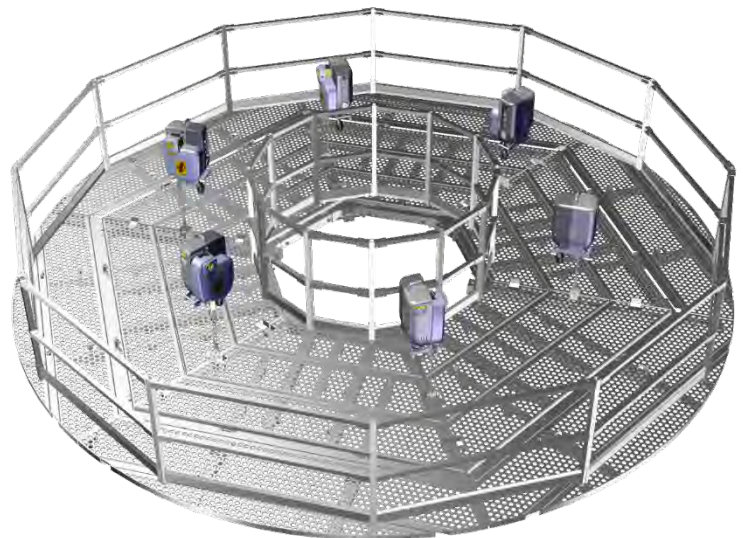
The last added feature is simple but every bit as important as the others; organization. A platform, depending on its configuration and features, can weight from 1,200 lbs. [540 kg] to 2,500 lbs. [1130 kg]. This is all lightweight aluminum but at Ø25 ft. diameter, that's 490 ft² of platform parts. We learned valuable lessons as we moved our early platforms through an operating plant, in a building, and to the vessel door, via crane, forklift, and manual labor. Organizing parts before and after assembly was also a challenge. Our solution is an organizational and shipping pallet to mount the parts. This pallet can be shipped to the customer in a container or boxed up as loose freight. It can be carried by crane or forklift to the vessel door. The platform parts can be pulled off in order, assembled, and then disassembled and reinstalled on the pallet in reverse order, ready for its next use.



Shipping Pallets



Our current family of adjustable platforms has evolved. We have included customer input, lessons learned, and the best design tools to develop this platform into the highly productive product it is. With assembly time of only hours (with rigging pre-installed), capacity of 6,000 lbs., flexible configurations from Ø11.5 ft. to Ø25 ft., maneuverability and stabilization from outriggers that extend 40 in., removable center section for material handling, and handrails for safety, you will find this to be the safest, most productive tool for servicing and relining your vessels.





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