21ST CENTURY CRANE ACCESS TRESTLE

Abstract

Over the years, crane access over shallow waters and wetlands has been accomplished by a variety of temporary platforms .

In the last decade, temporary bridges have become the preferred method to access over streams, rivers, shallow estuaries, the surf zone and wetlands.

When these temporary bridges are constructed in multiple spans, they are commonly referred to as access trestles.

In an effort to mitigate both environmental and commercial project impacts, many owners now require the construction of access trestles as part of the defined scope of work.

Specifying trestle type access methods early in the project design process has significantly increased the ability of project owners to communicate and secure the necessary permits from the various government bodies and other stakeholders. By incorporating a temporary trestle design element, the owner can assure others that there will be no dredging or filling of the wetlands or shallow estuaries. This in turn creates a more defined scope of activity, and results in a clarified and expedited permitting process. The additional benefit of defining access methods in the design, is that there will be a reduction in access related construction claims. All the above heavy construction industry benefits are further enhanced when standardized access trestle sections become available in industry. The Omega Trestle, that will be described herein, is the first standardized and saleable access trestle so conceived.

Access trestle can be described as a multi span, temporary bridge that can be quickly erected and dismantled by the same crane or excavator that it is designed to support. A typical access trestle includes driven pile bents spaced at 15 ft. to 60 ft. apart, spanned by I-beams which are typically covered with a 12”-15” thick timber mat deck. While such trestles have demonstrated a significant reduction in environmental impact, and improved the construction delivery process, they are hardly economical. Past designs lack interoperability, can be extremely heavy and have a vast requirement for hardwood timber for the equipment riding surface.

The Omega beam access trestle, offers a more economical and erector friendly solution than any other trestle type previously used. Additionally, the torsionally resistant, scalable design should elevate the access trestle from temporary materials status, to that of a strategic equipment asset.

Here below is a review of the current shallow access methods mentioned.

Fig. 1 Filled Causeway - Drive

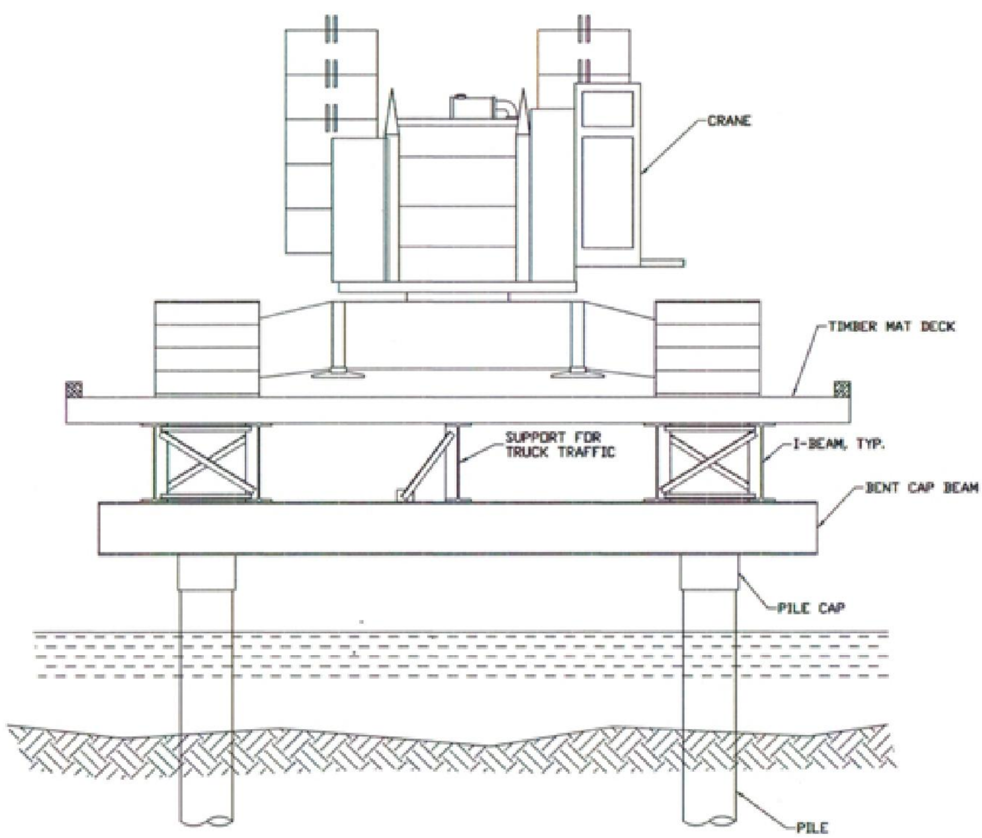
Fig. 2 Dredged Access Channel- Float

Fig. 3 Access Trestle – Bridge

Structural Elements of Existing Trestles

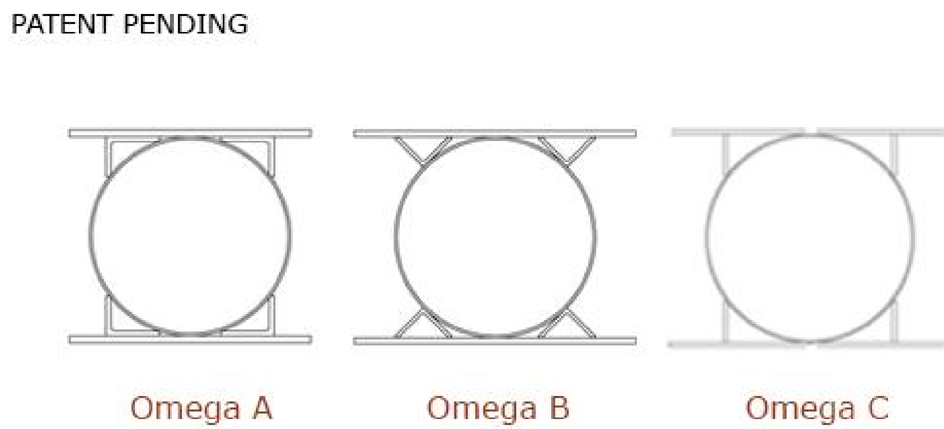
The main structural elements of almost all previously constructed trestles include I-beams which span between pile bents and carry the weight of decking and live loads due to equipment and truck traffic. However, I-beams require elaborate lateral and torsional bracing, fabrication of which is time consuming and labor intensive. Wide flange heavy steel I-beams, typically used for trestles, are fairly expensive if purchased new. Used I-beams are sometimes available on the aftermarket, but availability of significant quantities in like sizes is often limited. Another structural element of existing trestles is a bent cap that spans between the piles in transverse direction. Such bent caps are typically constructed using double I-beams, which are heavy, expensive, and quite often, not readily available as surplus. See Fig. 4 below.

Fig. 4.Typical crane access trestle cross section



Proposed Solution for Structural Elements of Trestles

The new Omega Trestle design (for which a number of patent applications have been filed with USPTO) relies on fundamentally sound, built-up steel sections consisting of pipe, angle, and plate. When beam type flange plates are properly affixed to a torsionally resistant tubular member, the result is a rugged and highly efficient new steel section we call the Omega Beam™.



These steel elements are all readily available in the surplus steel market, and this not only results in lower upfront costs, but this repurposing of these materials is in line with our goals of sustainable development.

Simplified Fabrication

Fabrication costs of such built-up sections are further reduced by utilizing the latest advances in robotic welding. The pipe based built-up sections are inherently stable, and do not require elaborate bracing.

Frame Style enables cap elimination

With the newly invented male-female connection that carries all the shear load, the beams can connect independent of the bent caps which allows for the elimination of the bent caps in most cases.

Relaxed tolerance of temporary pile

This connection detail also helps to relax strict tolerance requirements when it comes to the pile driving, thus improving production and reducing time required for deployment of the trestle.

Optimized Timber Utilization

Hardwood timber is the most expensive consumable in heavy construction. Currently, there is no proved method for preserving it, so the best approach to reducing the expenditure is by optimizing it use. We position 12" timbers in the middle of the frame to pick up the HS-25 wheel loads in simple bending, 4" timbers in compression directly between the crawler and the Omega beam, then we utilize adjustable overhang brackets to create a pedestrian walkway area that can be decked in a variety of ways.

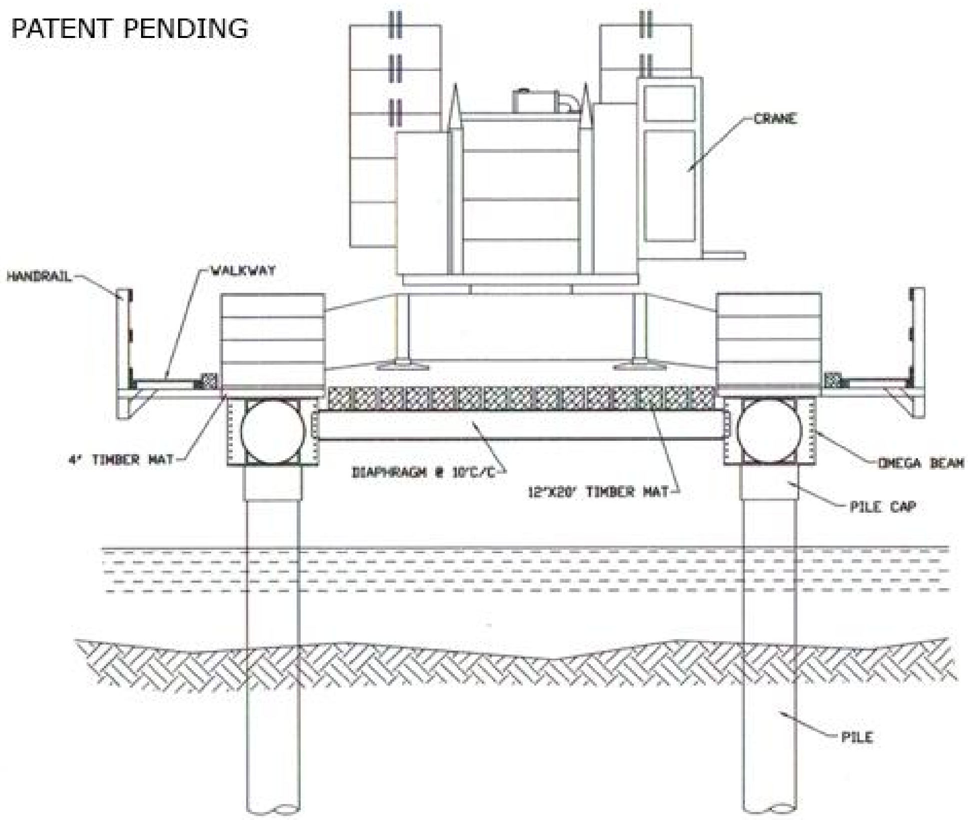
Corrosion Resistant

With an enclosed hollow core, about 1/3 of the steel surface area is protected from the environment, so they are naturally more corrosion resistant. Additionally, the reduced surface area makes painting economical.

Optimized mobilization: 1 span = 1 load

These built-up Omega Beam sections, are designed so that they can be delivered over the road without obtaining special permits. The steel associated with one typical 40 ft. span of Omega Trestle, sufficient to support a 230 T crane, is optimized to fit onto one truck. 48,000 lbs. +/-

Fig. 5.Omega Trestle cross section



Timber Deck for Existing Trestles

Traditional decking for existing trestles include transversely placed hardwood timber mats spanning between the longitudinally oriented steel I-beams. When the mats are travelled upon, every individual timber is subjected to the loading by the full axle load of a moving truck, or a wheel loader at one time. These designs also require very long timber mats, typically 28 ft. to 40 ft. long and the availability of these materials is very limited.

New Decking Solution

Newly proposed Omega Trestle Beams are inherently stable and allow for our proprietary longitudinal placement of standard size 20 ft. timber mats. When mats are placed in the longitudinal direction, they span between diaphragms which connect omega beams at the interval of 10' or less. Since most loaded trucks have dual rear axles to distribute the concentrated load, the wheel load gets shared by at least two timbers, thus reducing stress and improving performance of the timber mats. Longitudinal placement of the mats in the Omega Trestle frame also eliminates the requirement for extra-long timbers which significantly reduces the costs.

Fig. 6 Omega Trestle frame - plan view

PATENT PENDING

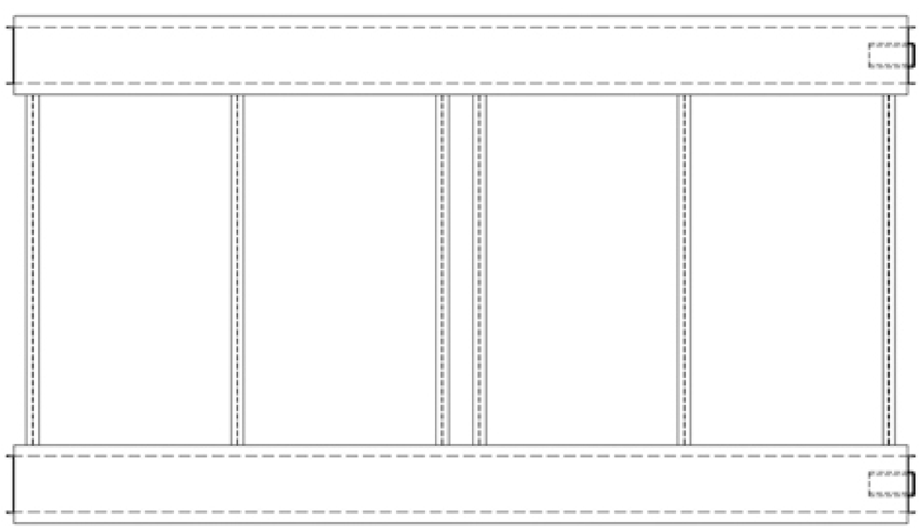


Fig. 7 Omega Trestle – timber deck plan

PATENT PENDING

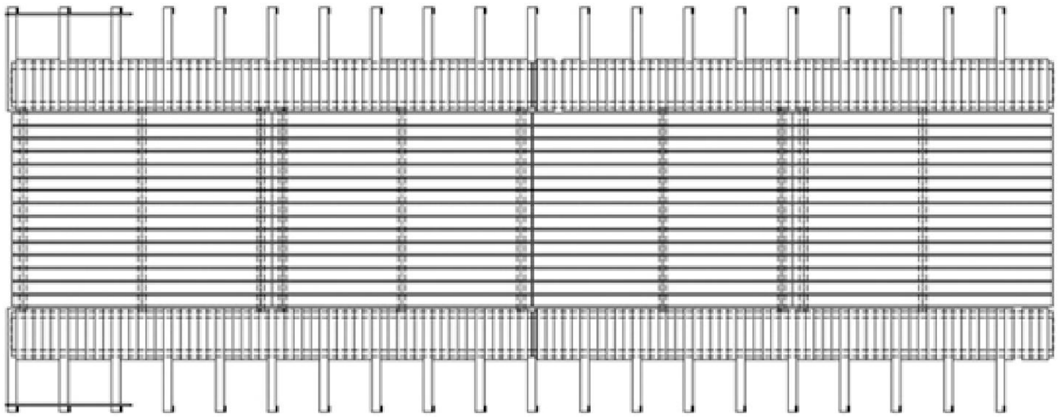
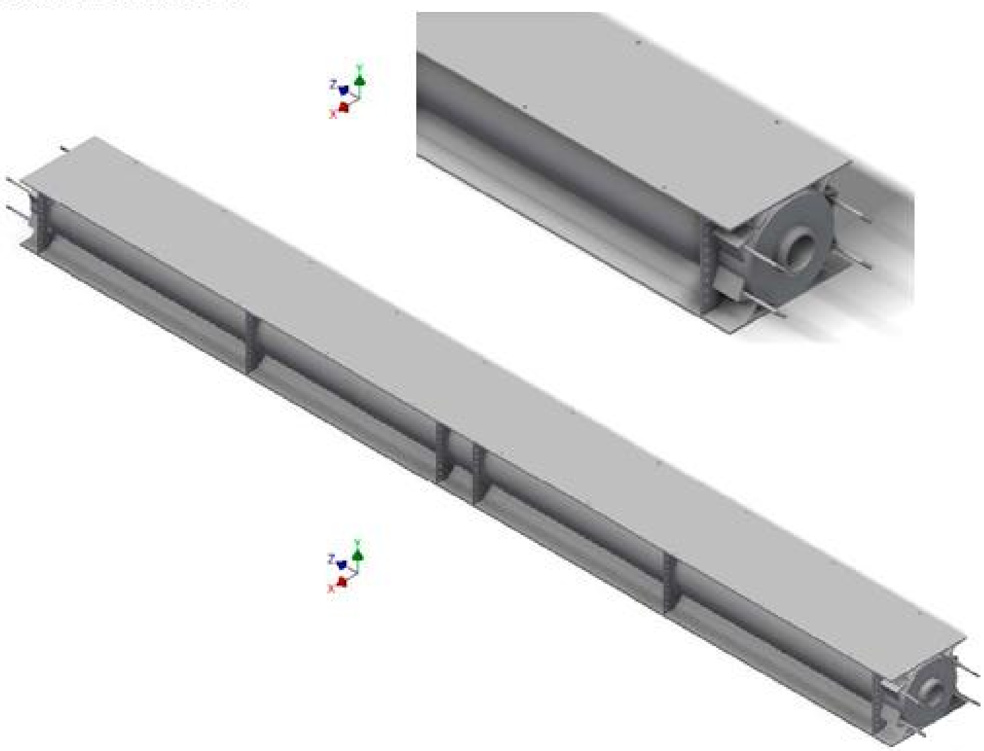


Fig. 8 Omega Beam - perspective view & end detail

PATENT PENDING



Conclusion

The Omega Trestle system offers a highly efficient crane access solution for the 21st century. With the long span capability, scalable frame style design, optimized timber utilization, and relaxed pile driving tolerances, this system should simplify the deployment of crane access trestles long into the future.

For more information, please contact us.

OMEGA Trestle, LLC
Heavy Construction Innovation