



► STEEL SHIPPING
CONTAINERS – THE MANY
USES1



► WILSON FIRE/RESCUE
TRAINING FACILITY2



► A NEW ADVENTURE.
BEGINS.2

○ ISSUE 6

○ VOL 3

○ December 2019

fyi

ADDRESSING THE CIVIL, STRUCTURAL AND MUNICIPAL
ENGINEERING NEEDS OF STATE AGENCIES, MUNICIPALITIES,
INDUSTRIES, DEVELOPERS, CONTRACTORS, AND HOMEOWNERS

Not only are they great for shipping and stacking, but their modularity, strength and durability lend themselves to such uses as Tiny Houses, Barns, Offices, Residences, Condominiums, Restaurants, Emergency Shelters, and Offices.

Steel Shipping Containers - The Many Uses

Though not very pretty, they are highly functional forms designed for one purpose...to have a standardized container that can be packed with dry goods and transported by either truck, rail or container ships.

Ninety percent of the global container fleet consists of "dry freight" or "general purpose" containers – both of standard and special sizes. And although lengths of containers vary from 8 to 56 feet, according to two 2012 container census reports about 80% of the world's containers are either twenty- or forty-foot standard length boxes of the dry freight design. About 90% of the world's containers are made in China.

These typical containers are rectangular, closed box models, with doors fitted at one end, and made of corrugated weathering steel (commonly known as CorTen) with a plywood floor (usually 1" thick). Corrugating the sheet metal used for the sides and roof contributes significantly to the container's rigidity and stacking strength, just like in corrugated iron or in cardboard boxes. Standard containers are 8-foot wide by 8 ft 6 in high, although the taller "High Cube" or "hi-cube" units measuring 9 feet 6 inches have become very common in recent years. By the end of 2013, high-cube 40 ft containers represented almost 50% of the world's maritime container fleet.



Did you Know?

A 40-foot shipping container weighing in at about 8,200 lbs. dead load (Tare Weight) can accommodate a payload of 61,200 lbs.? To allow gripping the container from above, below, or the side, ISO containers have standard iron corner castings with openings that allow fastening the boxes to lifting cranes, to other containers, to truck trailers, and to rail cars. The typical connection is made with a Twistlock fastener at 4 or more of the 8 corners of the container. Heavy-duty bridge clamps enable connecting/attaching containers to each other either at the side or between stacked units. Containers shipped by rail well or flat rail cars are typically double stacked. On container ships, containers can be stacked up to 10 high.

Fire/Rescue Training Facility

Appian recently assisted the City of Wilson's Fire/Rescue Services with the design of multi-unit multi-level burn box training facilities. The initial two-story complex is a residential training facility consisting of three 40-ft containers and two 20-ft containers. The commercial training facility consists of nine 40-ft containers and five 20-ft containers forming a tri-level multi-container training facility. The prime design directive imposed by Fire/Rescue Services was that the units had to be easily removed and replaced.

So?

Because of the standardized modularity of the containers and their inherent strength, a whole new industry has developed whereby container units are modified to conform to varied uses. The containers are being modified and used for food services, multifamily, motels, tiny houses, offices, retail, commercial, and training facilities.

Connecting the units:

Although a code has not officially been developed around the containers, yet; the International Code Council has developed a Guideline (2019 ICC G5 Guideline for the Safe Use of ISO Containers) that provides guidance in the use of ISO containers. The guideline references the applicable provisions of the IBC. A 2021 IBC update for Shipping Containers will be published in 2020.

Standard Twistlock fasteners and bridge clamps are fine when either attaching the units to a foundation or when connecting adjacent units together but that method does nothing to seal out the weather. When multiple container units are proposed to be joined together to create larger habitable spaces, the

methods of attachment must take priority to seal out the weather and create a dry indoor environment.

Because ISO container roofs are cambered to direct roof runoff to the side walls, joining units side-by-side presents a problem. The common method of connection, once the units are set and leveled, is to weld the units together at the roof with a plate across the longitudinal joint (expensive but functional); directing runoff to the ends. More commonly, and often driven as much by aesthetics, a pitched roof is constructed on top of units placed side-by-side.

The units can be stacked, welded, and most wall joints filled with polyurethane foam



insulation (which adds insulation value to the units).

Because of their inherent strength, the boxes lend themselves to be stacked, cantilevered, and even turned on end (vertically).

See some of the photos in this newsletter for examples of container applications.



BOBBY L. JOYNER, PE

Where Excellence is a Direction, Not a Destination



Appian recently completed a copyrighted Manual of Specifications Standards and Design (MSSD) for the City of Durham, a 2019 update to the City of Wilson's MSSD (originally developed for the City in 2010 with updates in 2013 and 2015), and are adding the finishing touches to a new MSSD for the Town of Youngsville. Appian hosts the City of Wilson's MSSD and will be hosting the MSSD for the Town of Youngsville. We would like to thank these municipalities for trusting Appian with their Municipal & Civil needs. Check out our website for additional information about our copyrighted MSSD and other related books authored by Appian.



Appian Consulting Engineers, PA

154 Roundabout Ct.

Rocky Mount, NC 27804

252.972.7703

www.appianengineers.com

bjoyner@appianengineers.com

ENGINEERING:

A new
Adventure
begins...



You may not know but...

Intermodal rail shipping, involving two or more different modes of transportation in conveying goods, starts or ends with a truck and include a connection to a train hauling many container cars long-distance between intermodal facilities. Appian provided the due diligence engineering services for Carolinas Gateway Partnership (CGP) by initially identifying two potential sites in Nash and Edgecombe Counties. Norris Tolson, President and Oppie Jordan, VP of CGP, pitched the site that is now the CCX Intermodal Facility to CSX officials. Initially, CSX was uninterested in Rocky Mount but warmed up after seeing how well the site fit their siting criteria.

During the due diligence phase, the project code name assigned to the CSX Intermodal Facility was aptly named "We Got This." Prior to CSX selecting this site, Non-Disclosure Agreements (NDA's) were signed and due diligence by CSX consultants began.

During design, CSX's environmental consultants advised that CGP had picked a great site compared to other sites CSX had considered for this facility.

The NCDOT has invested \$118.1 million and CSX \$40 million. The facility and associated highway improvements are now under construction.