



**US Army Corps  
of Engineers**  
Middle East District

# COS CUBE Exercise Build in Poland

**WHO:** Middle East District and 500<sup>th</sup> Engineering Company

**WHERE:** Poland

**WHEN:** April 2018

**WHAT:** Designs from the USACE Center of Standardization (COS) for Nonpermanent Facilities were put to the test in an exercise in April -- Resolute Castle 18 in support of Atlantic Resolve in Poland.

The 500<sup>th</sup> Engineering Company built the CUBE, based on a COS design, in less than four days. The CUBE is an outer shell that can be paired with a variety of interior standard designs from living quarters to office space.

They later disassembled, transported and reassembled the CUBE in under two weeks.

The CoS is responsible for developing Army designs for temporary and semi-permanent facilities, ensuring alterations comply with standards, actively participating in other designs, creating functional spaces for various missions within standard exterior envelopes, and working closely with combatant command engineer staffs.



## Constructing the USACE CUBE by 2LT Eva Thatcher

The United States Army Corps of Engineers (USACE) Center of Standardization (CoS) for Nonpermanent Facilities developed the Common Uniform Building Envelopment (CUBE) design as a temporary facility. Designed to replace the B, SEA, and SWA huts, the CUBE dimensions are 7.3 meters by 4.9 meters, which is the size of a single modular “bay”. The structure, including the foundation which is built entirely out of wood, can be constructed in 40 hours. The CUBE is designed to be occupied for no more than five years and has the ability to be disassembled/assembled no more than six times.

Patiently waiting over a year for actual construction, USACE CoS Chief, Dale Hartmann, and his colleagues ensured they were on site to provide quality assurance and quality control at key points of construction. While forward deployed in support of Resolute Castle 18, 3<sup>rd</sup> Platoon, 500<sup>th</sup> Engineer Support Company, 15<sup>th</sup> Engineer Battalion (15<sup>th</sup> EN BN) fabricated and assembled the first ever USACE CUBE. Over an eight day period, the platoon erected the CUBE and then disassembled it for non-engineers to assemble using an instruction manual as a guide.

3<sup>rd</sup> Platoon hit the ground running upon arrival to Camp Trzebien, Poland. They quickly set up the job site, identified separate teams for fabrication, and established an efficient battle rhythm. By using a detailed design manual the Soldiers did not have difficulty understanding how to turn raw materials into individual CUBE pieces, i.e. foundation boxes, floor, wall and truss roof panels. As each CUBE piece was completed, the CUBE’s design load strength and durability became very apparent. The seismic basis of design was from Bagram, Afghanistan. The roof’s live and snow load is 98 kg/sq. m. The floor’s live load is 490 kg/sq. m. The wind load can withstand 115 mph wind gusts while the foundation has been designed for an allowable bearing capacity of 1,500 psf.

During construction operations, the OIC and NCOIC of the project, alongside the USACE CoS Chief, identified friction points and key pieces of information that would help USACE develop and refine a more efficient end product. The first of those friction points identified was the complexity of the plans. For example, the truss roof panel system consisted of 24 x 16 ft. trusses. When assembled, one truss roof panel required four top chords, four bottom chords, six struts, four diagonal braces, numerous 8-penny nails, twelve mending plates and five sheathings weighing in at approximately 275 pounds. In order to expedite the construction, the platoon created a customized jig to provide repeatability and accuracy. In addition to the jig, the platoon created a device to assist lifting and guiding the truss panels into place. As an improvement, the roof system could use individual trusses and install a tin roof instead of plywood. This method would allow for better packaging in a 20 ft. container and decrease overall weight and volume.

After the platoon successfully fabricated each piece and erected the CUBE, they disassembled and staged the pieces for nine non-engineer Soldiers to reassemble. To assist the nine Soldiers from the Headquarter and Headquarters Company (HHC), 15<sup>th</sup> EN BN, they were provided a tool kit, two subject matter experts (SME), and an instruction manual. The tool kit consisted of an 8 ft. ladder, a sledge hammer, cordless drills, hammers, a level, sand bags, and a tape measure. All items were considered necessary to complete the assembly, however, could include additional items such as pry bars. Identifying the components of this tool kit was vital. This information was fed to USACE with the hope to create a standardized tool kit as an option to purchase alongside the CUBE itself. If units are able to provide their own tool kit then they can be self-reliant and opt out of purchasing one.

The CUBE experienced its true test during Saber Strike 18 in Drawsko Pomorskie Training Area, Poland. Due to packaging complications, the CUBE was downsized from 16 ft. by 24 ft. to 16 ft. by 16 ft., essentially creating a cube structure. A squad of 10 Soldiers from the 615<sup>th</sup> Military Police (MP) Company, 709<sup>th</sup> MP BN assembled the CUBE using the same resources the HHC was provided. After the ground was leveled out enough, the MPs erected the CUBE with no major difficulties or safety constraints. The onsite SME identified early on that the truss panels would require a different placement configuration due to the reduced dimension. Instead of inserting the individual truss panels through the door like the manual instructed, they left out two wall panels (each 4 ft. wide) to provide enough space to maneuver the 16 ft. trusses inside. Once the truss panel system was complete, they positioned the two wall panels to close the gap. The MPs utilized the CUBE at their Detention Holding Area as an aid station. After conducting their After Action Review, the major improve, and the most common one across the board, was to reduce the weight and height of each individual piece.

From start to finish, the USACE CUBE proved to be a challenging, yet rewarding construction project for the platoon. Aside from the many lessons learned, the project gave Soldiers a unique experience, constructing the first CUBE of its kind in the entire Army. The Soldiers efforts during construction presented USACE CoS Chief and staff valuable insight on how to improve the concept and plans needed to build the CUBE from the ground up. Whether it be used as a command and control node or a battalion aid station, the USACE CUBE modular system is a durable, transportable, and versatile system that will enable future units the freedom of movement and adaptability in the ever changing complexed environments the military faces today.