



The 211 life-size statues that comprise Troy University's "Warriors Unearthed" art installation were colored by spraying on binder washes made of natural oxides.

## RECREATING AN ARMY FOR THE AGES

A step-by-step tutorial on how to cast with Rapid Set® Cement to mass-produce artwork in any climate.

**Project Type:**

Decorative

**Application:**

Casting

**Location:**

Troy, Ala.

**Project Owner:**

Troy University

**Project Size:**

29 Tons

**Product:**

Rapid Set® Cement

Egypt wasn't the only ancient civilization to bury rulers with everything they might need to survive the afterlife. In 1974, farmers digging a well near the capital of ancient China stumbled across terra cotta statues buried with the country's first emperor in 209 BC. Most are warriors — archers, infantry, cavalry and charioteers armed with their weapon and wearing the uniform specific to their role and rank — and all are life-size, measuring up to 6.6 feet. They're painted with vibrantly colored lacquers that flake off and fade to a mottled gray and brown when exposed to air.

Archaeologists estimate the burial mound contains 8,000 statues, which is the largest group of pottery figures found to date. A historian writing a century later noted the "terra cotta army" involved 700,000 conscripted workers.

If you live in the United States, you don't have to travel to China to see what's sometimes referred to as the Eighth Wonder of the World. You can go instead to Troy University in Troy, Ala., where 211 replicas form the campus showcase. It's the largest representation of the statues outside of China and the first place Chancellor Jack Hawkins Jr. takes visitors.

Unlike the originals, however, this installation didn't require forced labor. Instead, Professor of Professional Practice Frank Marquette and his arts and design students perfected the process of casting with Rapid Set®



# PROJECT PROFILE

Cement. Over six months of weekends and school breaks in varying temperatures that included extreme heat and humidity, they learned how to make a 100-pound batch of perfectly homogenized mix in 60 seconds and cast the front or back half of a statue in 3 minutes.

"We had all the molds lined up and all our batch water ready," he says. "We'd drop the pre-weighed dry cement into a flat-bottom muck bucket, add the water and mix it up with a hand-held Collomix duo. We were cookin'."

This was the first time Marquette used Rapid Set to mass-produce artwork. The rapid-hardening hydraulic cement sets in 20 minutes, making it ideal for casting. In addition, the material's virtually nonexistent rate of shrinkage prevents the statues — which are exhibited outside all year — from cracking.



"Everybody at CTS was fantastic," he says. "They got us fresh batches when we needed them, which is important because the material hardens in the bag and loses reactivity if a pallet sits around too long."

Ultimately, Marquette and his students used 29 tons of Rapid Set to recreate 211 life-size statues. Rapid Set

was mixed 1:1 with 60-mesh silica sand from a local quarry. "Rapid Set is extremely environmentally sensitive, so learning how to regulate set time was critical," he says. "To slow set time in summer, we tried ice-cold water and water with ice before hitting on citric acid. In winter, we warmed the mix water overnight with an aquarium heater; by morning it would be 70° and good to go." Each statue used 550 pounds of mix.

"Warriors Unearthed" comprises 12 different figures plus dozens of hands and heads. Marquette and his students made a clamshell mold — a front and a back — for each figure. The molds are ½-inch-thick polyurethane backed by Ultracal gypsum cement reinforced with hemp fiber and sprayed with AquaCon water-based release agent. They lifted molds off the ground via an electric winch and relied on gravity to separate the casting from the mold.

To cement the front and back of a statue together, the team lifted the front or back half into the air with the winch, applied 2 inches of the Rapid Set/sand mix around the edges with a mortar bag, lowered that half onto the other half, and scraped off any excess with a trowel. "If you did that with portland cement, the joint would fail," Marquette says. "Your product bonds to itself much better; just pre-wet the surfaces and it's like epoxy. After two years, there's no indication of delamination." The mix also was used to cement heads and hands to the statues.

And why the university's interest in warriors? Because the school's team is the Troy Trojans. It's a no-brainer!

