Edison Coatings, Inc.

Terra Cotta Replacement with Custom System 45 TC Castings

Throughout its 37-year history of use in the restoration of historic buildings and structures, Custom System 45 has been used as both a trowel-applied patching system and a formed/poured replacement system.

The earliest application, in 1982, involved casting of replacement sandstone details on the 1855 Palladium Building in New Haven, CT, listed on the National Register of Historic Places. Most of the 8 tons of Custom System 45 applied to the façade was used for creation of these cast replacement elements. Thirty-seven years later, the castings remain crisp and undamaged by the many years of harsh New England weather exposure.

The premise for casting with Custom System 45 is simple: A well-engineered system of 10 different grades of repair mortar, already matched to the characteristics of their corresponding natural substrates, is easily transformed from a trowel-grade repair consistency to a pourable casting material simply by switching from the standard Restoration Latex #1 liquid component to the super-plasticized Restoration Latex #2 Casting Grade liquid.

The ability to provide durable, compatible, lightweight, field-castable replacement units is particularly applicable to terra cotta replacement units. The following are several examples of projects utilizing Custom System 45 Type TC for replacement units for terra cotta.

230 Park Avenue

The Helmsley Building, built in 1929 as the **New York Central Building**, was designed by Warren & Wetmore, the architects of Grand Central Terminal, in the Beaux-Arts style.

In 2008, terra cotta brackets supporting massive 3-story terra cotta columns 25 stories above Park Avenue were found to be failing and repairs were undertaken under the direction of Thornton Tomasetti.

While replacement in-kind with new terra cotta was considered, the cost was deemed to be excessive. The replacement process would have involved structural shoring, hoisting of large new units into position 25 stories above one of the busiest streets in New York, setting the new units and then reloading them.

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Figure 1. Failed Terra Cotta Bracket, 230 Park Avenue

The option to strengthen the existing assembly and to cast new replacement units in place using Custom System 45 TC (Terra Cotta Grade) greatly simplified the process and cut costs by more than 95%. Fiberglass molds were produced and these were re-used to produce replacements for 30 of the 32 brackets on the building.

Individual castings weighed as much as 1000 pounds. The replacements were cast as individual units matching the exact dimensions of the original terra cotta. Existing mortar joints were carried through the work, allowing the building to expand and contract without restriction by the replacement units. After forms were removed, the units were coated with a custom color-matched Elastowall 351 coating, matched to the original glaze color. *(Photos courtesy of Jun Yu, Thornton Tomasetti)*

Photos, left: Following installation of structural anchors, a custom fiberglass mold was attached to the prepared wall surface and Custom System 45 Type TC was poured and consolidated.

Photos, Below: Once forms were broken, the castings were coated with Elastowall 351 breathable coating, custom color-matched to the original terra cotta glaze.

In 2018, follow-up inspections indicated that the castings remain in perfect condition after 10 years. Additional work is being performed in 2019, including repointing with Spec Joint 46 and repairs to stone and terra cotta utilizing Custom System 45.

Photo, left: Eleven years after installation of Custom System 45 castings to replace 30 of the 32 terra cotta brackets on the building which had been damaged, all remain in perfect condition.

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U. S. Post Office, Courthouse and Customs House Honolulu, HI

The central courtyard of the US Post Office, Courthouse and Customs House is lined with a series of ornate terra cotta columns.

Shattered terra cotta column sections, shown below, were the result of roof leaks into the columns, containing structural steel that was solidly grouted. Rust-jacking caused various degrees of distress, with the most seriously damaged units requiring replacement. Some units exhibited minor cracking, that could be repaired, while others required disassembly and reassembly after treating the structural steel. Complete roof replacement was also included in the scope of work.

As there was inadequate time available to fabricate new terra cotta replacements, Custom System 45 TC with RL-2 liquid component was used to cast new units in 6 different profiles, including 2 sections of ornate column capitals. Molds were made from units remaining in good condition and casting was performed on site, minimizing transportation and handling. It also permitted completion of the project within the scheduled 5-month construction schedule. The replacement units were coated with Aquathane UA210E and Aquaspex 220, matched to the original glaze. They were then assembled as unit

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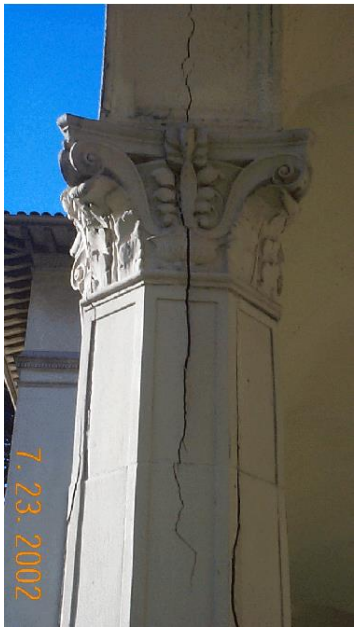
masonry using Spec Joint 46 custom mortar. The project was completed in 2002. When work was completed, the replacement units were visually indistinguishable from adjacent original terra cotta.



Completed sections of replacement castings are shown above.

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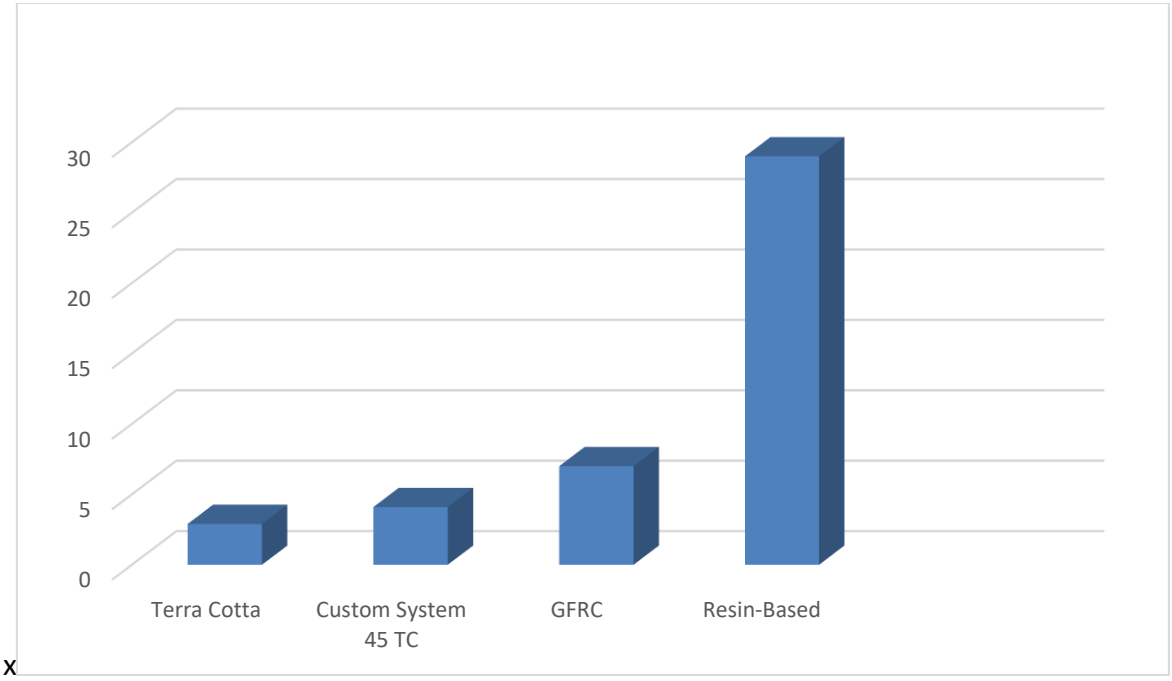
Technical Data

Linear Coefficient of Thermal Expansion, in/in/^{o}F x 10^{-6}



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Custom System 45 TC is formulated to closely match the thermal expansion characteristics of terra cotta, assuring that replacement castings work compatibly with existing terra cotta assemblies, even when units are large.

PROPERTY	VALUE	COMMENTS
Linear Coefficient of Thermal Expansion, in/in/^{o}F x 10^{-6}	4.1	Low thermal expansion, compatible with existing terra cotta
Moisture Vapor Transmission, US Perms	2.92	Allows long-term continued drying of wet adjacent terra cotta assemblies
Freeze-Thaw Resistance, ASTM C672	0 Scaling at 50 cycles	Excellent Freeze-Thaw Resistance
Saturation Coefficient, ASTM C67 Part B	0.45	Low saturation coefficient correlates with excellent freeze-thaw resistance
Accelerated Weathering, ASTM G154	No Change, 1500 hours	Complete UV stability and wet-dry cycling stability

In addition, Custom System 45 has a proven history of positive performance on thousands of projects performed over nearly 4 decades.

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