

JOHN EARLEY'S MOSAIC CONCRETE ART — SAINTS AND BATTLE MAPS

by Robert F. Armbruster

ABSTRACT

Synopsis — John Earley created a new artistic medium in 1921 when he decorated the interior of the Shrine of the Sacred Heart in Washington, DC with breathtaking polychrome illustrations of mosaic concrete, utilizing hundreds of colorful, rare stones and ceramics. Earley developed methods to apply his mosaics as stucco, as thin precast ornamentation and as large precast panels.

Earley Studio's mosaic commissions included at least seven more church interiors, a dinosaur mural over the entrance to the Reptile House at the National Zoo, entrance facades, large decorative urns, murals of ships, Great Seals of the United States for embassies, and battle maps for a World War II memorial chapel in France.

The final, most intricate artworks that Earley Studio created were polychrome mosaic battle maps at the National Cemetery of the Pacific in Honolulu, Hawaii. When a new Vietnam War Memorial was added to the national historic landmark site, new battle maps were designed and produced using style, materials, colors and techniques similar to Earley's historical battle maps.

This article reviews John Earley's mosaic concrete projects, historical production techniques and current day fabrication methods for mosaic concrete artwork.

Keywords — John Earley, exposed aggregate, polychrome mosaic concrete, artwork, murals

A video of the full presentation with 85 slide images is available on Youtube:

John Earley's Mosaic Art—Saints, Dinosaurs, and Battle Ships

— https://www.youtube.com/watch?v=-TIps0NhL_g

video of presentation by Robert F. Armbruster at ACI Fall 2014 Convention, Washington, DC

Document: ACI Fall 2014 Convention, Washington, DC

Author(s): Robert F. Armbruster

Publication: Web Session

Volume: Armbruster.pdf

Keywords: historic concrete, John J. Earley

Date: May 1, 2015

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JOHN EARLEY'S MOSAIC CONCRETE ART — SAINTS AND BATTLE MAPS

John J. Earley announced that concrete can satisfy the most extreme requirements of form, color, and texture desired by architects and artists. He proved it with polychrome mosaic concrete artworks of saints and battle maps. Earley unveiled concrete's potential as an artistic medium when he exposed hundreds of colors in the surfaces of intricate illustrations and complex, three dimensional ornamentation.

EARLEY'S ARTISTIC PROCESS

Trained as an architectural sculptor, and assuming charge of his father's studio at the age of 26,¹ John Earley was skilled in clay, gypsum plaster, carved stone and lime based stucco. He was attracted to Portland cement as a binder because it offered easy workability in its plastic phase, rapid results and a durable final product.² Earley began to use it in 1905 for cement stucco that he applied with traditional plastering methods.³

By 1920 Earley was creating beautiful architectural concrete with exposed aggregates. Earley had established procedures to produce architectural concrete in the studio as cast stone or as thin, precast slabs. Earley's craftsmen installed the precast elements on site along with architectural concrete that they cast and finished in place or applied as a cement stucco.

A comprehensive color palette — John Earley's colors came from the optical effect of the crushed pebbles and sands that he exposed in his concrete. Most of Earley's polychrome mosaic concrete used pebbles that passed a 1/4 in. (6.3 mm) sieve and were retained on a No. 6 (3.35 mm) sieve.⁴ He gathered materials from North America, France, Italy and Africa for ceramics, porcelains, opaque enamel glasses, marble plated with gold, and natural stones such as quartz, obsidian and granite.⁵

For his palette of colors, John Earley carefully selected 10 hues, five values from light to dark, and four chromas or intensities. These 200 colors of pebbles were more than sufficient for all of his projects.⁶

Earley combined pebbles of different colors in a single concrete mixture to create the optical impression he desired. He explained, "A great wealth of color knowledge, all that of the impressionist or pointillist school can be immediately applied to concrete if we consider each grain of aggregate as a spot of color placed in [juxtaposition] to other spots, all of which will blend in the air to a hue of even value and chroma."⁷ For example, he combined red and blue pebbles to create a shade of violet. He routinely combined three colors of pebbles with two colors of sand to create the visual results he wanted.

Earley developed the color palette for each project in a two step process. First, he analyzed the design and planned the optical sensations and decorative effects required without considering what materials might be used. The results of the first phase became the reason for the selection and arrangement of materials during Earley's second phase when he prepared formulations of pebbles and sand for the project's mosaic concrete colors.⁸

Producing vibrant color in mosaic concrete — For final color selections, Earley made multiple mosaic concrete samples for colors specified by the artist or architect. The samples were evaluated at the job site under the intended lighting conditions. After the final mosaic concrete colors were chosen, the required stones were procured, crushed and sieved into pebbles and sand in the quantities required for the many batches of concrete mixtures in the project.

Earley Studio worked from detailed drawings prepared by the architect or artists. For polychrome mosaic murals or illustrative pieces, full scale paintings were created by an artist. Earley Studio then prepared shop drawings for

approval of the architect or artist. The shop drawings identified the precast pieces of mosaic concrete, applied mosaic concrete, dimensions and colors in every area of the final composition. The approved shop drawing was translated into a mosaic drawing or “cartoon” with lines separating every area of color.⁹

Using traditional methods of paper tracing and pounce wheels, Earley's craftsman transferred the lines onto the surface of a plaster slab.¹⁰ The lines were then inscribed into the slab, creating V-shaped grooves 1/8 in. (3 mm) deep. The slab was shellacked, a release agent was applied and a second plaster slab was cast from it. The second slab now had 1/8 in. (3 mm) high ridges outlining each area of color. This second slab became the mold for the mosaic concrete panel.¹¹ For the curved surfaces of polychrome mosaics applied to domes, arches and moldings, Earley used the same techniques to create curved plaster molds.

The plaster mold was shellacked and coated with a release agent before each casting operation. To prepare for a day of casting, pebbles and sand of the different colors were measured in the correct quantities for every batch. At the time of casting, concrete was mixed for each color by combining the pebbles and sand with Portland cement and water.

On the casting day, craftsmen used artist's palette knives to place and consolidate each mixture into its area on the mold.¹² The colored layer of concrete visible on the face of the mosaic concrete was just 1/4 in. (6.3 mm) thick.¹³ The first color was placed in the mold up to the top edge of the V-shaped ridge. The adjacent color was installed to cover the ridge and overlap the first color. After all of the colored concrete mixtures were placed, the reinforcing steel was installed and covered by a backup mixture of concrete that filled the mold. Casting a panel with 15 ft.² (1.4 m²) of complex, polychrome mosaics could take six to ten hours.¹⁴

When the mosaic concrete was removed from the mold on the following day, the surface was chalky and dull in appearance because particles of cement covered the pebbles. The sparkling mosaic effect came to life only after the pebbles were carefully exposed with 1 in. (25 mm) wide wire brushes.¹⁵ Concrete mixtures that had been placed late in the casting day were not yet as hard as those first put into the mold, so the exposing had to be carefully done for each color. Small picks, similar to dental tools, were used to clean the grooves in the mosaic concrete surface.

All ornamentation incidental to the general decoration was precast in the studio as thin slabs.¹⁶ Earley Studio precast and finished small polychrome elements, 5/8 in. (16 mm) to 1 in. (25 mm) thick, that were later assembled into larger precast components or installed on site into a brown coat of cement stucco. For larger assemblies at the construction site, the studio fabricated precast components that were locked into position with grout or combined with cast in place mosaic concrete.

COLOR FOR THE GODS AND THE SAINTS

The Parthenon replica in Nashville — John Earley installed exposed aggregate architectural concrete finishes on the 1921 replica of the Parthenon in Nashville, Tennessee. Color was required for features that had been painted on the ancient Parthenon. Instead of painting the new replica, Earley produced architectural components with crushed pebbles and sand in buff, sky blue or dark red colors.¹⁷ The buff mixture was formulated to suggest the weathered appearance of the ancient marble. The red and blue areas were monochrome, made only with pebbles and sand of the desired color. The architectural features with red or blue colors were precast by Earley as smaller elements and then installed onto the building. In a few locations, such as the wall behind the pediment statues, the colored aggregates were exposed after application in a cement stucco mixture.

On the exterior of the Parthenon, Earley separated the colors by placing the concrete mixtures within different depths of relief in the molds. By 1928 when the interior polychrome mosaic concrete was installed, the studio had achieved more precise control over the crushing and screening of their aggregates, tighter packing of the pebbles, and finer definition of colors and patterns by using molds with ridges to separate the colors.

Polychrome emerges in the Shrine of the Sacred Heart — When architects Murphy and Olmstead designed the Shrine of the Sacred Heart in Washington, DC in 1921, they wanted to finish the interior with colorful north Italian Romanesque decoration including religious figures and symbols.¹⁸ The budget would not provide for traditional frescoes, mosaics, or painted finishes so the architects explored alternative methods.¹⁹ They asked John Earley if he could create the effects using his mosaic concrete material.²⁰ Earley was excited by the unprecedented opportunity that the project presented.²¹

The architects prepared detailed interior elevations and renderings showing the decorative symbols, saints, geometric patterns, moldings and all of the colors required throughout the church. John Earley met their specifications by providing every form, texture and color in polychrome mosaic concrete.²² Earley covered the walls of the church with all the colors of the rainbow including rich reds, soft pinks, warm oranges, muted browns, brilliant blue, pale green, navy blue, sky blue, emerald green, brilliant white, sparkling gold and lemon yellow.

Following the geometric tiling of the architects design for the ornamental patterns and moldings, Earley divided the interior finishes into small, repetitive elements. This let him use the same mold multiple times and provided easily handled, precast mosaic concrete components for installation at the church. For example, in the hemispherical domes over the alters, Earley laid out tiles on a hemispherical model. The figures of the saints filled a number of tiles within the overall pattern. The same molds was used to cast the angels Gabriel, Raphael and Uriel with different colors of aggregate to vary their appearance from angel to angel. A section of the mold that spelled out the angel's name was switched for each angel.

Earley Studio's sculptors and model makers employed traditional techniques of low relief modeling to create shadows and apparent overlap in leaves and wings of birds. Shallow relief was also used to great effect for the geometric patterns and iconic symbols. Although the relief was often less than the thickness of one pebble, the relief added highlights and shadows that visually reinforced the images. The texture of the exposed aggregate surface created another effect to enrich the viewer's experience.²³

Within a single area, Earley could vary the color from one shade to another by blending different colors of aggregate as the mosaic concrete was installed into the mold. After visiting John Earley in Washington, DC, Laredo Taft, the sculptor of the "Fountain of Time" statue in Chicago, suggested that Earley placed his colors of aggregate with a "pepper box."²⁴

Where precast mosaic concrete moldings wrapped around right angled corners of columns, pilasters or openings, Earley made the thin slabs of precast moldings with 45° reverse bevels for an installation with a tight, mitered joint. For short returns, the moldings were precast with the polychrome aggregates on the return. The studio's model makers laid out the designs so that geometric patterns turned corners without interruption.

Every column capital is uniquely decorated and appears to be seamless, but the capitals were assembled from small, thin slabs of precast ornamentation. To create complex three-dimensional components in the studio, Earley first made thin precast slabs and then inserted them within larger molds before placing additional mosaic concrete to complete the larger precast component. Earley also used thin precast slabs to build up larger architectural components during installation at the church. By combining precast elements displaying different symbols and colors, the desired variety was easily obtained.

Earley enjoyed great freedom in sequencing the installation for efficient production. Studio artisans could place thin, precast pieces of polychrome mosaic concrete into a brown coat of stucco on walls, ceilings, arches or domes.²⁵ The precast units could be set before or after a single color of mosaic concrete was applied to adjacent areas. Studio artisans temporarily installed thin strips of wood onto the surface to screed the applied mosaic concrete surfaces. After removing the wooden strips, the craftsman either installed precast, patterned moldings of mosaic concrete or placed mosaic concrete of an alternate color to fill the strip area. As precast moldings were installed against finished areas of applied mosaic concrete, any gaps could be closed in a seamless manner using mortar with the same color of sand as the adjacent field of mosaic concrete.

As artisans applied mosaic concrete colors in polychrome designs upon the church walls, it was difficult to place different colors of the wet concrete mixture accurately. Earley's craftsmen solved the problem by creating grooved plaster slabs for templates that were pressed into the wet brown coat to create raised ridges outlining each area of color. On the following day, the craftsman applied the mosaic concrete mixtures within the ridges.²⁶

Earley adapted the ridge technique to precast molds. The ridges in the mold produced grooves in the finished mosaic concrete surface that provided crisp delineation, highlights and shadows. The molds were easier to produce than a low relief mold. Earley used this technique extensively on later projects.

The architects combined traditional tesserae mosaics and painted illustrations with Earley Studio's mosaic concrete. Earley produced precast mosaic concrete for three-dimensional frames around features such as the stations of the cross. In some churches, polished marble or ceramic tile was used to surround and highlight Earley's polychrome mosaic concrete panels.

The Franciscan Monastery projects — Earley created multiple projects at the Franciscan Monastery in Washington, DC. Finished in mosaic concrete, the Rosary Portico is articulated with spiral columns of multiple designs and colors between fifteen chapels. Each chapel features an illustration of a mystery of the rosary in a traditional tesserae mosaic. The tesserae mosaics are framed by polychrome mosaic concrete. Earley produced a vibrant visual effect by combining multiple colors of aggregate in each mosaic concrete mixture. The geometric patterns and letters in this mosaic concrete are not as well delineated as Earley Studio's later work and do not have the V-grooves in the surface.

Within the gardens on the grounds of the monastery, Earley constructed a domed, open air, Chapel of the Ascension. The architectural features of the chapel are finished with one mosaic concrete color. However, the interior of the dome is covered with polychrome mosaic concrete illustrating the Ascension of Christ with figures of Christ, Mary and eleven apostles. Earley precast thin, curved, polychrome mosaic concrete slabs for the figures and decoration. The craftsmen installed the thin precast slabs onto the dome's surface. Next, in the areas between the figures and decoration, a uniform mosaic color was applied as cement stucco, troweled smooth and the aggregate exposed. The colors in the ascension figures demonstrate Earley's ability to generate colors in pure, primary hues as well as subtle variations of tone.

The visitors entrance to the monastery is surrounded by precast, polychrome mosaic concrete in shades of soft rose, olive and golden tan. Earley created the patterns with his V-groove technique. Letters were painted and gold leaf applied on top of the mosaic concrete above the door. Comparison of photos taken in 1993 and 2013 show that although the gold leafing has worn away and needs replaced, Earley's polychrome materials remain in excellent condition.

Near the entrance to the monastery John Earley sculpted a statue of St. Christopher with the Christ child and cast it in place with mosaic concrete. Earley was also the artist for two smaller statues set in wall niches flanking the entrance.²⁷

Campus decorations and a Reptile House at the Zoo — For the Louisiana State University campus in Baton Rouge, the studio provided precast ornamentation such as polychrome mosaic concrete medallions that were installed on the walls of the campus buildings.

In 1925 Earley fabricated an entrance to the Reptile House at the National Zoo in Washington, DC. The architect's fanciful design featured reptiles carved in stone and set off by polychrome precast mosaic concrete moldings. Above the doorway is a brightly colored scene with a dinosaur, palm trees and clouds rendered in polychrome mosaic concrete. Earley translated the artist's painting into polychrome mosaic concrete displaying brilliant mixtures of pebbles and sand.

Glorious church interiors — John Earley sought religious projects by preference. Earley Studio created polychrome mosaic concrete interiors for a number of churches in the 1920s.²⁸ Holy family Church in Dayton, Ohio features

shades of green and blue on walls and columns in the nave. Column capitals, arches and moldings were precast in polychrome mosaic concrete at the studio and shipped to the site. The walls of the narthex welcome church goers with warm, red tones of applied mosaic concrete walls and precast mosaic concrete moldings.

The architects of the Chapel at the Villa de Matel in Houston, Texas chose Earley in 1927 to create soft, pastel tones of pinks, yellows, greens and blues for the chapel interior. During the same year, for the St. Francis de Sales Church in Buffalo, New York, Earley used deep shades of mauve and blue, light pinks, green-grays, parchment yellows, and bright turquoise for a very different effect. The following year, Earley covered the interior of the Church of the Sacred Heart in Newark, New Jersey in warm shades of tan and brown.

In 1927 Earley was commissioned for the interior of the Church of St. Philip and James in Baltimore, Maryland. Earley created mosaic concrete for muted green columns with Corinthian capitals supporting arches and a hemispherical dome over the altar. The dome features figures of Christ, angels and saints, a star-studded blue sky with religious symbols surrounding a central sun, and a dove of peace above Christ's head. Words of Scripture set in polychrome mosaic concrete wrap around the spring line of the dome. Within the nave, the architect had Earley produce figurative polychrome mosaic panels that were installed within a field of tiles on the pendentives of the central dome and in arches above rose windows.

The studio also created an entrance facade for St. Charles Borromeo Church in Newark New Jersey in 1936. Here, the polychrome aggregates produce a wonderful impact in a simple, modern design. In the same year, Earley Studios completed the interior of St. Anne's Church in Houston, Texas where the architect chose a combination of rose, tan and muted green mosaic concrete.

MODERN POLYCHROME PROJECTS

With the onset of the great depression, Earley's polychrome projects came to a halt.²⁹ Earley's market for decorative church interiors never recovered. In 1932, the studio started three decades of work on the Baha'i Temple in Wilmette, Illinois.³⁰ Two years later, offering his contribution to the construction of small houses, Earley produced a series of polychrome houses with precast mosaic concrete panels.³¹

In 1936 Earley produced six murals illustrating the progress of shipbuilding for the U. S. Navy's Model Basin in Calderock, Maryland.³² Even the rigging of the sailing ships is rendered in delicate lines of mosaic concrete. In Washington, DC, Earley created a polychrome entrance facade for the Scottish Rite Center. The central panel was the largest polychrome work that the studio cast in one continuous operation. Earley also created 11 ft. (3.3 m) tall, polychrome mosaic concrete urns for each side of the entrance. The studio fabricated the urns in segments, incorporating curved, thin precast slabs into larger molds. Completed precast sections of the urns were assembled on-site and the joints pointed with a mortar of crushed quartz sand. The studio also began work on the Thomas Alva Edison Memorial Tower in Edison, New Jersey. The tower was constructed using architectural precast panels of mosaic concrete in twelve different hues.³³

John Earley's successors — John Earley passed away in 1945, a few weeks after he had sold Earley Studios to his associate Basil Taylor.³⁴ Taylor continued the work of the studio until retiring in 1955 when his son, Vernon G. Taylor, took over the direction of the studio.³⁵ Both of the Taylors were skilled in the art of polychrome mosaic concrete and enjoyed creating it whenever the opportunity presented itself. Earley Studio made dozens of Great Seals of the United States in polychrome mosaic concrete. The Great Seals were created in three sizes and installed in US embassies throughout the world. The studio also fabricated a 6 ft. (1.8 m) diameter polychrome mosaic concrete emblem for the Naval Research Laboratory in Washington, DC.³⁶

Basil Taylor directed work as the studio finished the interior of the Baha'i Temple in 1948. Earley Studio's bid to fabricate and install 2,457 precast panels of polychrome mosaic concrete was \$12,000 less than bids for ornamental plaster.³⁷ The architects selected an off-white mixture of white, clear and amber quartz for the ornamentation and a

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mauve combination of pink, amber and gray pebbles for the background. On the side portions of the sculpted ornamentation, which projected as far as 2 in. (50 mm) from the background, the studio did not expose the aggregates. This technique provided an additional chroma of white without requiring another concrete mixture.

The Islamic Center in Washington DC was finished in 1953 with Earley Studio's precast polychrome mosaic concrete panels.³⁸ The architect chose an elegant combination of off-white quartz with a light blue, mosaic concrete mixture to highlight the geometric and calligraphic ornamentation. The studio fabricated thin, perforated screens to cover window openings. At entrances and along colonnades, the architect combined polished granite columns with precast mosaic concrete capitals to support pointed arches of precast panels in polychrome mosaic concrete.

HISTORIC BATTLE MAPS

The American Battle Monuments Commission asked Earley Studio to create battle maps for two memorials. The first project was two battle maps for a World War II Memorial Chapel at the American Cemetery in Brittany, France in 1956.³⁹ The battle maps illustrate the advancement of Allied troops after the invasion of Normandy and the progress of the war throughout Europe

The second memorial project displays the most elaborate artworks that Earley Studio ever created: twenty battle maps for World War II and the Korean War at the National Memorial Cemetery of the Pacific in Honolulu, Hawaii. The maps are four times as intricate as Earley's other polychrome mosaic concrete because the studio used 1/8 in. (3.2 mm) diameter pebbles instead of their normal 1/4 in. (6.3 mm) size. The smaller pebbles were needed to render the extensive amount of detail required in the battle maps.

The artist, Mary Morse Jacobs, painted full scale drawings with text, symbols and geographic features in addition to wonderful scenes of soldiers, marines, military equipment, and local animals and plants. She designed 1,450 ft.² (133 m²) of maps⁴⁰ with a dynamic range of colors requiring hundreds of color blocks within each 2 in. (50 mm) thick precast panel measuring approximately 3 ft. (900 mm) by 5 ft. (1.5 m) in size. The studio chose crushed glass for the pebbles and sand, and added pigments in the miniature concrete mixtures. For panels full of text, the studio selected quartz aggregate for a parchment colored background. 48,000 plastic letters were embedded within the mosaic concrete panels to identify geographic features, military units and provide descriptive narration.⁴¹ 887 tiny, glazed ceramic shapes were cast into the maps for symbols of ships, planes and military units.⁴²

Earley Studio worked for three years to design and fabricate the project's 88 panels. The 10 ft. (3.m) high maps extend along open air galleries clad in travertine marble. In the warm, reflected light of the Hawaiian sun, the crushed glass mosaic produces a vibrant optical effect that touches the hearts of the visitors and would have delighted John Earley.

Earley Studio was commissioned to create the battle maps in polychrome mosaic concrete after the memorial's original battle maps, that had been fabricated in Italy using scagliola, deteriorated after just a few years of humid, Hawaiian weather.⁴³ Nearly fifty years after their completion, Earley Studio's map panels remain in superb, "like new" condition.

NEW BATTLE MAPS

In 2011, when a Vietnam War Memorial was added to the national historic landmark in Honolulu, Hawaii, the American Battle Monuments Commission selected the author's company to design and produce new battle maps using a style, materials, colors and techniques similar to Earley Studio's historical battle maps.⁴⁴ Although we manually created models and molds with plaster for some tasks, we augmented Earley's methods with digital technology, computer aided machining and modern materials.

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The historic battle maps were carefully studied, measured and photographed with targets showing scale and colors. To develop our color palette, glass was sourced, crushed, screened to size, then mixed into hundreds of samples that were matched to a standardized color system, similar to what John Earley did using the Munsell color system. Using the image of an eagle from the historic maps, a sample panel of polychrome mosaic concrete was fabricated to test the workflow and materials.

Mary Morse Jacobs, the artist for the historic battle maps, was commissioned as the consulting artist. Mrs. Jacobs prepared watercolor paintings that were translated into scaled mosaic drawings using digital software. Colors in the artwork were identified in the color system and final colors were selected using mosaic concrete samples. Plastic letters were not available to match the historic map's numerous styles of text, so digital fonts libraries were searched for comparable fonts and typographic software was used to add text to the mosaic drawing. Progress drawings were printed and distributed for review by the Commissioners and historians for all the branches of the military.

The approved battle map drawings were translated into digital cartoons with vectors outlining each area of color, military unit patches and letters. The overall drawing was then subdivided into drawings of each precast panel in the map. Electronic files with the cartoons were imported into computer aided manufacturing software and toolpaths created for a CNC router to machine high density urethane foam into V-ridged molds for the concrete panels. The CNC router also machined 5,000 letters from acrylic plastic sheets. Alignment holes were machined in the acrylic letters and in the foam molds for stainless steel wires to pin the letters into position during the casting process. Molds were machined for 56 military unit patches to be shaped in porcelain clay, fired, glazed with the unit's graphic symbol and then embedded into the map.

Tiny batches of colored concrete were weighed and mixed using laboratory equipment. Some batches were so small that the pigments had to be measured in hundredths of a gram in order to match mosaic concrete mixtures on adjoining panels cast on different days. With glass aggregates, we wanted to minimize potential alkali-silica reactions even though the historic battle maps showed no distress or indication of alkali-silica reaction. We tested our concrete mixtures according to ASTM C1567 and measured a significant reduction of expansive reaction in samples with white pozzolanic material replacing portions of the white Portland cement. A twenty percent substitution of white pozzolan was selected for the new mosaic concrete mixtures.

The glass pebbles were screened to pass a No. 6 (3.35 mm) sieve and be retained on a No. 14 (1.4 mm) sieve. The glass sand passed a No. 30 (600 μ m) sieve and was retained on a No. 60 (250 μ m) sieve. The concrete mixture proportions by unit weight were 30 water, 80 white Portland cement, 20 white pozzolan, 34 sand, 92 pebbles, 0 to 6 pigment, and 0.12 viscosity modifying agent. The viscosity modifying agent provided less than thirty minutes of working time for placement of a mosaic mixture. The backup concrete mixture was produced with silica sand, crushed granite pebbles 1/4 in. (6.3 mm) in diameter, white Portland cement and white pozzolan.

If there were more than thirty colors on a single panel of the battle maps, smaller sections of the panel had to be precast as thin slabs and then embedded into the panel when the remaining areas of the panel were cast. The thin slabs were 5/8 in. (16 mm) thick, including a backup mixture of glass fiber reinforced concrete. The thin precast slab was completely finished with exposed aggregate mosaic. Before it was inserted into the larger panel mold, the finished surface of the thin slab was coated with a layer of natural clay to prevent fresh concrete cast into adjacent areas of the panel from adhering to the exposed glass aggregate on the thin precast slab.

On the day before casting, the V-ridged face mold was sprayed with a form retarder and all mosaic concrete mixtures were pre-measured with the cements stored in sealed containers. We obtained the best results by following a twenty minute sequence of batching and mixing the concrete ingredients in the same order that John Earley recommended. Mixers sized for five different capacities were required for the range of sizes of the color areas on the map panels. Laboratory homogenizers provided the proper torque and container capacity for the smallest mosaic concrete quantities. Artist palette knives were used to place and consolidate the mosaic concrete mixtures. Six

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artisans could batch, mix and install up to thirty different colors of mosaic concrete on a 15 ft.² (1.4 m²) panel in six to ten hours.

The glass pebbles in the new mosaic concrete panel were exposed on the following day. The precast panels were washed and cured according to Earley Studio's specifications before being crated and shipped to Hawaii for installation in the new Vietnam War Memorial for a dedication on Veterans Day, November 12, 2012

THE FUTURE OF POLYCHROME MOSAIC CONCRETE

Few artists, craftsmen or architects have continued to use the artistic medium of polychrome mosaic concrete. When Earley Studio closed its doors in 1973, a number of the studio's craftsmen collected the remaining sacks with dozens of colors of crushed pebbles and sand, formed an association, and continued to practice their art. Jim Linville led the efforts and coordinated projects until 1989.⁴⁵ The shifting economic costs of labor and materials, a reduced number of readily trained craftsmen, decreased use of the decorative arts in architecture, and shifting tastes in style have all contributed to the decline.

John Earley shared the artistic principles he employed and the technical aspects of his craft in eloquent articles that describe his polychrome mosaic concrete. Careful study of Earley's writings and projects, together with a solid training in the art and craft of the architectural sculptor, will provide a sound basis for the creation of polychrome mosaic concrete artwork in the future.

Let us hope that the artistic potential of polychrome mosaic concrete will once again capture the interest of artists and architects. As John Earley said, "Such a multiplicity of hues is a property of architectural concrete, unequalled by any other masonry material, in fact it is rivaled only by the great medium of the mosaicist, which however is not adaptable to form in three dimensions."⁴⁶ "In the hands of a skilled craftsman, concrete is an exquisitely decorative material affording with extraordinary facility the expression of predetermined form, color and texture."⁴⁷

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Figure 1 John Earley stunned the industry in 1921 by creating breathtaking colors, forms and textures with exposed aggregate polychrome mosaic concrete for the interior of the Shrine of the Sacred Heart.



Figure 2 — Craftsmen use artists' palette knives to place and consolidate polychrome mosaic concrete mixtures into molds with ridges outlining every small area of color in the artwork.

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Figure 3 — For architectural decoration and moldings, Earley Studio installed polychrome mosaic concrete as thin, precast slabs and applied stucco with great precision.



Figure 4 — John Earley collected 200 colors of aggregate that he crushed and sieved into pebbles and sand before combining them in miniature concrete mixtures in all the colors of the rainbow.

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Figure 5 — Thin, precast slabs were prepared on curved molds in the studio for the figures and decoration. The thin, precut slabs were installed on the dome with a brown coat before mosaic stucco was applied around



Figure 6 — The Baha'i Temple interior displays 2,457 panels of polychrome precast mosaic concrete with ornamentation sculpted in 2 in. (50 mm) deep relief.

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Figure 7 — Polychrome mosaic concrete panels for the Baha'i Temple display remarkable precision in delineation of the color, sharp arrises, uniform exposure of the aggregate and a third chroma effect by not exposing the sides.



Figure 8 — The most intricate artwork that Earley Studio created in polychrome mosaic concrete can be found in twenty battle maps extending along galleries in the National Memorial Cemetery of the Pacific.

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Figure 9 — This 18 in. (450 mm) by 24 in. (600 mm) legend on the battle map includes plastic letters and glazed ceramic symbols among flags, soldiers, plants, an airplane and clouds created with polychrome mosaic concrete.

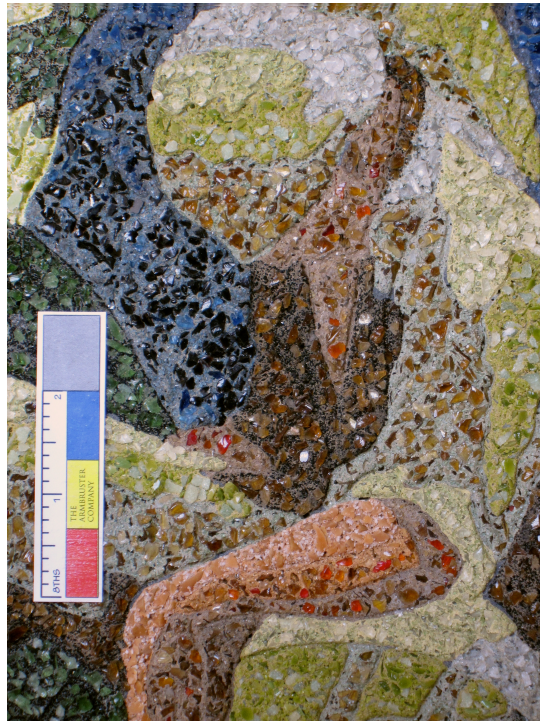


Figure 10 — Earley Studio's craftsmen rendered the battle map artwork using polychrome mosaic concrete mixtures with many colors of crushed glass for 1/8 in. (3 mm) pebbles and fine sand.

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