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21ST CENTURY BUILDING CODES AND SEISMIC STANDARDS INFORM EXCEPTIONAL DESIGN, CRAFTSMANSHIP AND ATTENTION TO DETAIL RESULTING IN A MODERN, 16TH CENTURY-INSPIRED PALAZZO BUILT FROM AN ABANDONED 100-YEAR-OLD SAN FRANCISCO ESTATE.

BY STACEY FREED

All photos by Roger Davies Photography, except as noted

This staircase is the center of the home in terms of design and circulation. Building it was a collaborative effort among designers, engineers, masons, and technology professionals. Just building the staircase and railing from bottom to top took a five-person crew nearly two months.

Sometimes a single element can speak for an entire structure. In the case of this 6,848-square foot San Francisco estate, it's the grand entry stairway designed by project architect Andrew Skurman. A three-story Botticino Classico marble structure, the stairway ribbons upward through the center of the house in a marvelous marriage of craftsmanship and technology. The attention to detail, the complexity of its creation, and the extraordinary effort involved by the team responsible for the stairs are also evident in every aspect of the magnificent home.

SOURCE AND INSPIRATION

In the 1920s, a wealthy California industrialist wanted a show home built in the Italian Renaissance style. He got his wish, and for 100 years, the house, designed by architect Henry Clay Smith, has commanded a hillside corner with a panoramic view. In 2012, new owners had ambitious ideas. On order was renovating, restoring, and creating an authentic Italian palazzo, with the emphasis on authentic. The house should look and feel as if it had been standing since the 1600s. That necessitated a collaboration between architects, designers, stone professionals, and even technology students from the University of Bolognato to deliver on a project that includes over 40 rooms of custom marble, the stairway, an indoor underground pool, and an Italian grotto and garden with fountains and mosaics as well as a modern floorplan, updated kitchen, and ensuite bathrooms. All of it would need to be built to the rigor of 21st-century building codes and seismic standards.

Ed Westbrook, founder and CEO of QuarryHouse in San Anselmo, California, came onto the project about a year after work had begun. "The stonework was

going to be complex, and the general contractors wanted to get moving," Westbrook says. QuarryHouse offers design assistance, stone sourcing, project management, fabrication, installation, and restoration services. They have a small hand carving atelier (studio) in Italy, outside of Verona, and have also formed a partnership with CITCO in Italy, a world-renowned company known for its expertise in CNC carving and stone fabrication.

Westbrook set to work sourcing the stone along with the project's interior designer Suzanne Tucker, principal, Tucker & Marks. "She had a palette of ideas when (our company) stepped into the project, and we made adjustments and recommendations," Westbrook says. They eventually located 120 slabs and 10 blocks in Italy and used 18 full containers of finished stone on the project. The main stone was the Boticcino Classico marble, but there were others used, including onyxes from Turkey and Giallo Siena, Jamaica Rosa, Onice Avorio, Breccia Oniciata, Macchia Vecchia, Rosso Imperiale, Calacatta, Travertino Navona, and Verde Esmeraldo marbles. "We spent a good portion of that first year tracking down the exact blocks we wanted. The veining aspects were very important to the homeowner, who was very involved in the project," Westbrook says.

For inspiration, Tucker says she worked closely with Skurman Architects to "dive into the minutiae of historic Italian palazzos — specifically Palazzo Chigi-Odescalchi, Palazzo Spada, and Palazzo Pisani Gritti — to research informative details from balustrades, mosaics, and intarsia floors to plaster ceilings and moldings."

Skurman likes to say, "We create the coloring book, black and white drawings on paper or a computer. We leave it to the interior designer and client to color in."

Their final color choices, Tucker says, were "guided by a desire to fit the home's Italian vernacular, but they also

The shower in the upper floor's home office is one of the home's five bathrooms. It features a tree of life design and is one of the many mosaics done by Sausalito artist Pippa Murray. The colors and design are inspired by historical Italian palazzos and they pick up the other stone colors in the space.

Left: In the outdoor garden, the fountain features complex Thala marble dolphins handcarved in Italy by QuarryHouse stonemasons. Right: The dolphin theme continues in the grotto alongside the underground pool. The grotto was carved from one block of travertine. It was lifted through a skylight above the pool area. QuarryHouse built a special steel truss to slide the grotto into place.

had to feel warm and livable. Hence the palette of Giotto-like colors, warm and complex, which gives a Renaissance feel throughout."

TECHNOLOGY MAKES STAIRS BUILDABLE

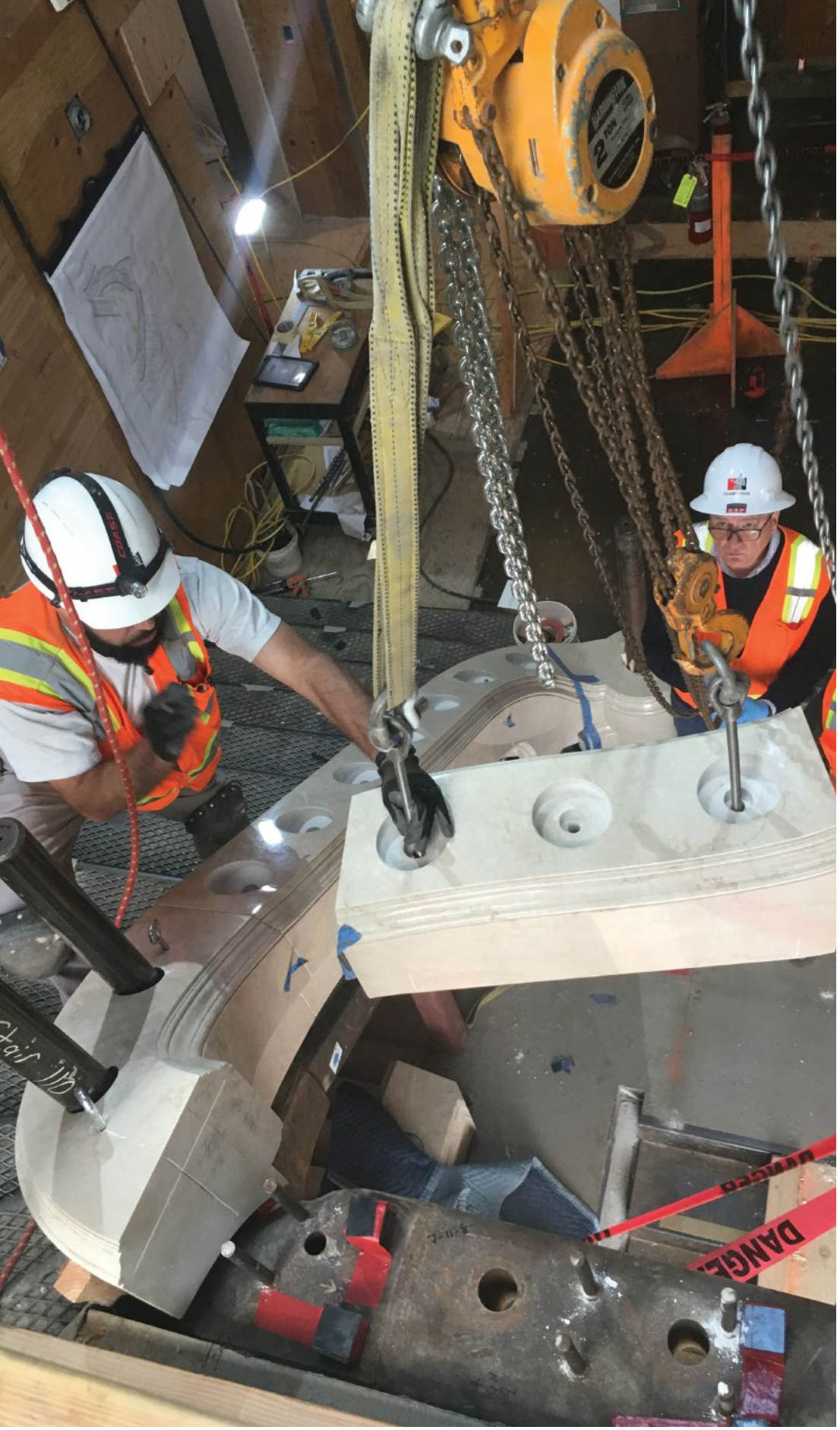
The Botticino Classico is "an absolute classic stone for this type of work, a great marble with beautiful veining. We could get high quality blocks and there were no challenges with the strength of the stone," Westbrook says. The challenge, he says, came from turning the design into a buildable object.

In the old days, people would have carved the staircase in place but that's not practical or possible now. Westbrook used CATIA (Computer-Aided Three-dimensional Interactive Application), a 3-D technology used by Boeing to make its 777. "Once we got everything codified in the 3-D model we could change one dimension. We could move something 1/8th of an inch at the bottom of stair, and the software would change everything (else on the design). That was critical," Westbrook says.

The stair is basically a structural steel frame covered by plaster and marble. It was challenging for both the steel and stone people, Westbrook says. "The non-movement joints of the staircase are at a 1/64th, virtually nothing. Where the balustrades join the rail there's almost no joint. To have that tight space on a large curving piece like this is almost unheard of."

Once the client and the architect were clear on how resilient and massive they wanted the staircase to be, they brought in an engineering team. After running through many scenarios, they decided they would post tension every one of the 33 balustrades. Each has a metal rod that runs through it and attaches to the steel frame. This gives the stone compressive

The windows, a fixed element, made the stair design challenging. The 3-D model revealed the difficulties of curving the staircase and hitting perfect alignment with a window frame. If the calculations were off, even slightly, the crew would have to go back down to the beginning to figure out the correct geometry.



QuarryHouse built an overhead crane system and hung it from ceiling beams. Here the crew is placing one of the stair bases. Then, they'll insert steel rods on which to place the balustrades. Photo courtesy of QuarryHouse

strength in more than one direction to help it resist a bending force. The staircase is designed to 6.8 on the Richter scale. "If you take 50 pounds of resistance and you put 33 balustrades in and multiply that's a tremendous resistance to bending force," Westbrook says. "In an earthquake, the antidote to that is rigidity to counteract seismic forces, wind forces, etc."

The stairs, the centerpiece of the house in terms of design and for circulation, had to be installed before other work could get done. "The whole side of the building was open because we had to get the steel frame in," Westbrook says.

First they had to figure out how to marry the marble to curve on top of the steel frame and how to resist external force over three stories. "Everything had to be accurate," Westbrook says. "Once you weld the steel it would change the dimensions."

In the CATIA model they could see problems, particularly in spots where the curved staircase had to be in perfect alignment with a window frame. "The windows were fixed, and we couldn't shift them," Westbrook says. "If we were off a little bit in calculations, we'd have to go all the way back down to the beginning to figure to the geometry. For stone nerds this was nirvana." They held "endless Zoom meetings" with the steel fabricator, contractor, 3-D modeler and often someone from Skurman and someone from Tucker & Marks. "Sometimes the steel people would have issues and say, 'We can't do that; it doesn't meet code. We can't weld it that way. We'll have to shift.'"

With the building open and time (and money) dwindling, they decided to go ahead and install the steel frame. To control the fine tolerances from fabrication all the way to final install they employed metrology, the science of measuring, and high-precision scanning technology, Westbrook says. It turns out that University of Bologna, Italy, has a metrology program

Each individual balustrade was carved in Italy, and each is unique. The steel rods had to be tightened down back and forth and up and down to pull everything into alignment to make sure the structure didn't drift. The entire process of the staircase element took nearly five months. Photo courtesy of QuarryHouse

A view from the house illustrates the central stone fountain, the carved bench and the double arc of symmetrical fountains surmounted by tazza urns and finials all silhouetted against a dark background of a dense Magnolia 'Little Gem' hedge.

and extremely accurate scanning devices. Several graduate students and their professor brought their technology to San Francisco and "went through the whole steel frame with a device that looks like a vacuum cleaner. We had a perfectly scanned model," Westbrook says.

With that information they could solve clashes on their CATIA model — where the install would meet the original 3-D model, where it got warped or would expand. "If we were off 1/8th of an inch we were in trouble. Using the clash model, we could tune it all the way up. Now we'd have the stones sitting in the 3-D world on a steel structure."

With CATIA they could move directly into production. "We didn't want anyone to draw this and get it wrong," Westbrook says.

WORKING ACROSS THE DIGITAL AND PHYSICAL WORLD

The stair rail is all languid twists and turns. It has very long pieces of marble as does the base beneath it. The fabrication work was done CITCO in Italy. To see the vein flow they'd need to follow, they set the stone block on a 6-axis CNC wire saw to make the initial turning cut. Then they put the piece on a CNC machine. To get all the angles they had to turn the stone during production. "The piece was bigger than the table we were working on. We had to create jigs to get the CNC to align so we could finish."

The pieces — rail, balustrades, stair treads — were scanned in Italy and then put into the computer model so they could see if anything was out of alignment. The metrology measured down to basically zero so they could easily see if it wasn't going to work. The stonework should match up with the steel frame.

In Italy, they created a mock-up on false frames and made sure that end to end they'd hit the mark. Then they numbered the 240 fabricated pieces, packaged them, and shipped them to QuarryHouse's factory in Richmond, California, where they were checked for damage before being sent on to San Francisco.

On the site, Westbrook's crew began assembling the string railing and base first. They built an overhead crane system and hung it from ceiling beams. The base, a solid piece of stone weighing about 750 pounds, was the first piece set. Site supervisors had a condensed version of the CATIA program on iPads so they could check the 3-D model as they built. They set up laser grids and a Leica scanner. With the 3-D model, they could find a point anyplace on the staircase and check it by laser to make sure they were in tolerance as they went up the staircase. Just building the staircase and railing from bottom to top took a five-person crew nearly two months. Then they began on the treads, risers, and trim work.

As Skurman says, "It was quite an amazing feat to get this stair built. Without computers and machines to create the pieces it would

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In the primary bathroom a Calacatta marble tub sits amidst the intarsia floor.

have been unbelievably difficult. It's a stair in a classical design that couldn't have been made to withstand the major seismic forces before the 21st century."

ALL OF A PIECE

Other parts of the house were done in the same methodical and exacting ways. Skurman says that they had to totally remove the existing facade because it wasn't structurally sound, but because the home is historical, they needed to "respect the exterior." They replaced it with integral colored steel-troweled plaster in a smooth finish. Skurman's goal was to make the house look old. The design makes sure the exterior and interior are "of a piece. If you visit, you'll see the house looks original because it looks as if it were done 100 years ago by the same architect inside and out," says Skurman who adds that everything had to be upgraded: the electrical, the HVAC, "even the drainpipes."

An old tennis court was removed and

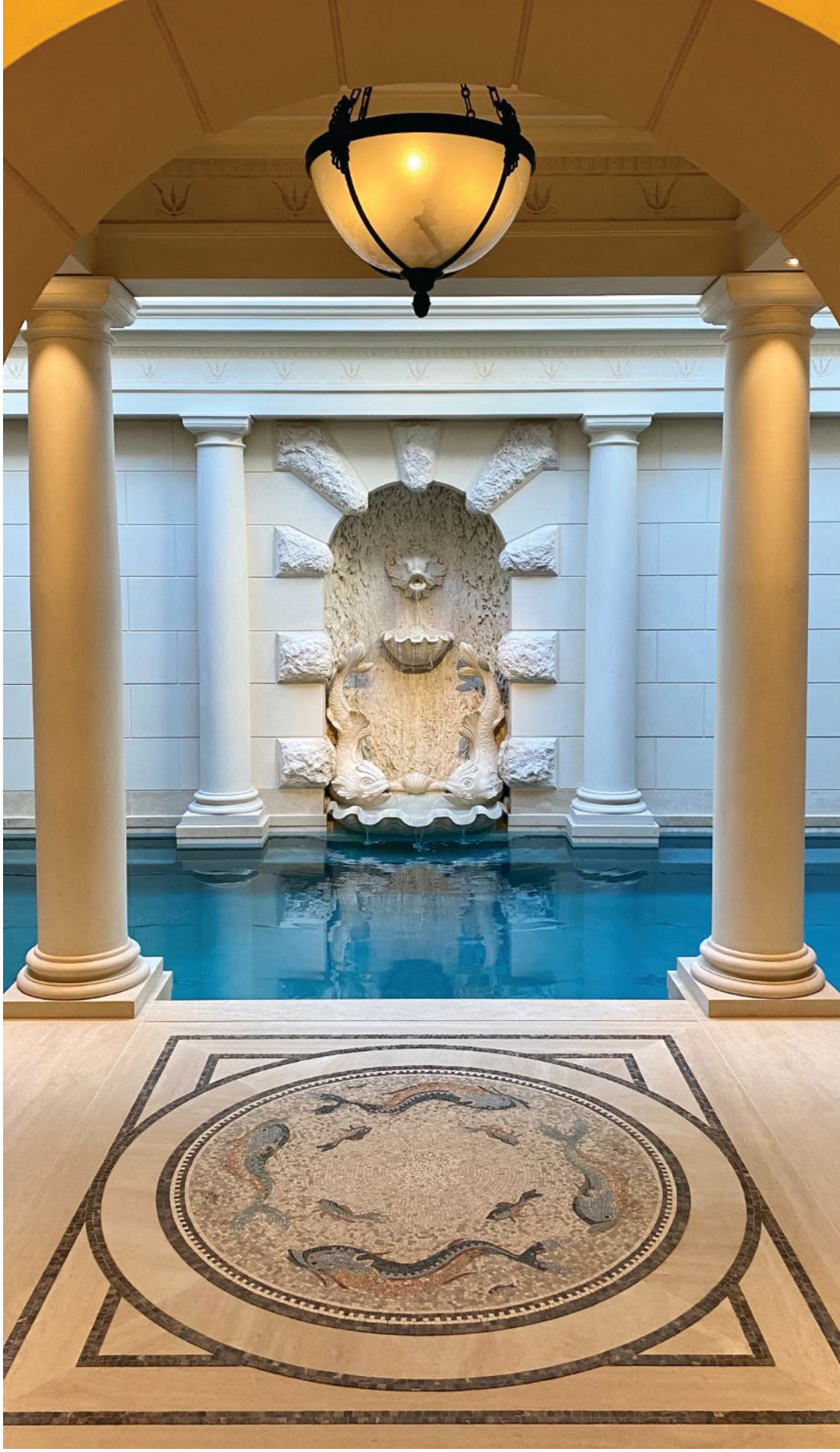
replaced by an Italianate Garden with carved fountains, sculptures, and urns in Thala marble, and paving, walls, and stairs done in Travertino Noce. The motor court is paved in Scala del Pesce cobblestone in golden granite. Inside, five existing fireplaces were replaced with antique or antique reproduction mantles. In the primary suite alone stonemasons carved two marble fireplaces, one in Breccia Pernice and the other in Breccia Onicata. There's more marble in that bedroom, dressing areas with Tea Rose and black Portoro, and intricately layered Calacatta Oro and Calacatta Toscano in the bathroom.

The underground pool was another formidable challenge. The general contractor, Level 10Construction, dug down one story below the area where the garden would be situated on a decklike structure. There's a grotto fountain, hand carved in Italy from one block of travertine. It's surrounded by marble paving. The QuarryHouse crew had to lift the grotto through what would be a skylight, and then using a specially built truss they slid it into place. "The engineering alone took us nearly two months," Westbrook says.

The project, which was originally scheduled for a four-year turnaround, took eight years to complete. It was finished just before the pandemic. As Westbrook says, "Every room has a story." ■

Pacific Heights Palazzo
San Francisco, California

Architect: Skurman Architects, San Francisco, CA
Interior Designer: Tucker & Marks Design, San Francisco, CA
Landscape Architect: Zeterre Landscape Architecture, San Francisco, CA
Mosaic Artist: Pippa Murray
Fabricators: CiTCO S.r.l, Verona, ITALY (Italian marbles); Atlantide Marmi, Verona, ITALY
Installer: QuarryHouse, Inc., San Anselmo, CA



One story below the main level, the underground pool features a grotto fountain hand-carved from one block of travertine.