Case Study

POLYCOR
NATURAL STONE

THE SUSTAINABLE ADVANTAGES OF INDIANA LIMESTONE

A CASE STUDY OF FREEDOM PLACE

It has always been my opinion that cathedrals, governmental, institutional, higher education buildings and museums should be statements, built to last the test of time. These iconic buildings should be built with products that are proven, natural and will stand the test of time.

Robert V. (Rob) Barnes III President, CEO of Dee Brown, Inc.

Design Architect: Craig Hamilton Architects, Ltd. United Kingdom WEBSITE
General Contractor: The Beck Group, Dallas, TX, USA WEBSITE
Stone Suppliers: Polycor, Bloomington, IN, USA WEBSITE
Primary Stone Fabricator: 3D Stone Inc., Bloomington, IN, USA WEBSITE
Stone Installer: Dee Brown, Inc., Richardson, TX, USA WEBSITE
Engineer: PICCO Group, Concord, ON, Canada WEBSITE

Material source: Polycor Quarries, Bloomington, IN, USA
Material: INDIANA LIMESTONE - FULL COLOR BLEND™
Applications: Facade panels, columns, sculpture, balusters, arches
Size: 78,000 ft^3
Additional Suppliers: Prosoco, SpecMix

THE PROJECT

"It has always been my opinion that cathedrals, governmental, institutional, higher education buildings and museums should be statements, built to last the test of time. These iconic buildings should be built with products that are proven, natural and will stand the test of time," says Rob Barnes, President and CEO of Dee Brown, Inc., whose company performed the stone installation on the Freedom Place project.

Freedom Place at Old Parkland is a significant architectural project in Dallas, Texas that has become one of the most sought-after destinations. The campus attracts top-tier tenants from private family investment firms to the esteemed presence of former President George W. Bush. The project's purpose was to design and build a 7-story structure, incorporating 8,310 pieces of stone, as an extension of the existing Jeffersonian-style buildings on the campus.

"The Jeffersonian architecture came into the project very early on in early discussions; we were pursuing that because it represented American architecture and it represented what Thomas Jefferson was all about when he designed buildings in his career. It's classical architecture that goes back to the Romans and the Greeks, if you will," said Mark A. Mathews, AIA, of the Beck Group.

It is a deliberate departure from modernist design that, instead, embraces neoclassical additions that seamlessly blend with the historic campus buildings, creating an environment that exudes timeless elegance and sophistication.

At 210 feet tall, the building is full of thoughtful detailing, complexity, and symbolism, utilizing only the highest quality materials, including natural stone. "To give you an idea of scale, The Parthenon in Greece is 45 ft tall," says Barnes.

A decision was made mid-way through the design process to switch the specification from cast stone to Indiana Limestone, which presented a unique opportunity for an added "green bonus" by using sustainable natural stone.

Dee Brown, Inc. was involved with the project for slightly over 2 years, but the 90-person crew was present on-site installing stone for 9 months, logging 135,000 hours. The shop drawing process took nearly 1 year to complete before the stone went into fabrication, due in part to the changes in the design as well as the structure and the detailing variances between the limestone and cast stone.

By collaborating closely with Polycor team members at the quarry, the project was completed in time for the 43rd president of the United States, George W. Bush, to be welcomed into the building.

THE MATERIALS

"I have a strong belief that buildings are supposed to stand the test of time," says Barnes. "They should be natural products and not manufactured. It gives you that awe-inspiring [look]."

"Anytime I can take something natural, I do just because I prefer it," Barnes said, who played a pivotal role in presenting a thorough comparison of natural versus cast stone to building owner Crow Holdings, who ultimately ended up opting for durable Indiana limestone over cast stone for the Freedom Place project.

Barnes highlighted the sustainability advantages of natural stone, emphasizing its quarrying and fabrication process, its density and less porous nature, as well as its resistance to crazing or spider veins that can occur with cast stone. He stressed that water infiltration in cast stone leads to longevity issues such as cracking and spalling, typically caused by corrosion of metal reinforcement materials, visible as rust stains, while natural stone offers a solid and historically proven performance.

Barnes explained that he asked his client, "How many times do you want to replace the material?" "You don't have to replace natural stone," he said. "It was an easy conversation with the owner."

The first building on the campus was built in 1894. "It was the first community hospital in the Dallas area, and it was originally built with Indiana limestone. So that started the conversation."

"When I saw the price points I knew that we could get closer with the stone," Barnes went on to say. "The owner didn't want the product to look manufactured."

Barnes explained that the building is a massive structure that would benefit from using quarried, natural stone with its scale. "When we took it from cast stone to natural stone, we could increase the size of the pieces. This project had almost 80,000 cubic feet of material. There was [sic] a lot of different technologies used here. Some were done on a CNC machine, some on lathes, and there was also handwork."

INDIANA LIMESTONE - FULL COLOR BLEND™

WHY INDIANA LIMESTONE?

The use of Indiana Limestone in Freedom Place showcases its versatility in architectural design. The limestone pieces were meticulously fabricated to fit the unique requirements of the building's design, including large cubic stones with cantilevered overhangs, cornices, and balusters. Its diverse mix of colors, ranging from silver to buff, adds natural beauty to the structure, emphasizing the variety that can be achieved using this sustainable material. This versatile material was employed not only for flat wall facade panels but also for bespoke elements like soffits, keystones, arches, sculptural carved elements, and columns, demonstrating its adaptability to various design features.

Unlike cast stone, Indiana Limestone is denser and less porous, providing increased durability and longevity. Its inherent strength and density ensure resistance to "crazing" or spider veins, a common issue in cast stone resulting from the curing process.

Considering that the first building on the campus was also built with the same Indiana limestone, using natural stone on the newest building would be a bookend-type approach to the project.

COST CONCERNS

"The natural stone materials — about a $6.75 million stone purchase — was only about $175,000 more than the cast product," Rob Barnes, President and CEO of Dee Brown, Inc., points out.

Contrary to common assumptions, the cost of natural stone can be competitive with cast stone depending on supply and demand dynamics. During the bidding process, natural stone's price was comparable to cast stone due to the high demand for the latter. The market dynamics further supported Barnes' argument, as the demand for cast stone at the time made the cost of natural stone highly competitive. Harlen Crow was receptive to the idea, recognizing the value of choosing a sound natural stone like Indiana limestone.

Moreover, natural stone's extended lifecycle reduces long-term maintenance and replacement costs, making it a financially savvy investment for structures intended to stand for a century or more. The decision to use Indiana Limestone showcases the long-term vision of the building owners, Harlen Crow and Crow Holdings, in constructing a landmark that honors the history of the campus.

"The perception of natural stone has been that it costs too much," said Ralph Morgan, Director of Environment and Sustainability at Polycor. "But when you actually get into it and start doing lifecycle analysis, it does not."

CONSTRUCTION CHALLENGES

Freedom Place is a massive structure: 8,310 pieces of variegated **INDIANA LIMESTONE - FULL COLOR BLEND™** were fabricated using sawn finish pieces ranging from 75 lbs. to over 13,000 lbs. The project consisted of 60,000 cubic feet of finished limestone material, quarried from Polycor's Certified Sustainable Indiana Limestone quarries, with an additional 180 hand-carved stones.

The transition to natural Indiana limestone from cast stone presented a unique challenge for the fabricators at 3D Stone and the engineers from PICCO Group. The concerns revolved around anchoring the new material to the structure, especially considering the potential for larger and heavier natural stone pieces that were not part of the original plan. With dimensional stone, larger pieces can be cut and fabricated from raw blocks resulting in fewer joints and an aesthetic improvement, for the final project.

A two-story tall 16' x 13' mockup was constructed in Indiana with 3D Stone, approximately the size of a bay. It included the base, column, window with returns, and the panels above it. The intent was to include as much detail as possible.

"One of the biggest set of challenges was just the scale of the pieces," said Dustin South, Project Manager at PICCO Engineering. "And we had to come up with fairly creative ways to help support and carry things off."

Switching from cast stone to Indiana Limestone necessitated a shift from traditional bidding to design-build, requiring increased stakeholder collaboration. Fabricators at 3D Stone, alongside their counterparts at Dee Brown, Inc. and PICCO Engineering, made adjustments to the anchoring details for the new material connections to the steel structure, leading to innovative solutions.

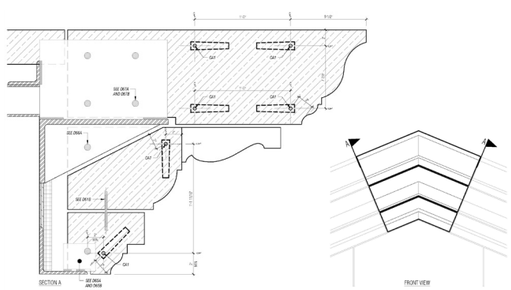
"We came up with fairly creative ways to help support and carry the load and effectively transfer it to the structure," said Dustin. "When we get involved early as a structural engineer, somebody who understands how to support the stone, we can advise on joint placement based on load bearing considerations of the stone."

All told, PICCO developed over 200 bespoke connection types for various unique elements like soffits, keystones, cornices, and columns. These connections, including dowels, pins, and stainless steel cramps and plates, had to withstand the weight of the stones, prevent them from separating from the structure, and resist wind and shear loads. A two-piece connection with a pin was the most typical anchor used for most of the flat facade panels.

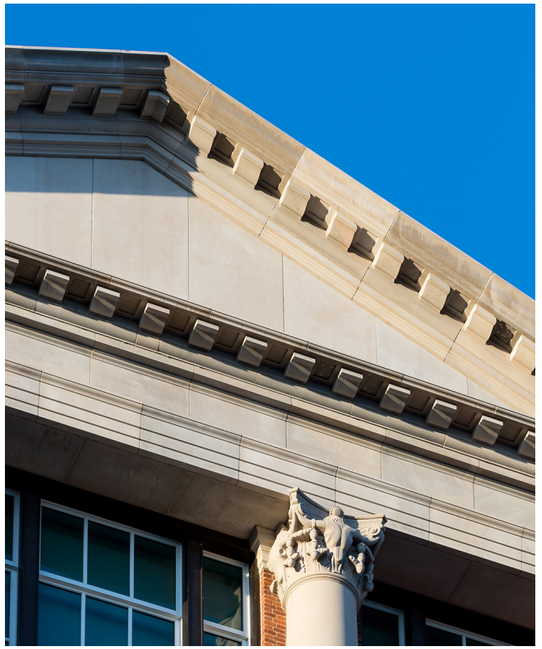
"Some of the cubic cornices were absolutely enormous," continued Matthew Innocente, Structural Engineer at PICCO Engineering, responsible for designing all the stone connections. "Just huge pieces of stone, and the problem was that, in some cases, there was no structural backup. It got complicated because there were large pieces of stone and a lot of weight that was trying to bring it into the structure somehow. And it worked."

The coordination between architects, engineers, fabricators, installers, and Polycor's quarry teams was vital in ensuring successful fabrication and installation. The use of CAD-CAM software, CNC equipment, and handwork allowed for the precise carving of detailed elements, such as the large-scale oxen crania, rosettes, and balconies, contributing to the project's overall aesthetics.

"Dee Brown, Inc.'s team understands the install and what they need and there is a reliance and trust on [sic] us in terms of making sure that everything worked together. So, I think we worked together as a good team, including 3D Stone," Dustin explains. "3D Stone produced their shop drawings first to work through the modulation and the aesthetics with an eye towards their fabrication, then we would get involved and develop our connections."



PICCO Group developed 205 pages of bespoke connection details. This section view shows one example of how the stone was anchored and braced with plates and pins to resist tipping out.



SUSTAINABILITY

By opting for Indiana Limestone, Freedom Place contributes to sustainable building practices, as it aligns with the vision of constructing enduring structures such as churches, institutions, and government buildings using low embodied carbon building materials. Natural stone, specifically Indiana Limestone from Polycor's NSI-373 Certified Sustainable quarries, offers various sustainability advantages.

By using Polycor's third-party verified environmental product declarations (EPDs) to estimate the embodied carbon of the facade application of the project, it was determined that using Indiana Limestone saved over 1,000 metric tons of CO_2 equivalent.

Converting the 78,000 cubic feet of equivalent concrete that would have been required to manufacture the precast concrete facade and comparing that to the natural stone panels used reduced the project's embodied carbon from 1,350 metric tons of CO_2 equivalent (for the concrete) to 350 metric tons of CO_2 equivalent (for the stone).

The calculations also took into consideration Polycor's extraction results for the original blocks (i.e., the processes involved in quarrying the rough blocks that the stone panels were cut from downstream in production at the factory), as well as the industry average data for the transformation processes of the blocks into the finished panels.

This represents an impressive 80% reduction in the carbon footprint for this particular aspect of the project.

With fewer manufacturing variables, natural stone has a longer history of proven performance, making it an ideal choice for structures built to last for generations.

As Ralph Morgan states, "There is no manufacturing in natural stone; there is only fabrication." Whereas other building materials are made from a mix of various ingredients, all originating from different sources and undergoing a wide range of processes like heating and burning (such as in the production of Portland cement and clinker), or include petrochemicals, natural stone comes ready-made and simply needs to be fabricated down to specific sizes from its original block.

Matthew Innocente, structural engineer at PICCO, goes on to say, "With concrete, you still have to quarry stone material for your aggregates, but you then take limestone and heat it up, turn it into cement, and then mix them back together to get something that looks somewhat like stone, as opposed to just quarrying the stone directly and putting it right on the building."

The ANSI/NSI 373 Natural Stone Sustainability Standard, to which many Polycor quarries hold certification, provides a comprehensive framework to ensure that natural stone production is conducted responsibly and sustainably. By meeting the requirements of this standard, Polycor demonstrates its commitment to environmental stewardship and social responsibility and helps to promote a more sustainable future for the natural stone industry.

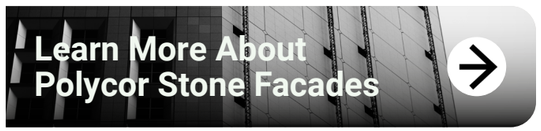
Beyond embodied carbon, Polycor only uses rainwater for stone extraction, recycles it, and uses dry sawing technology in a growing number of quarry operations. Natural stone lowers water use throughout its life cycle in quarrying, production, installation, and maintenance,. Polycor is the Natural Stone Sustainability Standard (ANSI 373) leader with 25% of our sites certified.

The carbon equivalency on cast stone versus Indiana limestone and the resulting savings.

		ft^3	Thickness	Sq. ft.	m^3	m^2	Industry-wide mt of CO_2e	Company-wide	VS Concrete	Industry-wide saving of mt of CO_2e		Company-wide saving of mt of CO_2e	
3651 - Old Parkland	6"	52,750	0.5	105,500	1,493.71	9,801.27	209.75	**135.06**	924.19	714.44	77% less	**789.13**	**85% less**
4027 - Parkland Tower	6"	24,354	0.5	48,708	689.63	4,525.12	96.84	**62.36**	426.69	329.85	77% less	**364.33**	**85% less**
4155 - Parkland Tower Basement	6"	1,046.5	0.5	2,093	29.63	194.45	4.16	**2.68**	18.33	14.17	77% less	**15.66**	**85% less**

ADDITIONAL INFORMATION

Originating at the Polycor quarries and through production, limestone facades are manufactured to various systems' specifications, from ultra-thin profiles up to full-thickness dimensional elements complimenting a wide range of façade structures. Limestone is an inherently non-emitting source of VOCs, and its durability allows it to perform impeccably in commercial & residential applications, interior or exterior



CONCLUSION

Freedom Place at Old Parkland stands as a testament to the sustainability advantages, cost debunking, long-term viability, and versatility of Indiana Limestone. By choosing this natural stone, the project showcases a commitment to creating enduring and environmentally responsible architecture. The collaboration among the team, the use of innovative technologies, and the dedication to preserving historical aesthetics have resulted in a stunning structure that will continue to inspire admiration for generations to come.

Freedom Place, with its facade of enduring and sustainable Indiana limestone, bridges the gap between the illustrious past and the promising future ahead for Old Parkland and symbolizes the commitment to building for generations to come.

Indiana Limestone Quarry, Bloomington, IN, USA
This quarry was certified under the Natural Stone Sustainability Standard (ANSI/NSC 373).

Photography: ©2019 Steve Hinds, Inc.

Photography: ©2019 Steve Hinds, Inc.

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Our natural stones are quarried and processed in the U.S., Canada, and France

carbon neutral 2025