Discover
the Freedom of Precast Concrete

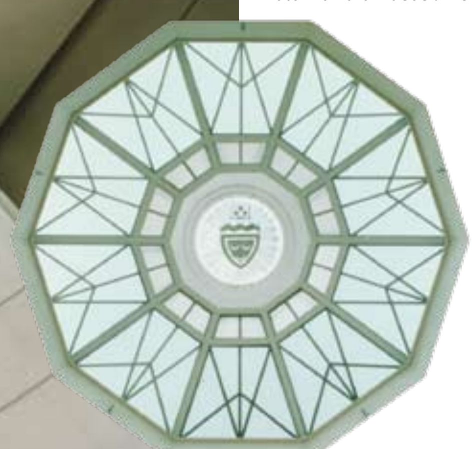
Precast/Prestressed Concrete Institute

Design
aspirations materialize through precast concrete

Design challenges and cutting-edge aesthetics — Precast concrete helps designers meet critical project demands for sustainability, accelerated schedules, life safety, security, storm resistance, long-term durability, and life-cycle economy.

Art and Science.
Design and Engineering.
Form and Function.

Walsh Library at Seton Hall University
South Orange, New Jersey
Architect: Skidmore, Owings & Merrill
Photo: Edward Hueber/Archphoto.com



WHAT IS PRECAST/PRESTRESSED CONCRETE?

Baha'i House of Worship, Wilmette, Illinois
Architect: Louis Bourgeois
Photo: Kelly Leader Photography

Precast concrete is a mixture of common earth elements. Cement, sand, mineral aggregates, and admixtures are combined with water to form concrete, which is then poured into forms in quality-controlled plant manufacturing environments. These forms are reinforced with reinforcing bar or laced with pretensioned, high-tensile-strength strands that behave like muscular sinews.

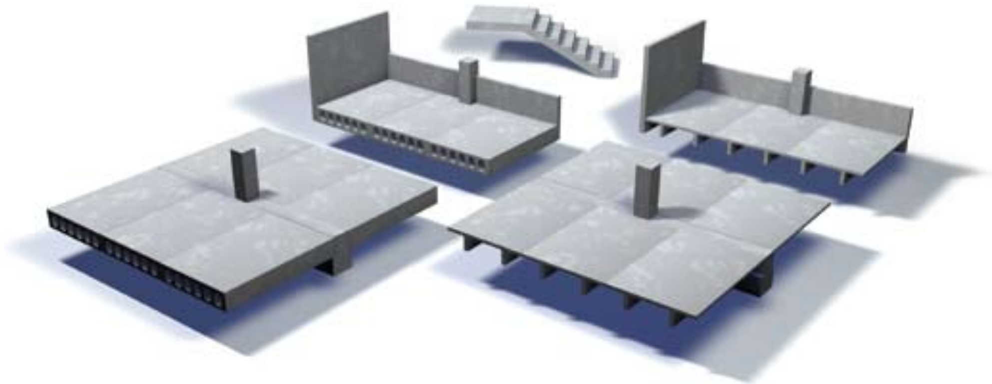
Prestressing stretches the embedded strands. Steel strands are pretensioned prior to placing the concrete in forms. After curing, the strands, now bonded with the concrete, are "detensioned," or cut, and reflectively seek to contract. This adds a compressive force that controls cracks and adds enormously to the materials' load-carrying capacity.

As a result, precast/prestressed concrete components are strong, durable, and highly flexible in their use.

Precast concrete was first tested and proven in Europe in the early 1900s. The elegant façade of the Baha'i House of Worship (shown here), which was built in 1910 in Wilmette, Illinois, showcases an early example of precast concrete construction in the United States. Significant use of prestressed concrete in the United States began in the 1950s. Since then, thousands upon thousands of precast and prestressed concrete buildings, bridges, and other structures have been built in North America.

Precast/prestressed concrete can be manufactured in many forms for many uses – from architectural "cladding" and structural components to total-precast concrete building systems; from flat wall panels (insulated, non-insulated, load-bearing or non-load bearing) to table-like "tees" or "double tees" and hollow-core planks; from columns, beams, spandrels, stair units, elevator cores, risers, and stadium seating systems to total modular units for homes, schools, correctional facilities and a variety of other structures.

The material continues to evolve. New admixtures, concrete mixes, fabrication techniques and product innovations continually expand precast concrete applications and benefits.



KEY COMPONENTS

WALL PANELS

Can include an interior (sandwiched) layer of insulation and can be loadbearing if desired. Wall panels can be solid or "punched" for windows and door openings. A variety of architectural textures and finishes are available.

SPANDREL PANELS

Generally span between columns or walls and are used with window systems on office buildings or on parking structures.

TEES

Named due to the extending "stems" perpendicular to the flat horizontal deck (looks like a "T" in section). Double tees are the most popular form and are used for parking structures and buildings where long, open spans are desired.

HOLLOW-CORE PLANKS

Long slabs in which voids run the length of the pieces, reducing weight without reducing the structural integrity.

STAIR UNITS

Can include elevator cores.

COLUMNS AND BEAMS

Commonly used as structural systems.

SEATING SYSTEMS

Include raker beams, risers, and seating units, universally used for stadiums, arenas, and theaters.

MODULAR UNITS

Outfitted at the plant, often with mechanical, plumbing, electrical, and glazing systems pre-installed, and delivered ready for installation. Typically are used for prison cells, school class-rooms, and similar repetitive applications.

Starz Encore Headquarters, Englewood, Colorado
Architect: Barber Architecture
Photo: David Cornwell Photography

Saint Clare's Hospital, Weston, Wisconsin; Architect: Hammel, Green & Abrahamson Inc. (HGA); Photo: Staley Studio

1. SPEED

Design. The repetitive nature of precast panels and components allows design work to move more quickly to the shop-drawing stage. Precast components can also aid a fast-track design by completing designs while other design work is still underway.

Construction. Precast components can be installed quickly, often cutting weeks or months from the schedule. This allows construction to get into the dry quicker and allows interior trades to begin work earlier.

Scheduling. Because precast components are fabricated under factory-controlled conditions at the plant, harsh winter weather does not impact the production schedule or product quality. This eliminates "cushions" added to the timetable to accommodate unforeseen schedule creep due to delays caused by weather or site requirements. Factory production also provides tight tolerances, minimizing the need for field adjustments.

Interior completion. Precast concrete insulated sandwich wall panels provide a finished interior wall that avoids the time and cost of furring and dry-walling while offering energy efficiency. Electrical conduit can be embedded in the panels. The entire wall assembly can be constructed with one trade, versus the six or seven for a typical wall assembly. Precast components can be erected in almost all weather conditions. Using hollow-core planking to combine ceiling and flooring units can speed construction even further.

2. DESIGN FLEXIBILITY

Architectural precast panels can make unique aesthetic statements or can mimic a wide range of finish materials. This capability ensures the building blends with nearby structures, whether contemporary or historic, or creates its own striking appearance while still meeting a tight budget. Inset thin-brick techniques can provide a masonry appearance while eliminating the multitude of joints and long scheduling required for brick. And stone cladding can be embedded in precast concrete for high performance, high-quality finishes.

3. CONTROLLED PRODUCTION

Casting components under controlled factory conditions provide a high level of quality. Designers exert more control over the structure's final appearance because they can view finish samples, as well as mockup panels, prior to full scale production.

4. CERTIFIED QUALITY

The manufacturing plants operated by members of the Precast/Prestressed Concrete Institute (PCI) meet a stringent quality-control program. Every plant undergoes two unannounced inspections each year to review their quality-control procedures and ensure that each product meets rigorous standards. More than 120 areas are inspected and tracked over time. PCI certification meets International Building Code (IBC) requirements and eliminates the need for special inspections.

key BENEFITS

5. SAFETY AND SECURITY

Fire safety. Precast concrete is a noncombustible material that can meet fire-code provisions without additional design techniques, coatings, or insulating material. It won't give off lethal smoke and maintains its structural integrity even when subjected to intense heat.

Storm resistance. Structures clad with precast concrete perform well against wind loads, thanks to the durability of the material and the strength of the connections. Precast walls have also been tested to deflect hurricane-force winds and windborne debris, protecting those inside.

Seismic needs. Precast concrete panelized systems can meet all seismic zone requirements. New connection techniques help re-right buildings after a seismic event and minimize structural damage.

Blast resistance. The dense mass of precast concrete components and the large panels used for cladding help meet federal requirements. It can also be used to create planters and other barricades at street level that are prescribed by governmental regulations.

Site safety. The off-site fabrication of precast concrete components enhances safety during construction. It provides a controlled fabrication environment and eliminates several trades from the site.

6. SUSTAINABILITY

Concrete is made of readily-available, common earth elements. Precast concrete can help projects earn as many as 27 to 28 points on the U.S. Green Building Council's (USGBC) Leadership in Energy & Environmental Design (LEED). The material contributes to standards for energy efficiency, reduction of heat islands, use of local materials, use of recycled products, minimal site disturbance, reduction of job waste, and more. Products can be recycled and sometimes even reused after their useful project life.

7. LAYOUT FLEXIBILITY

Precast hollow-core planks and double tees provide long, clear spans, opening interior spaces to allow designers to maximize functional layouts. Loadbearing precast concrete wall panels can reach heights of 55 feet, while double tees can span 80 feet or more.

8. LOW MAINTENANCE

Precast concrete panels require only periodic maintenance and inspection to maintain their reliability. The panels' fewer locations for moisture penetration prevent unsightly stains or damage to interiors.

9. ACOUSTICAL CONTROL

Precast concrete's mass and insulation create a quieter, less-disruptive environment, particularly in structures that use hollow-core slabs for flooring. Its mass and damping qualities also reduce vibration. Exterior sounds are kept out, which allows better interior sound transmission.

10. MOLD RESISTANCE

Because concrete is an inorganic material, it will not aid the growth of mold spores. Typical panel layouts provide fewer locations where moisture can penetrate, and these joints can be inspected and repaired quickly and easily if necessary.

Precast concrete components offer a range of advantages to the entire building team. Structures of all kinds can benefit from precast concrete's fast construction, aesthetic appeal, and economical fabrication, as well as its ability to meet today's stringent fire, seismic, storm-resistance, and other building code requirements.

Of course, each building type, and indeed, each individual building, has specific needs that create unique challenges. With its vast range of capabilities, precast concrete can help overcome these obstacles.

Rectory Building at the University of Monterrey, Monterrey, Nuevo Leon, Mexico; Architect: Bernardo Hinojosa Architects & Planners; Photo: Greg Wilson Group 2005

Building TYPES

COMMERCIAL & ENTERTAINMENT
Office & Corporate
Retail
Stadiums & Arenas
Parking Structures
Mixed-Use Buildings

INSTITUTIONAL AND PUBLIC
K-12 Schools & Higher Education
Justice & Correctional Facilities
Government & Public Buildings
Religious Architecture
Health Care Facilities
High Tech & Laboratory Facilities

HOUSING
Single Family Homes
Multifamily Buildings
Dormitories
Condominiums
Hotels /Motels
Retirement Housing
Assisted-Living Facilities

INDUSTRIAL
Warehouses & Distribution Centers
Manufacturing Facilities
Food Processing Plants

BRIDGES
Long-Span Bridges
Short-Span Bridges
Pedestrian & Bicycle Bridges

OTHER
Soundwalls
Water Tanks & Reservoirs
Air-Traffic Control Towers
Floating Piers
Terraces & Canopies

Precast concrete is a visually rich material that provides a flexible palette to obtain a multitude of design objectives. The inherent flexibility of the material allows components to be designed to match or contrast a building's surroundings or architectural context.

The Minneapolis Convention Center, Minneapolis, Minnesota; Architect: Setter, Leach & Lindstrom, Inc., The Leonard Parker & Associates, Loschky, Marquardt & Nesholm; Photos: Heinrich Photography

Aesthetic

COLOR

Design flexibility is possible in both color and texture of precast concrete by varying aggregate and matrix color, size of aggregates, finishing processes, and depth of exposure. Combining color with texture accentuates the natural beauty of aggregates.

The type and color of cement, water-cement ratios, qualities of the coloring agent, batching and mixing techniques, impurities in the aggregates and fine materials, and uniformity in the curing cycles — all impact the resulting color and color consistency.

TEXTURE

Working with their precast manufacturer, designers can specify a variety of aggregate colors and sizes, matrix colors, shape or form details, and surface finishes, as well as the depth of exposure of the aggregates, to achieve a wide variety of textures and meet numerous design objectives.

FINISH

A wide range of precast concrete surface finishes are available. The most common are listed here. In addition, two or more finishes can be readily achieved using the same concrete mix.

- Smooth or off-the-form finish
- Exposed-aggregate finish
- Form-liner patterns
- Sand or abrasive blasting
- Acid etching
- Tooling, spalling, or chipping, usually called bushhammering
- Hammered-rib or fractured-fin design
- Sand embedment
- Honing or polished finish
- Painting

FACING PRODUCTS

Clay products, such as ceramic tile, terra cotta, brick, and other facing products, can be cast integrally in precast concrete panels. The clay product can cover the entire exposed panel surface or only a portion, serving as an accent band or contrasting section. Granite, marble, glass, and ceramic mosaics also can be cast integrally or applied to the hardened concrete.

INTERIOR FINISHES

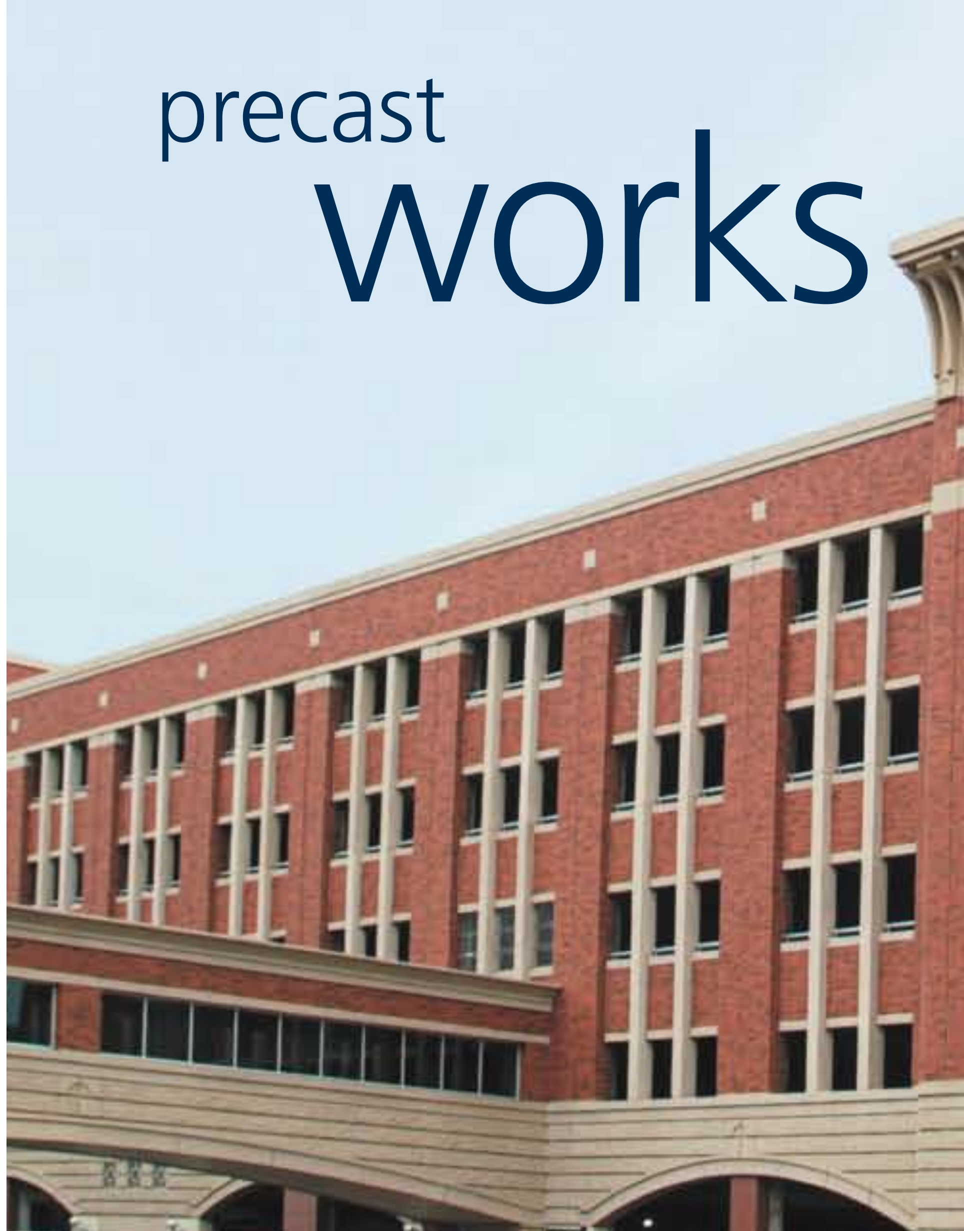
The interior side of architectural precast concrete panels can also be given an aesthetic finish, eliminating the need to provide an additional finished wall. This can save materials, time, and cost. It can also save energy over the life of the structure by making maximum use of the thermal mass of concrete. Finish options include screed, light broom, float, trowel, stippled, waterwashed, and retarded exposed-aggregate.

DESIGN POSSIBILITIES

Precast concrete construction has the flexibility to create virtually any design shape, curve, or form, thanks in part to such innovations as self-consolidating and ultra-high-performance concrete. Precast concrete is capable of articulating a myriad of design concepts and aspirations. The designer is free to deliver an uncompromised vision for commercial, residential, or specialized structures.

Versatility

precast works



MECHANICAL

Spaces within stemmed precast concrete members, or the voids in hollow-core slabs, can be used as distribution ducts for heating, air-conditioning, and exhaust systems. In stemmed members, three sides of the duct are provided by the bottom of the flange and the sides of the stems. The bottom of the duct is completed by attaching a metal panel to the tee stems.

The ducts can be connected in several ways, including powder-activated fasteners, cast-in inserts, or reglets. Field-installed devices generally offer the best economy and ensure placement in the exact location required. Inserts should be cast in only when they can be placed during the design stage of the job, well in advance of casting the precast members.

ELECTRICAL

For many applications, designers can take advantage of prestressed concrete's reflective qualities and appearance by leaving the columns, beams, and ceiling structure exposed. The lighting system should parallel the stems of tee members to achieve uniform lighting free from distracting shadows.

A high level of illumination can be achieved at minimal cost by using a reflective paint and proper spacing for high-output fluorescent lamps, which should be installed in a continuous strip. In special areas, lighting troffers can be enclosed with diffuser panels fastened to the bottom of the tee stems, providing a flush ceiling. By using reflective paints, the precast concrete lighting channels can be made as efficient as conventional fluorescent fixtures.

BUILDING PENETRATIONS

Architectural precast concrete wall panels can be adapted to combine with preassembled window or door units. Door or window frames, properly braced to prevent bowing during concrete placement, can be cast into the panels. Tight tolerances avoid time-consuming site measurements. The glazing or doors can be installed prior to or after delivery to the jobsite. If the glazing or doors are properly protected, they can also be cast into the panel at the plant.

MODULAR UNITS

A number of precast concrete manufacturers can create modular units that have mechanical, electrical, plumbing, and other systems installed prior to delivery to the site in a quality-controlled manufacturing environment, thus requiring only a final hookup after the unit is erected in its final location. This approach limits the amount of on-site labor that is required, saving time and adding safety.

with **other systems**

Working closely with the precast concrete manufacturer to satisfy all of the service requirements of a structure can ensure an economical solution for the designer and building owner.

Jefferson Street Parking Ramp, Wausau, Wisconsin; Architect: Mudrovich Architects; Photos: Precast Concrete Specialties, Inc

VAPOR BARRIERS

Concrete in general provides a relatively good vapor retarder, provided it remains crack free. Permeability is a function of the ratio of the concrete's water and cementitious materials. A low ratio, such as that used in most precast concrete members, results in concrete with low permeability. Where climatic conditions require insulation, a vapor retarder is generally necessary to prevent condensation. Closed-cell insulation will serve as its own vapor retarder.

Design SUPPORT

Precast concrete components can provide a number of advantages in the design and construction of a project. These benefits can be maximized when the design accommodates the material from the conceptual stages. Precast concrete manufacturers can provide critical support in a variety of areas.

INITIAL INPUT

The precast manufacturer's expertise at the conceptual stage can include input on key design factors:

- Mix durability and strength
- Panelization (sizes and layout)
- Bay sizes
- Repetition possibilities for reducing form materials and cost
- Efficient shipping sizes and configuration
- Seismic needs for joints
- Finish options
- Connection issues
- Scheduling, including production timing and sequencing of cranes
- Cost data, including assistance in creating a guaranteed maximum price

DESIGN ELEMENTS

Precasters can provide designers with valuable input on a number of key design elements beyond simply manufacturing the components:

- Structural considerations
- Code compliance
- Aesthetics
- Frame analysis
- Durability

CONSTRUCTION SUPPORT

The precast manufacturer can also help create an efficient construction process, providing input on:

- Site restrictions
- Scheduling
- Site logistics
- Owner requirements
- Project management

LONG-TERM CONSIDERATIONS

All buildings benefit from a long-term maintenance program that ensures the project retains its durability and aesthetic appeal throughout its service life. The precaster can help create a maintenance timetable that ensures the structure receives the appropriate attention.

840 N. Lake Shore Drive, Chicago, Illinois; Architect: Lucien Lagrange Architects; Photo: Steinkamp/Ballogg Photography

Innovations

As a fabricated material produced under closely controlled factory conditions, precast concrete can adapt its composition and capabilities. Architects, engineers, and precasters continue to push the boundaries of the material's applications and design parameters.

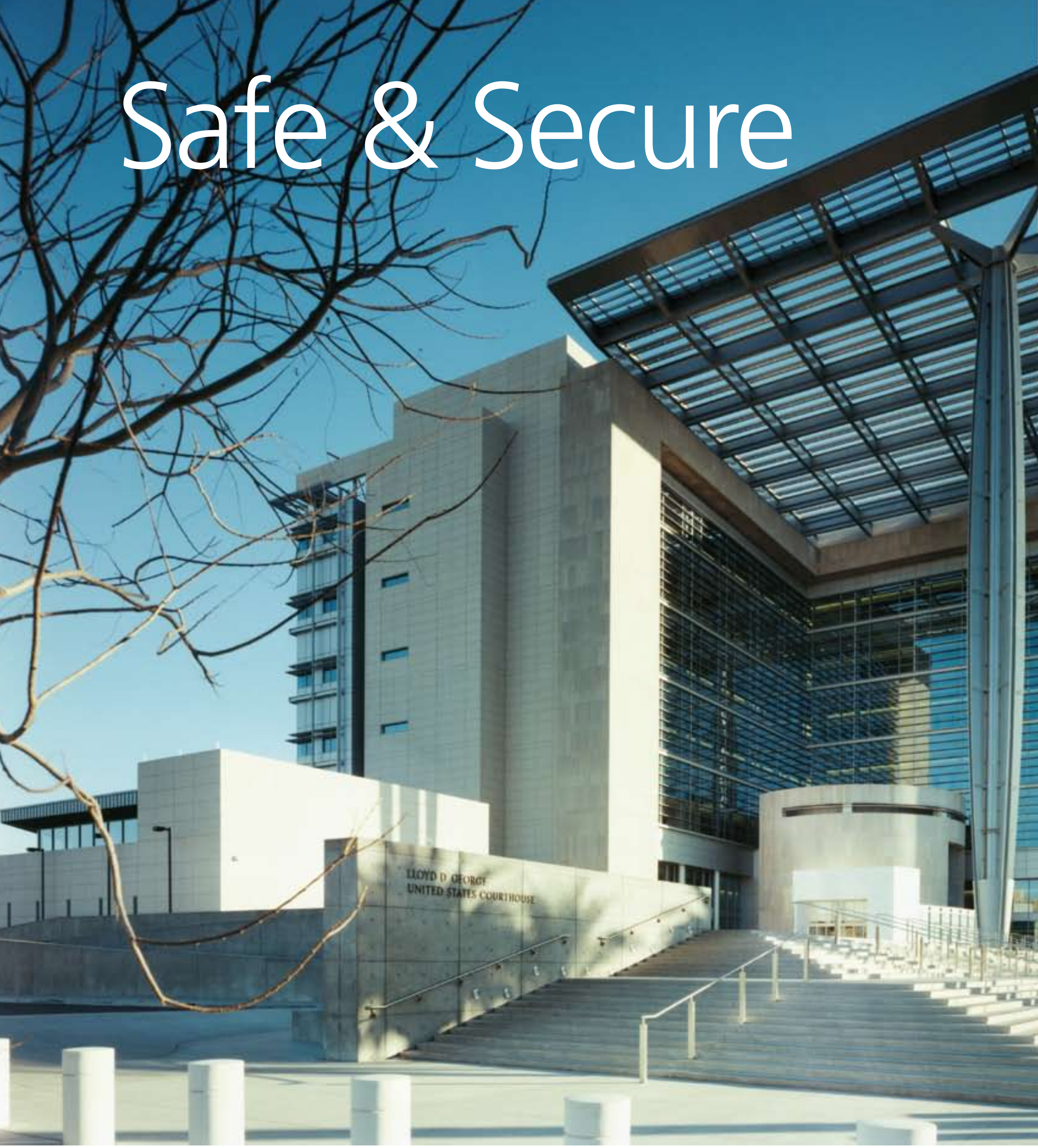
Self-Consolidating Concrete – a concrete mixture that incorporates high-range water-reducing admixtures that significantly increase the material's workability, fluidity, and stability. As a result, it flows quickly into place, fills every corner of a form, and surrounds densely packed reinforcement.

Ultra-High-Performance Concrete (UHPC) – a steel fiber-reinforced, reactive-powder concrete that provides a compression strength of 30,000 psi to reduce material costs and allow for longer spans.

Carbon-Reinforced Precast Concrete – a material that uses conventional steel for primary reinforcing and a resin-bonded, carbon-fiber grid for secondary reinforcing and shear transfer for thinner, lighter weight components and reduced risk of shrinkage cracks and corrosion.

Thin Brick – typically ½ inch thick, low moisture content brick is embedded in precast panels. These panels offer high performance with less material and higher quality control. The brick reduces efflorescence and combines with other finishes to offer a high degree of aesthetic flexibility.

Safe & Secure



Lloyd D. George Federal Courthouse, Las Vegas, Nevada;
Architect: Dworsky Associates;
Design Architect: Langdon Wilson, Architects;
Photo: Langdon Wilson, Architects

Whether fire, blast, earthquake, or high winds, precast and prestressed concrete construction provides a safe and secure structure for owners and building occupants.

FIRE RESISTANCE

Precast concrete provides noncombustible construction that can help contain a fire within minimal boundaries. As a separation wall, precast concrete panels help prevent flames from spreading throughout a building or jumping between structures. During wildfires, precast concrete walls help protect human life and occupants' possessions. Concrete that endures a fire can often be reused when the building is retrofitted. And insurance companies recognize the benfits of concrete structures and often lower premiums through the life of the structure.

When concrete does fail in a fire, it is generally by heat transmission long before structural failure, whereas other construction materials fail by structural failure. Precast concrete slabs or wall panels provide added endurance and expand when heated, so the joints tend to close during fire exposure.

The Importance of Passive Systems. Codes generally emphasize active systems that offer valuable protection, but they also include trade-offs. Passive systems based on compartmentalization offer more protection. They use noncombustible floors and walls, such as those made of precast concrete, to construct sections of the building as separate modules to confine fire to a specific area. Once incorporated into the building, these passive protectors will protect the building throughout its life.

BLAST RESISTANCE

Precast concrete components can aid designers in meeting protective design requirements for government and high-profile buildings.

Economically feasible designs for anti-terrorism/force protection (AT/FP) require an integrated approach that encompasses many aspects of the development, including the employment of active and passive security measures. Architectural precast concrete can be designed to mitigate the effects of a bomb blast and thereby satisfy General Services Administration and Department of Defense requirements.

EARTHQUAKE RESISTANCE

Precast concrete can be designed to resist seismic events, and new connection approaches now approved or in the process of being evaluated by code authorities are providing additional design options.

Precast components can span long distances between attachments to the main structure, even in seismic areas. Three new systems have been or are in the process of being codified: (1) a hybrid post-tensioned precast frame (codified in 1999), (2) a pre-tensioned precast frame, and (3) a shear-wall system (adopted for the 2003 edition of the National Earthquake Hazard Reduction Program Provisions).

WIND RESISTANCE

A variety of precast concrete components can be used to create hurricane- and tornado-resistant structures, including foundation walls, loadbearing or non-loadbearing precast concrete wall panels, and hollow-core plank for roofing and flooring.

With high durability, precast concrete construction also serves to resist surge damage. The use of precast concrete pilings can reduce the damage from water surging beneath a slab on grade.

SUSTAINABLE Design

Precast concrete components can contribute in an integrated design process toward achieving sustainable designs and in meeting standardized requirements for environmentally friendly designs in a number of ways. In fact, precast concrete construction can assist buildings achieve as many as 27 to 28 points in the LEED building-rating system from the USGBC.

Woodmont High School, Piedmont, South Carolina; Architect: Perkins & Will Design Architect, Craig Gaulden Davis, Architect of Record

- Precast concrete walls act as thermal storage to delay and reduce peak thermal loads and may help reduce the requirements of mechanical systems capacity.
- Precast concrete walls used with insulation provide energy benefits that exceed the benefits of mass or insulation used alone in most climates.
- Precast concrete sandwich wall panels used as an interior surface can save material by eliminating the need for framing and drywall.
- The raw materials used in precast concrete are generally local and the product is shipped locally, as well.
- Precast concrete walls can be designed to be disassembled for building-function changes, saving material and extending the service life of the panels.

- Precast concrete's durability creates a long life-cycle and low maintenance, which creates less need for replacement and maintenance during the building's life.
- As a plant-cast product manufactured under tight quality controls, precast concrete eliminates construction waste and minimizes transportation and disposal costs.
- Using plant-manufactured precast concrete components with just-in-time delivery reduces site disturbance and material lay-down requirements.
- Precast concrete contains recycled steel content and may contain recycled cementitous materials (fly ash or silica fume).

Mold and a lack of fresh air within a structure can cause considerable damage to a structure. Controlling these elements has become very important. The proper design of building envelopes with the correct construction materials is a key way to reduce the presence and potential damage from mold.

Photo: Craig Gaulden Davis Architects/Photographer – Working Pictures.

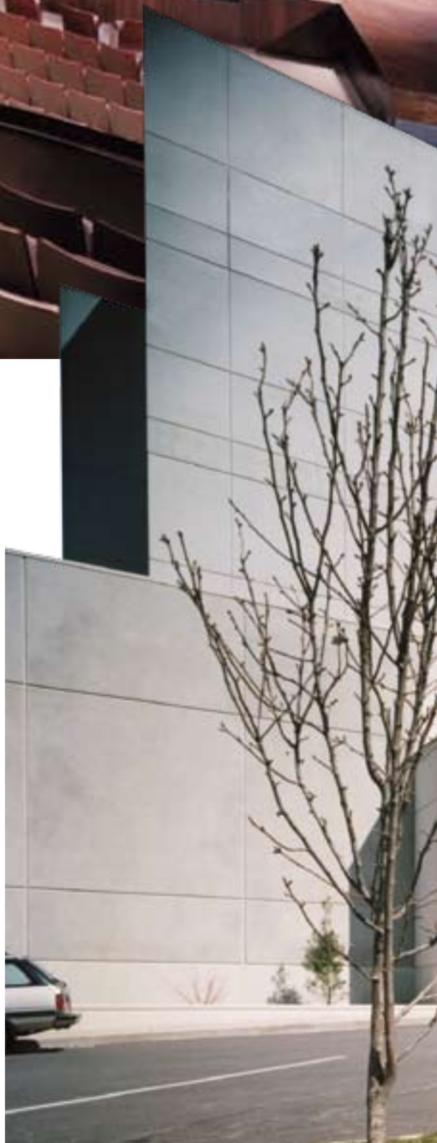
Inorganic Material:
Durable precast concrete is inorganic and it can be cleaned of dirt and debris (which could breed mold) by pressure washing. This can be done in place, making it unnecessary to remove the piece for remediation.

Controlled Production:
Precast concrete is produced in a controlled and protected environment in a process that resists moisture intrusion. Precast concrete is made of 5,000+ psi concrete and is impermeable to moisture migration. By delivering the components to the site as needed, they are exposed to the environment for a shorter period of time.

Quicker Close-in:
The construction speed of precast concrete allows the structure to be completed faster, leaving it exposed to humidity and moisture for a shorter time period. This is particularly vital for the installation of the heating, ventilation, and air-conditioning (HVAC) system, which is one of the more common entrance paths for mold formation.

Fewer Entry Points:
Because of its panelized construction, fewer points of potential moisture penetration exist with precast concrete panels. Maintenance needs are also minimal.

Photo: Metromont Corp.



Acoustics

Precast concrete walls, floors and roofs, have a very high sound transmission class (STC) rating and usually do not need additional treatment to provide adequate sound insulation. A dense, nonporous concrete surface typically absorbs only 1 to 2 percent of incidental sound.

The Bottom Line

INITIAL COSTS

Precast concrete components provide a variety of savings to a project in ways that are not always considered when looking at upfront costing versus other materials. These savings include:

- Speed in the design, fabrication, erection, and finishing processes;
- Design economy through repetition, maximizing piece size and shape and other approaches that limit form requirements;
- Flexibility of design that offers inherent aesthetic qualities, as well as the ability to mimic the appearance of materials such as granite, marble, limestone, sandstone, or slate;
- Material reduction by designing integrated structural components with architectural finishes and by using hollow-core slabs as combined ceiling/flooring units;
- Construction efficiency, due to the precaster's ability to cast and erect throughout the year; and
- Elimination of hidden costs, by reducing the time to carry financial bonds, lowering contractor overhead costs and risks, eliminating the expense of nonprecast-related equipment, and reducing subcontractor costs.

MAINTENANCE COSTS

Precast concrete components, even those exposed to weather, require little maintenance. A regular inspection and routine recaulking of cladding panels is all that is typically required. Panels can be washed with strong chemicals and cleaners without losing their color, and UV rays will not cause them to fade, as will happen with paint and other building materials.

PCI-Certified plants offer a controlled environment that can produce durable concrete mixtures with specialty curing that cannot be achieved in the field. However, without proper maintenance, any structure's life will be compromised.

LIFE-CYCLE COSTS

Precast concrete's energy efficiency and durability reduce future building operation and maintenance costs. In addition, precast concrete reduces long-term environmental costs.

Precast concrete receives favorable results in both life-cycle assessments (which track a product from harvesting and extracting of raw materials through processing, use, and ultimately recycling or disposal) and in life-cycle inventories (which track all the environmental flows to and from a product, including materials and energy needed to make the products and the emissions associated with making and using the product).

The environmental and economic impact of precast concrete in the context of its end use is minimal compared with the impacts associated with the operation of a building, such as heating, ventilating, cooling, and lighting. In a precast concrete plant, concrete-construction formwork is reused a number of times and is generally recycled at the end of its useful life.

Moreover, the embodied energy of a concrete mixture increases in direct proportion to its cement content. Replacing cement with supplementary cementitious materials, such as slag cement or silica fume, can effectively lower the embodied energy of the concrete.

The Juanita K. Hammons Hall for the Performing Arts, Springfield, Missouri; Architect: Pellham-Phillips-Hagerman and Butler, Rosenbury & Partners (joint venture); Photos: Pellham-Phillips-Hagerman

Quality is Certified

From raw materials to installed building components, the Precast/Prestressed Concrete Institute (PCI) qualifies the process of manufacturing and erecting precast/prestressed concrete components. Certification of the people, products, and performance assures owners, architects, engineers, and contractors that quality is achieved throughout the design, production, and erection phases. PCI certifies the supply chain in three ways:

PRODUCTS

Since 1967, PCI's Plant Certification program has ensured that each plant has developed and documented an in-depth, in-house quality system based on time-tested national industry standards. Each plant is inspected twice per year by independent auditors, who inspect the company for each product being manufactured. All PCI Producer Members are required to maintain PCI Certification for their plants.

PEOPLE

PCI offers Plant Quality Personnel Certification and Field Auditor Certification to ensure high levels of quality control.

PERFORMANCE

The Field Qualification and Certification programs extend PCI's quality performance standards throughout the construction process, ensuring that the appearance and performance of the finished product match the designer's intent.

LEARN MORE

To find out more about using PCI-Certified precast and prestressed concrete in your next project, go to ***www.pci.org***. For local support, go to ***www.pci.org/about/regional*** for a listing of regional organizations. They can supply your firm with a wealth of informational resources.

One such resource is the *Designing with Precast & Prestressed Concrete* binder. This highly visual and heavily referenced guide provides ideas and techniques for using precast and prestressed concrete in projects and structures of all kinds. Contact your local PCI-Certified producer, Regional Director, or go to ***www.pci.org/dwp*** to learn more and to request a copy.

PCI
Precast/Prestressed Concrete Institute

209 W. Jackson Boulevard Suite 500
Chicago, IL 60606
Phone: 312-786-0300
www.pci.org

Aurora Municipal Center,
Aurora, Colorado
Architect: Barber Architecture
Photo: Barber Architecture