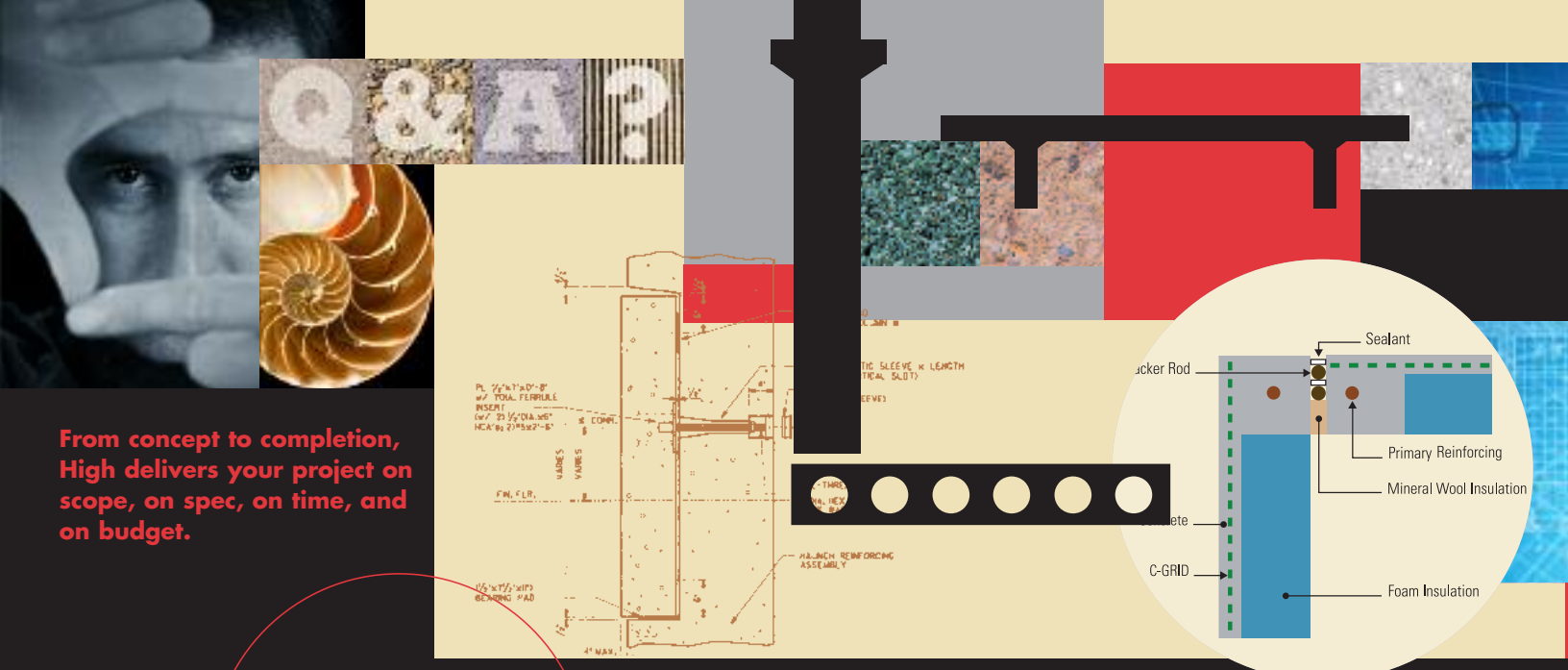


HIGH PRECAST ARCHITECTURAL FACADE SYSTEMS



CONCRETE INNOVATIONS & ANSWERS®

 **HIGH** CONCRETE
GROUP LLC
An Affiliate of High Industries Inc.



From concept to completion, High delivers your project on scope, on spec, on time, and on budget.

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High Precast Facade Panels realize any design treatment, from ultra-modern to historically accurate.

Architectural Facade Systems from High Concrete

Architects have chosen precast concrete architectural facades for almost half a century because they offer exceptional aesthetic and structural versatility, speed of enclosure, and durability. No other material combines the range of shapes, colors, and textures, fire-resistance, acoustical insulation, weather tightness, long-term durability, low maintenance, and rapid, IAQ-friendly enclosure. Now, the newest innovation in precast—CarbonCast®—enables precast facades to be lighter, better insulating, and more durable. Using C-GRID® carbon fiber grid in lieu of steel mesh, CarbonCast makes precast ideal for cladding or enclosing lightweight steel-framed structures, high-rises, and buildings in poor soil or high-seismic zones.

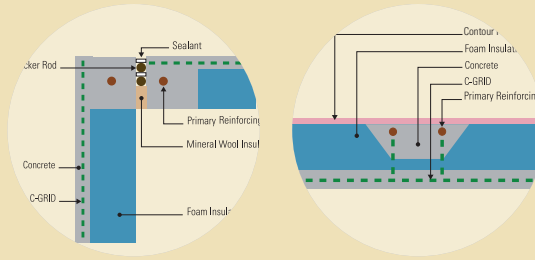
When it comes to architectural cladding panels, High Concrete is the clear first choice. As the nation's leading producer of architectural facades and parking structures, High Concrete gives you our undivided attention to the details that make the difference in the successful fulfillment of your design. It's our attention to detail at every step that has won us, and the customers we serve, numerous awards from PCI, ACI, and AIA. Since 1957 we've provided precast products for more than 5,000 buildings. High Concrete is ranked in the top 50 of ENR's "600 Top Specialty Contractors."*

From conception to completion, High Concrete will provide extensive design and specification assistance, connection detailing, construction scheduling and erection planning, samples, mock-ups, assembly testing, field erection finishing, and caulking as well as other services to ensure a hassle-free, high-quality installation. **That's the High Advantage.**

**Engineering News-Record, 2006*

DETAIL GALLERY:

Get an inside view of High Precast Architectural Facade Systems. Refer to the Gallery on pages 22-27. More technical information, guide specifications, and details, including CAD drawing files, are available at: www.highconcrete.com.



HIGH PERFORMANCE, HIGH QUALITY = PEACE OF MIND

High Concrete's architectural facade systems consist of a variety of structural and non-structural panels, columns covers, infill, and re-cladding panels. Use these systems to achieve exceptionally beautiful, weather-tight, durable, and low-maintenance facades on all-precast, steel frame, or cast-in-place structures.

Precast facade systems work seamlessly with a wide range of other building materials, enabling easy incorporation of brick, tile, stone, and glazing systems into a single, elegant, expressive facade that will stand the test of time.

Non-structural facade systems—including lightweight, thermally efficient CarbonCast® carbon fiber reinforced panels—can be engineered to meet the requirements of any project and can help contribute up to 21 credits toward LEED® certification.

High Concrete's innovative precast facade systems provide concrete answers to your design objectives.



Next-Generation Precast: Carbon Fiber Reinforced Precast

Ultra-light, ultra-insulating CarbonCast panels offer all the benefits of precast and more. CarbonCast carbon fiber reinforcement takes the place of mild steel, reducing the weight of architectural facade systems by 50 percent or more. Higher in strength and thermally non-conductive, the patented C-GRID® mesh provides improved durability and permits insulation values up to steady-state R-13.

Because carbon fiber won't rust, CarbonCast panels only need thicker concrete cover to accommodate reveals or other surface treatments. Much of the panel thickness is filled instead with foam insulation. A CarbonCast panel with 1" of foam factory- or field-laminated on the back side can deliver a wall assembly that substantially exceeds the minimum R-value for continuous insulation as defined by ASHRAE 90.1. In addition, the assembly will serve as a non-permeable vapor retarder as defined by IBC 2003. Air leakage concerns are virtually eliminated because the temperature in the wall cavity behind the drywall will be nearly the same as the temperature in the room.

Thermally-efficient CarbonCast panels contain insulating foam that provides R-values of 13 to 30. This energy-efficient treatment can lower energy costs and contribute to LEED certification.

Compare the advantages of CarbonCast architectural facade systems over other wall assemblies:

Lighter in weight by 50 percent or more

- Reduced structural costs
- Reduced foundation costs
- Reduced shipping and erection costs
- Ideal for high-rises and re-cladding

Improved durability

- Superior resistance to the effects of the environment
- Termite-resistant insulation

Sustainable design

- Low environmental impact
- Contribution toward LEED certification

For more information about the CarbonCast line of products, visit www.altusprecast.com.





High precast = peace of mind...with expert design assistance, rapid installation, early project completion, and longer long-term durability.

Designing with High Architectural Facade Systems takes the guesswork out of a project, delivering peace of mind unmatched by other building materials. High Concrete's expert design assistance sees you through from concept to completion, assuring rapid installation, early project delivery and occupancy, and longer long-term durability. High Concrete is your best resource for the Concrete Innovations & Answers® that will deliver your project on scope, on spec, on time, and on budget.

An appropriate choice for high profile projects, a High Concrete architectural facade captures the essence of your design theme. The panels are engineered to the specific requirements of your project. Many options are available for finishing cast-in-place and steel frame structures, including parking garages.

Outstanding Performance

- **Safe** Inherently superior fire resistance
- **Secure** Excellent security and impact/blast resistance and great structural strength and durability
- **Environmentally Friendly** Panels can be made from locally-sourced materials in low-waste processes; some forms and components are made using recycled materials; concrete is recyclable; panels are durable and can be reused if a building is expanded; CarbonCast insulated panels have low embedded energy, use less energy for transportation and erection, reduce other material usage, and have high thermal efficiency
- **Quiet** Outstanding acoustic insulation and isolation
- **Watertight** Weather-tight, face-sealed curtainwall enclosures with large impermeable components have fewer joints to maintain than other curtainwall systems

- **Durable and Economical** Superior resistance to abuses of man and nature such as impact and soil, mold, and mildew results in low maintenance and life cycle costs

Superior Quality

- **Consistent Results** Computerized batching and enclosed PCI-certified factory fabrication, under controlled conditions that exceed the Precast Concrete Institute's Plant Certification requirements
 - Superior to on-site cast-in-place or tilt-up construction and conventional outdoor precast operations
- **Surface Integrity and Imperviousness**
 - Factory-controlled batching and immediate placement of concrete enables mixes with low water/cement ratios to yield higher strength mixes—averaging 7,000 psi or more—virtually impermeable to moisture and will endure for years to come
 - Precisely controlled air entrainment also results in minimal expansion and contraction and reduced cracking and surface scaling for an enduring finish



High's Precast Architectural Facade Systems can be used for every building type.

Multi-Unit Residential



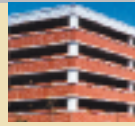
Industrial



Correctional



Civic and Institutional



Parking



Educational



Commercial



VERSATILITY AS INFINITE AS YOUR IMAGINATION

High Concrete's Precast Architectural Facade Systems offer a broad array of durable, aesthetic, insulating, and weather-tight options that deliver the value, quality, and performance you need. The form, color, and textural flexibility of precast concrete permit an expressiveness not achieved with any other single material. Even your most imaginative designs can be effectively realized through High Concrete's standard or custom solutions and carefully controlled factory production techniques. Also suitable for interior cladding of large public areas, gymnasiums and natatoriums, schools, dorms, and manufacturing and warehouse facilities, our facade systems can create a variety of visual effects, ranging from the subtle to the dramatic.

The Right Panel for the Job

There's a High cladding panel that's right for every job. All come in a wide variety of shapes, colors, textures, and finishes.



Non-Structural Facades

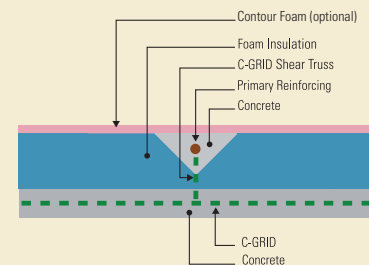
- 1. Architectural Precast Panels.** Solid, steel mesh reinforced precast panels of varying thicknesses (i.e., 4"-12", or more).
- 2. CarbonCast® Architectural Wall Panels.** Composite concrete and foam, C-GRID® mesh reinforced single-faced precast panels of varying thicknesses (i.e., 7"-12", or more).
- 3. Carbon Cast Thermally-Efficient Architectural Panels.** Precast cladding; composite concrete and insulating foam with steady-state R-value of 13 to 30. C-GRID mesh reinforced single-faced precast panels of varying thicknesses (i.e. 6"-12" or more).
- 4. CarbonCast Thermally-Efficient Hardwall Panels.** Lightweight precast spandrels, composite concrete and insulating foam with steady-state R-value of 13 to 30. C-GRID mesh-reinforced thin panels (i.e. 5"-7") installed horizontally and stacked to heights of 30'. May be placed with the same crane used to erect light steel buildings.
- 5. CarbonCast Thermally-Efficient Wall Panels.** Non-load-bearing; composite precast concrete and foam C-GRID mesh reinforced precast sandwich panels of varying thicknesses (i.e., 8"-12"). Can be stacked for low- and mid-rise applications.
- 6. CarbonCast Architectural & Veneer Panels.** Thin, solid C-GRID reinforced precast panels of varying thicknesses (i.e. 1½"-4").

Structural Facades

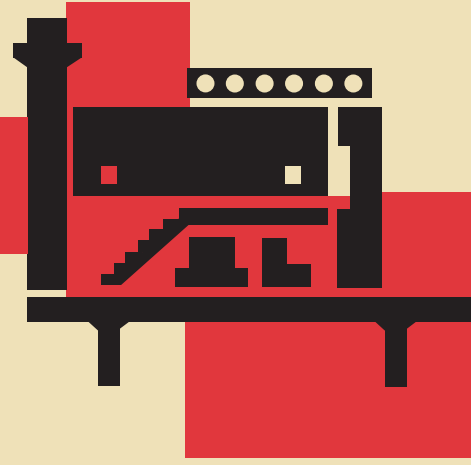
- 1. Precast Wall Panels.** Solid, steel mesh reinforced precast panels of varying thicknesses (i.e., 6"-12", or more.)
- 2. CarbonCast High Performance Wall Panels** Load-bearing; composite precast concrete and foam C-GRID mesh reinforced precast sandwich panels of varying thicknesses (i.e., 8"-12"). Can be stacked for low- and mid-rise applications

Precast is for Recladding, Too

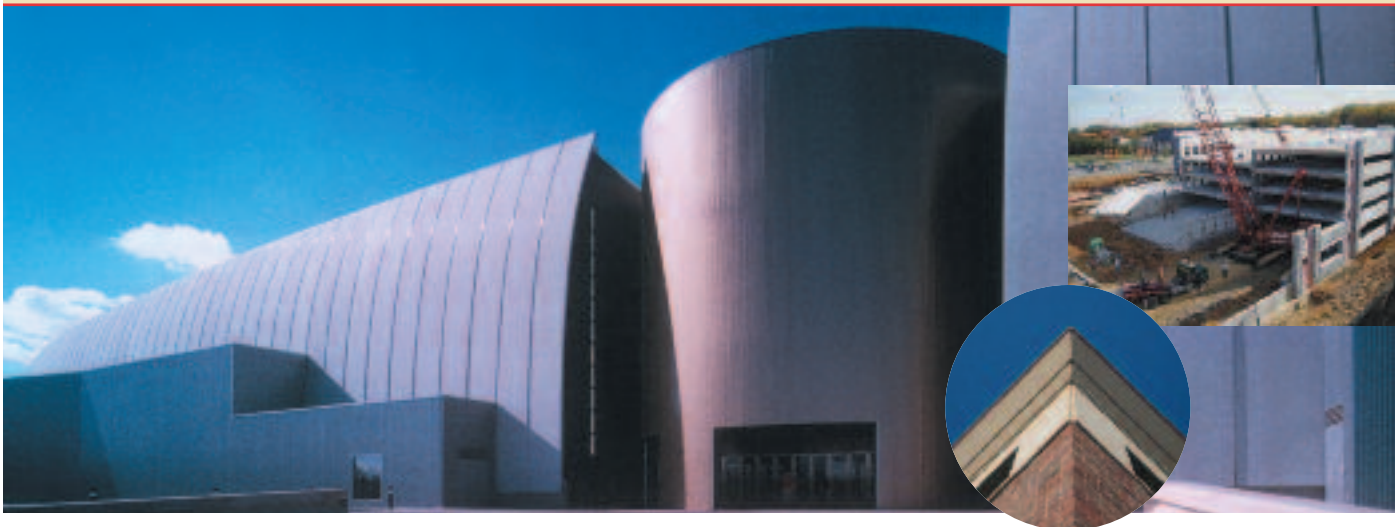
Precast panels, and especially lightweight or insulating CarbonCast panels, can be an excellent choice for recladding buildings where lightweight or stone veneer curtainwall systems have failed or aged beyond repair. Precast panels can be made with thin brick veneers, stucco, tile, or stone-like finishes with an unparalleled variety of surface patterns and in a nearly limitless variety of shapes so that the original design intent can be preserved.



Precast facade systems work seamlessly with a wide range of building materials and any precast structure can be built from the same basic “kit of parts.”



Precast Building Selector—Recommended Applications								
Building Type or End Use	Non-Structural Facades						Structural Facades	
	Precast Architectural Panels	CarbonCast Architectural Panels	CarbonCast Thermally-Efficient Architectural Panels	CarbonCast Thermally-Efficient Hardwall Panels	CarbonCast Thermally-Efficient Wall Panels	CarbonCast Architectural & Veneer Panels	Precast Wall Panels	CarbonCast High Performance Wall Panels
Low-Rise	■	■	■	■	■	■	■	■
Mid-Rise	■	■	■		■	■	■	■
High-Rise		■	■			■		
Apartments/Condos	■	■	■					
Retail				■	■		■	■
Hotels	■	■	■		■		■	■
Offices	■	■	■	■	■	■	■	■
Healthcare	■	■	■		■	■	■	■
Schools			■	■	■		■	■
Dormitories			■		■		■	■
Laboratories	■	■	■	■	■	■	■	■
Libraries	■	■	■		■	■	■	■
Cultural	■	■	■		■	■	■	■
Judicial	■	■	■		■	■	■	■
Public Safety	■		■		■		■	■
Sports Facilities	■	■	■	■	■	■	■	■
Parking Garages	■				■		■	■
Manufacturing	■	■	■	■	■	■	■	■
Warehouses				■	■		■	■





- Architectural facades can be**
- Insulated to meet the requirements of any project
 - Designed for flush curtainwall installations
 - Detailed with integral shading devices or deep window recesses
 - Either dark or light colors as needed to aid in solar control.

Precast Panel Type Selector—Recommended Applications

Panel Type or End Use	Non-Structural Facades						Structural Facades	
	Precast Architectural Panels	CarbonCast Architectural Panels	CarbonCast Thermally-Efficient Architectural Panels	CarbonCast Thermally-Efficient Hardwall Panels	CarbonCast Thermally-Efficient Wall Panels	CarbonCast Architectural & Veneer Panels	Precast Wall Panels	CarbonCast High Performance Wall Panels
Maximum Story Height	Unlimited	Unlimited	Unlimited	4	10	Unlimited	10	10
Light Steel Frame Recladding		■		■		■		
High Seismic Zones		■	■	■	■	■	■	■
Poor Soils		■	■	■	■	■	■	■
Salt-Laden Air		■	■	■**	■*	■		■*
Pre-Insulated Walls			■	■	■	■		■
Pre-Finished Interior Walls			■	■	■			■
Spandrel Panels (parking garages)	■							■
Vertical Panels	■	■	■		■	■	■	■
Column Covers	■		■			■		
Cornices	■	■	■			■		
Screen Walls	■					■		
Thick Panels (6"-12")		■	■	■	■		■	■
Thin Panels (1-1/2"-4")	■					■		
Curved Panels	■	■				■		
Irregular Shapes	■	■	■		■	■	■	■
Reveals	■	■	■	■	■	■	■	■
Projections and Trim	■	■	■		■	■	■	■
Brick Veneers	■	■	■	■	■	■	■	■
Size	<14' w x 55' l	<14' w x 40' l	<14' w x 40' l	<8' w x 40' l	<14' w x 40' l	<12' w x 12' l	<14' w x 40' l	<14' w x 40' l
Weight (psf)	60-180	25-75	55-75	65-95	65-85	15-20	75-100	65-85
Fire Rating	2-4 hrs	0-2 hrs**	1-2 hrs**	2 hrs	2-3 hrs	1-2 hrs**	2-3 hrs	2-3 hrs
R-Value Steady State	NA	Up to R8	R6-R11	13-30	13-30	0-8	NA	13-30
Carries Glazing Loads	Y	Y	Y	Y	Y	N	Y	Y
Carries Structure Loads	N	N	N	N	Y	N	Y	Y
Maximum Wind Load (lbs/sq ft)	150	150	150	150	150	150	150	150
Tower Crane		■	■	■		■		■
Long Crane Reach		■	■	■		■		■
Installed Cost	\$\$\$	\$\$\$	\$\$\$-\$\$\$\$	\$\$	\$\$-\$\$\$\$	\$-\$\$	\$-\$\$\$	\$\$-\$\$\$\$
LEED Certification		■	■	■	■	■	■	■

*If outside wythe is reinforced with C-GRID

**When used as part of an assembly

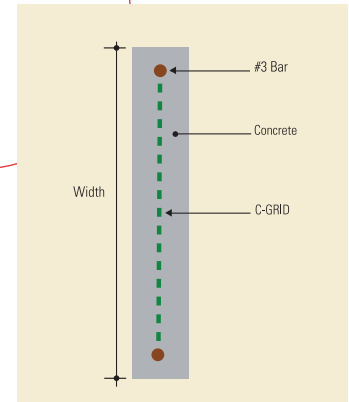
Dynamic solutions are possible with High's expert technical assistance in all phases of a project, from design to erection.



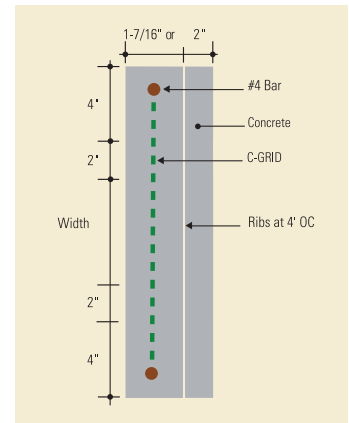
Solid Flat Panel Thicknesses—Precast Architectural and Wall Panels								
		Length (ft)						
		10'	15'	20'	25'	30'	35'	>35'
Width (ft)	4'-0"	4"	4"	5"	6"	6"	6"	8"
	6'-0"	4"	5"	5"	6"	6"	6"	8"
	8'-0"	5"	5"	6"	6"	6"	6"	8"
	10'-0"	5"	6"	6"	6"	6"	6"	8"
	12'-0"	6"	6"	6"	6"	6"	6"	8"

CarbonCast® Flat Panel Thickness—Precast Architectural and Wall Panels								
		Length (ft)						
		10'	15'	20'	25'	30'	35'	>35'
Width (ft)	4'-0"	See Small Panel Thicknesses	6"	6"	8"	8"	8"	8"
	6'-0"		6"	6"	8"	8"	8"	8"
	8'-0"	6"	6"	6"	6"	8"	8"	8"
	10'-0"	6"	6"	6"	6"	8"	8"	8"
	12'-0"	6"	6"	6"	6"	8"	8"	8"

Small, Thin Panel Thicknesses—Recommended Maximum Panel Size for Various Thicknesses						
		Maximum Length (ft)				
		4'	6'	8'	12'	15'
Maximum Width (ft)	2'-0"	2"				
	3'-0"	2-1/2"				
	4'-0"		3"			
	6'-0"		3-5/8"			
	6'-0"				4"	



2", 2-1/2", 3" Panel Section



3-5/8"-4" Panel Section



FULL SPEED AHEAD WITH FEWER DELAYS, EARLY OCCUPANCY

Along with infinite design options, outstanding performance, and superior quality, High Architectural Facade Systems give you faster and lower-cost fast-track construction and maximum schedule flexibility.

High Architectural Precast Facade Systems are pre-finished, pre-insulated, and weather tight. Indoor factory-cast and factory-cured components can be manufactured year-round and installed in almost any weather, which results in fewer schedule delays and faster occupancy.

Construction costs may also be reduced by:

- **Single-source fabrication and erection**
 - Less on-site labor with its associated congestion, cost, and schedule delays, and fewer quality problems due to manpower shortages
 - Eliminates the usual delays caused by multiple trades
- **Just-in-time delivery**
 - Streamlines the construction process by reducing site congestion and waste disposal

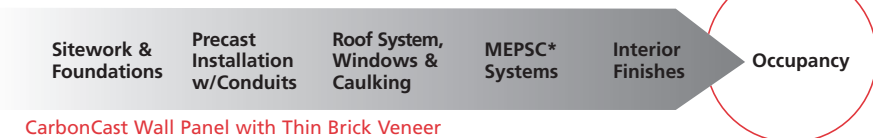
- **Rapid installation**
 - Simultaneous erection of structural elements and enclosure
- **Earlier project delivery and occupancy**
 - Reduces general conditions, construction financing, and other carrying costs

■ **Speeds realization of revenue**
Speed Enclosure, Improve Quality, and Reduce Mold Growth with Factory Glazing

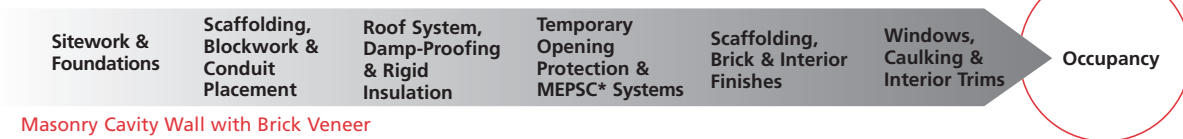
Factory installation of glazing systems not only speeds enclosure, making it easier to meet fast-track construction schedules, but keeps buildings dryer and less likely to have mold problems. Factory installation of glazing can also provide better quality assurance because all installations are done on the ground and under controlled conditions—instead of 30 stories in the air in severe weather conditions.

Schedule Comparison

Thin Brick Veneered CarbonCast Panel vs. Masonry Cavity Wall



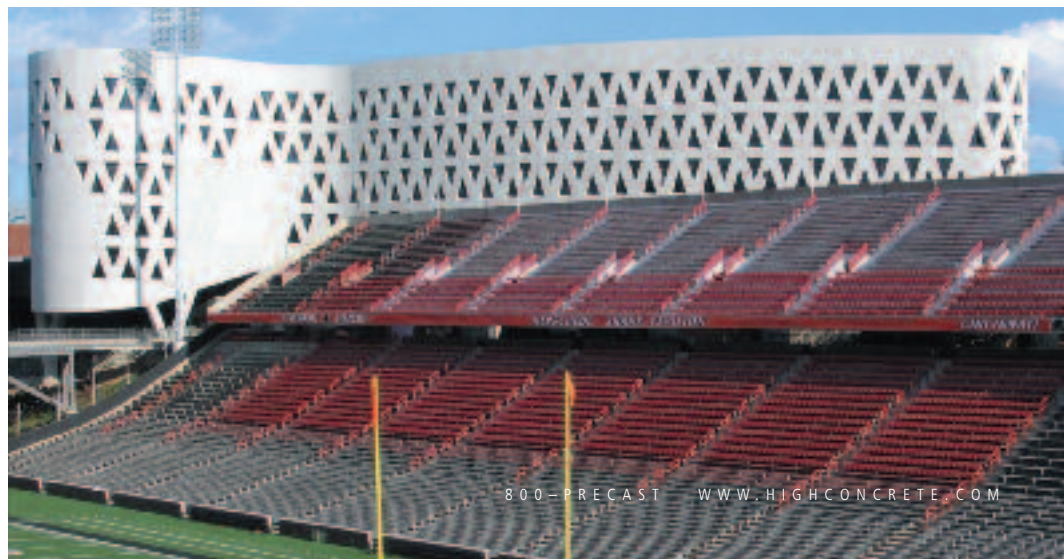
CarbonCast Wall Panel with Thin Brick Veneer



Masonry Cavity Wall with Brick Veneer

High provides single-source fabrication and erection, just-in-time delivery, and rapid installation for earlier project delivery and occupancy.

*MEPSC: Mechanical, Electrical, Plumbing, Security & Communication





COST-EFFECTIVE DESIGN: ONE MORE HIGH ADVANTAGE

Architectural precast offers many cost advantages over other cladding materials. High Precast is produced all year round in a controlled, cost-efficient production environment. And precast can be installed year-round too, even in harsh weather, eliminating the need for costly winter weather protection and significantly compressing the overall building schedule.

- Precast's installation speed can shave months off a construction schedule.
- Precast panels can span great distances and be connected directly or adjacent to structural columns, reducing structural framing time and costs
- Precast applications of up to 10 stories can be stacked onto a foundation to permit frame steel to be lighter and less expensive
- In high-rise construction, vertical precast panels can span multiple floors

- Brick-faced precast panels can be substituted for field-laid masonry to save time, reduce site congestion, and virtually eliminate moisture management problems associated with rainscreen veneers

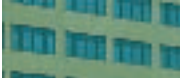
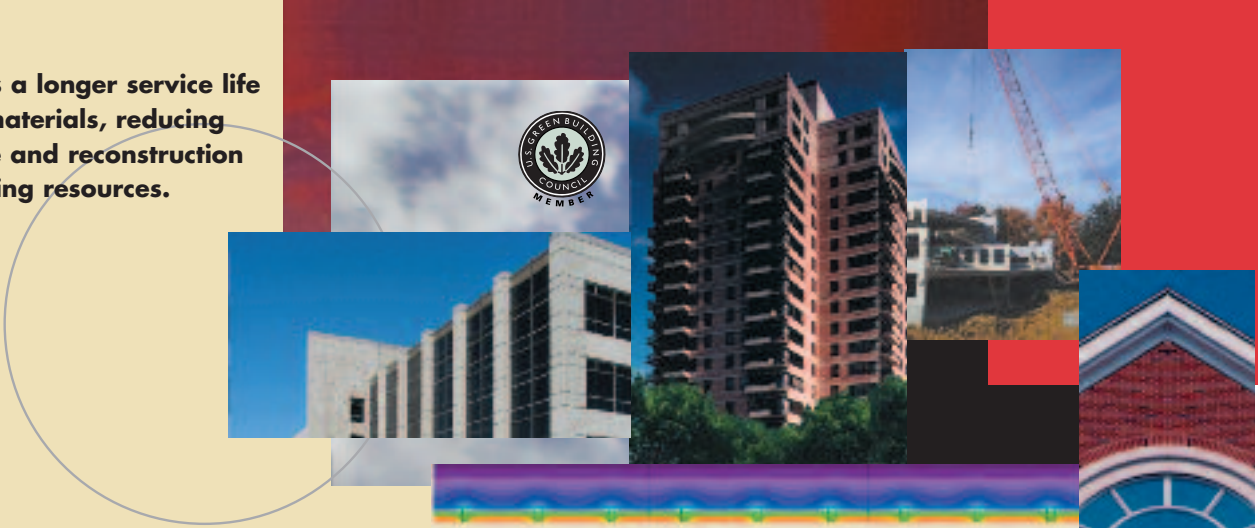
Working with High from the start maximizes cost-effectiveness

High will assist you with preliminary design and budget estimating from early in your project's design phase, to take maximum advantage of precast's cost effectiveness.

- Use of repetition and master molds
- Optimum panel size
- Choice of mix design
- Choice of connection hardware
- Choice of insulation



Concrete has a longer service life than other materials, reducing maintenance and reconstruction and conserving resources.



THE SURPRISINGLY GREEN, LEED-FRIENDLY BUILDING MATERIAL

Concrete is a key solution to modern concerns about energy efficiency, protecting the environment, and using our resources wisely, with many environmental advantages throughout its manufacture and use. And because old concrete can be reused, the energy savings accrue indefinitely. In fact, concrete is one of the oldest and most environmentally friendly construction products currently available.

Natural and Recycled Materials

Some building materials rely on scarce or nonrenewable resources. In contrast, concrete is made from three abundant ingredients

- Water
- Aggregate (stone, sand, and gravel)
- Portland cement (a fine gray powder)

A growing list of recycled materials can complement these basic ingredients. Aggregates may contain safe industrial by-products, such as steelmaking's slag. Portland cement can be supplemented by materials such as fly ash, a discard of coal burning power plants. Even cement's manufacturing process uses recycled materials. Each year, a single cement kiln can safely burn one million old tires, conserving fossil fuels and reducing landfill demand.

Stronger, Lasts Longer, Recyclable

Since precast concrete is strong and virtually impermeable, and resists fire, water, and weather, it has a longer service life than other construction materials. Concrete's durability reduces maintenance and reconstruction, conserving resources. And at the end of its service life, crushed concrete can be reused as aggregate for new concrete.

Year-Round Energy Efficiency

The thermal mass of concrete buildings saves energy year round by reducing temperature swings. A concrete building

will require cooling mainly during off-peak times, when power is produced more efficiently. The same building will also cost less to heat than a comparable structure made of different materials.

These benefits last as long as the building itself—which in the case of concrete structures is a very long time.

Finishes Can Improve Thermal Performance

Choice of color for architectural precast impacts thermal performance and LEED rating.

- Light colors help reduce the heat island effect, making buildings easier to cool

and can reduce heating costs. When selecting light colors, the aged albedo rating—a measure of a surface's light reflectivity—is important, because concrete can darken slightly with age. Albedo ratings of .3, with ratings up to a highly reflective .7 are possible with many common mix designs, and especially with mix designs that employ white cement.

A benefit of using precast panels is that each facade can be designed differently to help manage the solar gain or heat loss conditions unique to each orientation. For instance, thick panels, panels designed for

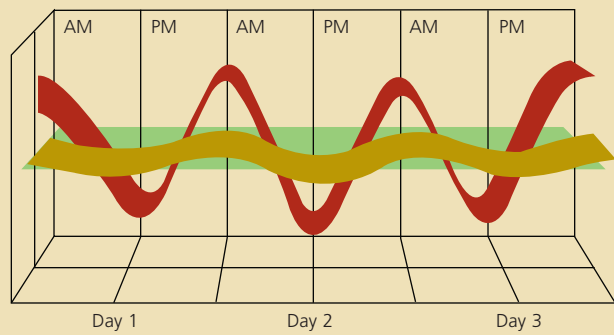
LEED® Project Checklist: Precast Concrete Potential Points		
LEED Category	Credit or Prerequisite	Points Available
Sustainable Sites	Credit 5.1: Site Development: Protect or Restore Habitat	1
	Credit 7.1: Heat Island Effect: Non-Roof	1
Energy and Atmosphere	Prerequisite 2: Minimum Energy Performance	—
	Credit 1: Optimize Energy Performance	1–10
Materials and Resources	Credit 2.1: Construction Waste Management: Divert 50% From Disposal	1
	Credit 2.2: Construction Waste Management: Divert 75% From Disposal	1
	Credit 4.1: Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	1
	Credit 4.2: Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	1
	Credit 5.1: Regional Materials: 10% Extracted, Processed, & Manufactured Regionally	1
	Credit 5.2: Regional Materials: 20% Extracted, Processed, & Manufactured Regionally	1
Quality		
Indoor Environmental	Credit 3.1: Construction Indoor Air Quality Management Plan: During Construction	1
Innovation and Design	Credit 1.1: Apply for other credits demonstrating exceptional performance	1*
	Credit 1.2: Apply for other credits demonstrating exceptional performance	1*
	Credit 1.3: Apply for other credits demonstrating exceptional performance	1*
	Credit 1.4: Apply for other credits demonstrating exceptional performance	1*
	Credit 2: LEED Accredited Professional	1
Projects Total 20		

*Up to 4 additional points can be earned, must be submitted and approved (not included in LEED Leadership in Energy and Environmental Design). Note: Scoring System: Certified, 26-32 points; Silver, 33-38 points; Gold, 39-51 points; and Platinum, 52-69 points.

Thermal Mass Effect Can Smooth Heating and Cooling Peaks

The ability of concrete to store energy and dampen the effect of temperature change on heating and cooling systems is known as the Thermal Mass Effect.

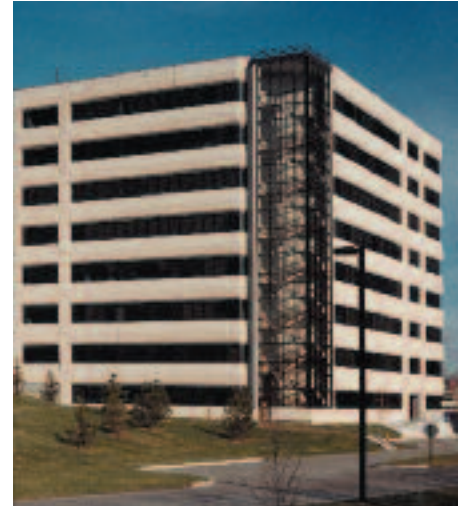
Source: *PCI Design Handbook, 6th Edition*



- Mass Wall Building
- Conventional Insulated Building
- Target Operating Temperature

shading devices can be used on the south to manage solar heat gain, while on the north side, shallow recesses can be used to maximize daylighting. Insulation values can also be varied by orientation when CarbonCast panels are used.

Managing solar gain and heat loss is especially important on buildings with high aspect ratios—taller buildings where there is greater wall surface area than roof area, causing more heat loss or gain to occur through the walls than the roof. Careful design can downsize HVAC systems, reduce operating costs, and improve occupant comfort.



Thermal and Moisture Management in Exterior Wall Assemblies

Wall Assemblies

Like any cladding, precast cladding is one element of a wall assembly (except in insulated wall panels where it *is* the assembly). As in any assembly, to preserve the integrity of the assembly so that it properly controls heat loss or gain and stays dry inside, the building team must control the interior design temperature and relative humidity and then select and specify the appropriate insulation, air barriers, and, if needed—depending on your location or end-use—vapor retarders, to ensure that the assembly performs as intended. In the process, thermal bridging—such as is commonly caused by many steel stud and batt insulation installations—must be considered and avoided if possible, or unintended dew point-temperature induced condensation may occur in the wall assembly.

Ideally, walls—whether precast or not—should be designed so that no condensation occurs across the section. However, if condensation is intended to occur in the assembly, measures must be taken to get it out either through ventilation or, in the case of precast, condensate drains designed into precast panels. CarbonCast® architectural insulated panels and insulated sandwich wall panels are designed so that the dewpoint temperature will always fall within the insulation. CarbonCast insulated sandwich wall panels have integral air barriers and vapor retarders and CarbonCast architectural insulated panels

can be designed to incorporate factory-installed vapor retarding insulation which reduces or eliminates the need for air barriers behind the gypsum board finish and reduces the potential for mold growth in the wall assembly.

Precast: A Face-Sealed Curtainwall System

To keep outside moisture out, designers can choose a rain screen enclosure or face-sealed curtainwall enclosure. Rainscreens, such as terra cotta-, masonry-, or stone-veneered walls, are not water tight and must be ventilated. Face-sealed curtainwalls—i.e., IBC 2003 vapor non-permeable retarders—have sealed joints between non-permeable components. For the wall to remain effective, the joints must be maintained. The most effective walls will have the fewest joints. Glazed systems and high-strength precast concrete-clad facades are face-sealed curtainwalls.

To Seal or Not To Seal

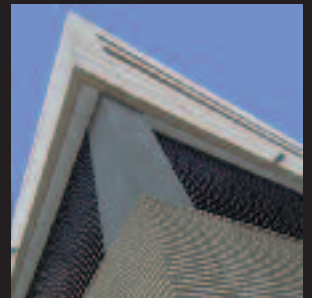
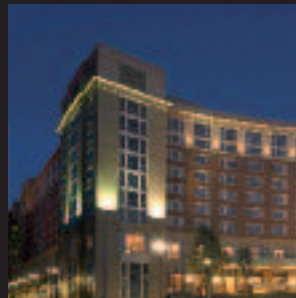
While sealers are not required to “waterproof” high-strength precast concrete, they prevent streaking caused by water runoff and prevent exterior mold growth found in some climates. Sealers can be integral to the mix or surface-applied. Some sealers may affect color or finish appearance; integral sealers affect mix design. High Concrete’s expert technical staff can help you determine if a sealer is right for your project.

PROJECT GALLERY



Top and bottom left: The Heldrich,
New Brunswick, N.J.

Bottom right: David L. Lawrence Convention Center,
Pittsburgh, Pa.





Above: Rosenthal Art Museum, Cincinnati, Ohio

Bottom left: Northwestern Memorial Hospital, Chicago, Ill.





Above: Lurie Medical Research Center,
Chicago, Ill.

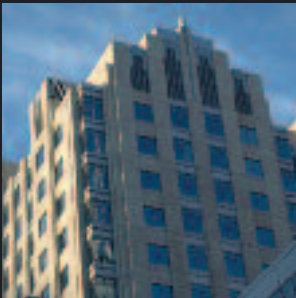


Bottom: Millionair Terminal,
Teterboro, N.J.

Top: Prentice Women's Hospital, Chicago, Ill.

Bottom left: Northwestern Memorial Hospital, Chicago, Ill.

Bottom right: David L. Lawrence Convention Center, Pittsburgh, Pa.



The industry's widest selection of additives, mixes, colors, and finishes offers total design flexibility.



Water wash, acid etch, medium blast.



Form finished painted.



Medium blast.



Light and medium blasts, granite veneer cast into panels.

ACROSS THE SPECTRUM: COLORS, TEXTURES, AND FINISHES

High Concrete Architectural Facade Systems come in an almost limitless palette of natural colors and finishes that can blend into any environment—whether modern or historic, formal or rustic—in addition to a variety of concrete mix designs to match the performance requirements of your project. With such a versatile, visually rich material, you can choose color, form, and texture to express a unique and particular design vision by choosing from a variety of

- Aggregates
- Finishes
- Pigments
- Veneers
- Mixes
- Shapes and Reveals

High Concrete will work with you from the beginning of a project to choose the finish with the aesthetic and functional attributes you need. And all components will be manufactured by High under factory-controlled conditions to ensure a uniform, high-quality facade.

Precast concrete is also a great interior finish option—especially in large public spaces, gymnasiums, and natatoriums or in buildings such as schools, warehouses, manufacturing facilities, and dormitories where impact-resistance and low-maintenance durability are required.

Color in Concrete

Color is achieved through a combination of white or grey cement, coloring agents, or pigments, and fine or coarse aggregates added to the mix. High Concrete is expert in matching color to existing buildings. Matching caulk colors, stains, and paint are also available.

Mix Designs for Beauty and Strength

Environmentally friendly “green” mix designs including High’s innovative EcoMix™—concrete densified with pozzolans made from waste products—can improve initial appearance and long-term performance by reducing shrinkage and temperature-induced cracking. Mixes that incorporate recycled materials such as slag can improve concrete’s properties including resistance to moisture, impact, load-carrying capacity, and even component sizes.

Consult High to pick a mix and finish that fits your budget while maintaining optimum strength and durability and giving the visual appearance you desire.

Aggregates

Precast concrete is cast in forms made of wood, steel, concrete, or rubber. Many color and texture options are possible by varying aggregate type and color, size, finishing process, and depth of exposure. Combining color and texture accentuates the natural beauty of aggregates.

Aggregate colors range from white to pastel to red, black, and green.

Finishes

Precast concrete is cast in forms made of wood, steel, concrete, or rubber. A smooth form finish highlights the natural mottled look of concrete as well as any imperfections in the form. As a result, it’s usually desirable to use an applied finish to achieve a more uniform appearance and to bring out the full color, texture, and natural beauty of the aggregates. Finish options include

- **Acid etch** Provides a textured surface that brings out the natural shine of the aggregates. Etched finishes include light, medium, and deep. Light etching leaves a shiny sand-textured surface; deep etching exposes the stone aggregate.
- **Blasted** Creates light, medium, or heavy exposure of aggregate which is slightly duller than an acid etched finish
- **Polished** For a finish resembling polished granite or limestone
- **Form-liner finishes and reliefs** Use molds to create textures and patterns
- **Form finish** A natural look, with natural color variations and surface imperfections intact
- **Field paint or stain** For economical visual impact





Formliner acid etch, water washed.



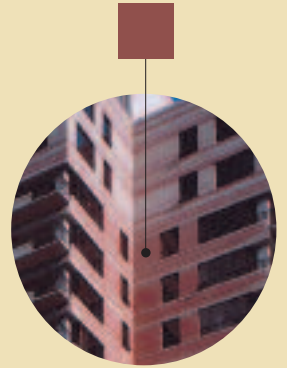
Pigmented heavy blast.



Pigmented light and medium blast.



Medium blast.



Medium blast.

Veneers

Brick and stone veneers set in precast achieve the look of a hand-laid masonry or stone cladding with greater construction efficiency, safety, and water tightness. Veneers include

- Thin brick
- Half brick
- Standard brick
- Oversized brick
- Honed or polished concrete block
- Tile (ceramic and terra cotta)
- Stone (granite, limestone, and marble)

Limestone, marble, and granite thin veneers (e.g., 1½"–2" thick) can be drilled, fitted with stainless steel pins, and cast into rigid precast backers to provide large, full- or partially-veneered panels. Stone-veneered precast panels can be an efficient

way to clad high-rise buildings. For economy, natural stone veneers are often used on lower levels of buildings with matching custom-mixed all-precast panels on the upper levels.

These veneers also eliminate the fireproofing required to protect steel-framed curtainwall assemblies. To ensure best quality, and to speed installation, sealing between stone joints can be done in the factory, leaving only the sealing between panels to be completed in the field.

Form-Lined Shapes

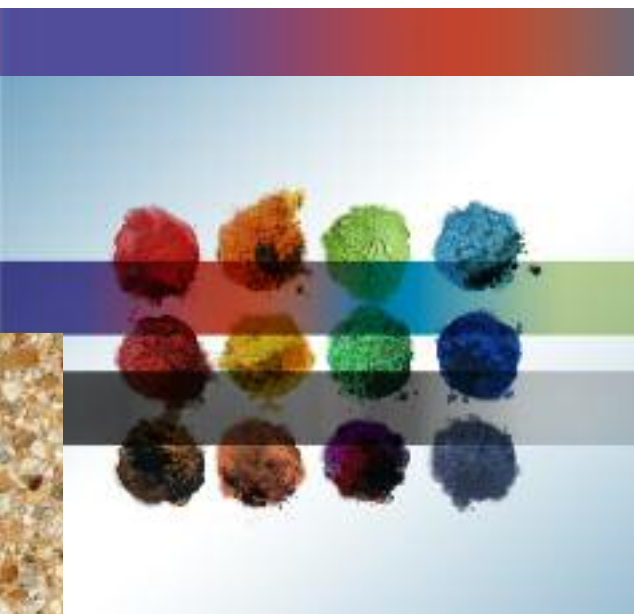
Using urethane, plaster, rubber, grained wood, rope or other material as a liner in the casting form can offer finishes, reliefs, textures, shapes, and patterns limited only by your imagination.

Color-Matched Caulks Protect Against Moisture

A wide array of color matched silicone or polyurethane joint sealants—also known as caulks—are available. Silicone sealants usually have the highest initial cost, but are resistant to ultraviolet rays and break down more slowly than polyurethane sealants. Polyurethane sealants bond well to concrete, aluminum, etc. and have additives to improve their resistance to breakdowns caused by ultraviolet rays. Both types of sealants can be obtained with 5- and 10-year warranties. Double caulking is always recommended for the longest-lasting, most weather-tight seal.

Cast-in thin brick replicates the look of brick but is highly impervious and is more economical than full depth brick veneers. Keyways help lock brick to concrete surfaces.

For more detailed information about color, texture, and finish in concrete see *Precast/Prestressed Concrete Institute Architectural Precast Concrete Color and Texture Selection Guide.* For a free copy of the guide call 1-800-PRECAST.



Thin Brick Looks Great, Performs Better

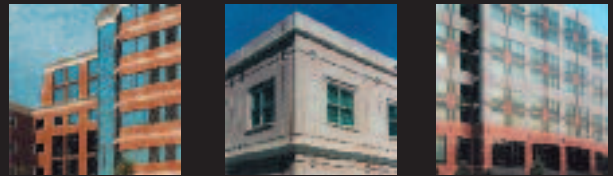
Thin brick is highly impervious compared to full or half-bricks due to its molding process and because an impervious precast panel backer replaces traditional pervious "mortar" joints. As a result, water will not get behind a thin brick veneered panel and cause bricks to pop off. Thin bricks are modular and course dimensions are fixed, so designs should take this into account to avoid excessive cutting to achieve the desired look.

HIGH ARCHITECTURAL PANEL DETAIL GALLERY

Architectural Panel Shapes	21
Foam Insulation Chart	21
Non-Structural Composite Panels	22-24
Structural Composite Panels and Non-Structural Hardwall Panels	25
CarbonCast® Architectural & Veneer Panels	26
Joint and Edge Details	27

Following are schematic details. Many applications require custom details. High Concrete will do all the final shop drawings and engineer all precast concrete connections. Get standard or custom CAD details by calling us at 1.800.PRECAST.

All panels also available as conventional panels without insulation.



Shape, Size, Accent, and Finish Options—Appearance and Cost Guide

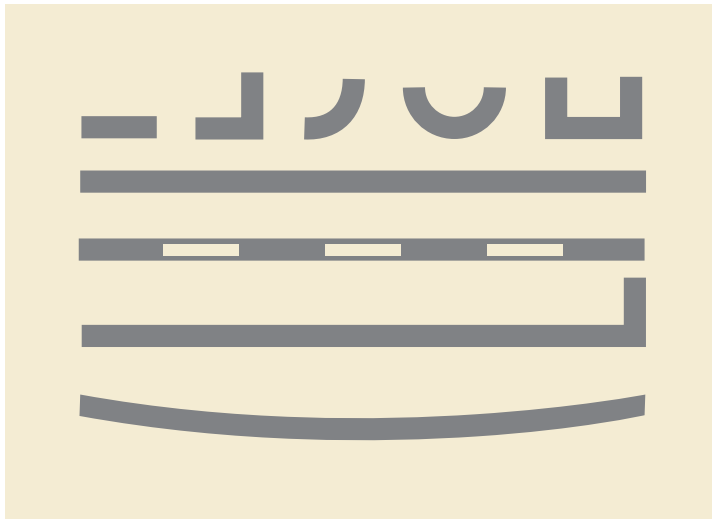
	Appearance Uniformity	Relative Cost		Appearance Uniformity	Relative Cost
Shapes			Accents		
Perimeter—4 sides	■	\$	Plain (no reveals)	■	\$
Perimeter—5 or more sides	■	\$\$-\$\$\$\$	Shallow Reveals (3/4" or less)	■	\$\$
Non-Rectangular	■	\$\$-\$\$\$	Deep Reveals	■	\$\$\$
Curved Shapes/Surfaces	■	\$\$\$\$\$	Reliefs (repetitive)	■	\$\$\$
Punched Shapes (openings)	■	\$\$	Precast Trims and Projections	■	\$\$\$\$\$
Returns	■	\$\$\$	Finishes		
Sizes			Form Finish	■	\$
Small Pieces	■	\$\$\$\$\$	Paint/Stain/Stucco	■	\$\$
Large Pieces	■	\$	Light Blast	■	\$\$\$
Thick Panels (up to 2 hour rated)	■	\$	Medium or Heavy Blast	■	\$\$
Colors			Acid Etched	■	\$\$
Standard Mixes (where available)	■	\$	Retarded (exposed aggregate)	■	\$\$\$
Custom Mixes	■	\$-\$\$	Integral Sealant (optional)	■	\$
Grey Cement	■	\$	Surface Sealant (optional)	■	\$\$
White Cement	■	\$\$	Standard High-Repetition Form Liner (ribs, molded brick, stone, etc.)	■	\$\$\$
Light Pigments	■	\$\$	Custom or Low Repetition Form Liner	■	\$\$\$-\$\$\$\$\$
Dark Pigments—high dosage	■	\$\$\$-\$\$\$\$\$	Acrylic Brick (where available)	■	\$\$\$-\$\$\$\$\$
Locally-Sourced Aggregates	■	\$	Thin Brick or Tile	■	\$\$\$\$-\$\$\$\$\$
Quartz & Marble Aggregates	■	\$\$-\$\$\$\$\$	Stone Veneer (stone by others)	■	\$\$\$
Granite Aggregates (non local)	■	\$\$-\$\$\$\$\$	Honed or Polished (where available)	■	\$\$\$\$\$
Two Mix Colors per Piece	■	\$\$\$-\$\$\$\$\$	Form-Finished Edges	■	\$
			Other Edge Finishes	■	\$\$

■ Low ■ Medium ■ High

Concrete is made from natural materials which vary in the colors they yield over time. High Concrete has 12"x12" samples available to represent a color in the range of colors produced by a mix design. Older samples should only be used as a guide for initial color and finish selections. Fresh 12"x12" samples should always be used to make near-final color and finish selections. As with natural stone, mock-ups produced near to the time of actual production should be used for final color and finish selections. For samples, call 1-800-PRECAST and ask for the sales representative nearest you.



ARCHITECTURAL PANEL SHAPES



Architectural Panel Shapes
Horizontal Sections



Architectural Panel Shapes
Vertical Sections

Foam Insulation for the Optimum High Performance Insulated Wall System

CarbonCast® Insulated Wall Panels can be made with one of two types of rigid foam insulation boards: EPS—Expanded Polystyrene or XPS—Extruded Polystyrene. Each type of foam has unique properties. When used at recommended thicknesses and in conjunction with precast concrete wythes, plastic foams produce assemblies with an M (permeance) of <1.0, qualifying as vapor retarders as defined by Chapter 2 of the 2003 International Building Code. Designers should select foams for CarbonCast panels based on project-specific requirements including location, end-use, R-value and budget.

Properties of Foam Insulations	EPS ¹⁰	XPS
Typical Density—pcf	1.0, 1.15, 1.35, 1.80	1.30, 1.55, 1.80
R-Value @ 75°F ¹ (ASTM C518)	3.8, 4.0, 4.2	5.0
Water Vapor Permeability/inch (ASTM E96) ³	3.5, 3.5, 2.0	1.1
Compressive Strength—psi (ASTM D1621)	13, 15, 25	15, 25, 40
Recycled Content ⁴	≤15%	≤15% ≤
Maximum Service Temperature	165°F	165°F
Flamespread (ASTM E84) ^{5,6}	< 75	< 75
Smoke Developed (ASTM E84) ⁵	<450	<450
% Vol. Water Absorption in 24 hours (ASTM C272) ^{7,8}	3%, 3%, 2%	.3%
% Vol. Water Absorption in 2 hours (ASTM C209) ⁹	NA	NA
Cost	\$—\$\$	\$\$\$

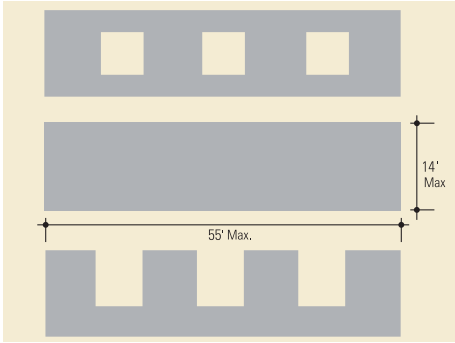
Sources: ASTM C-578 (EPS & XPS)
NA = Not Available

PerformGuard is a registered trademark of AFM R-Control

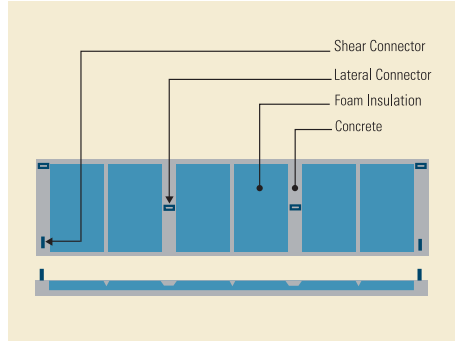
1. R-Value = 1/U = hr x ft² x °F/Btu; R-Values shown are @ 75°F mean temperature.
2. R-value is for unfaced insulation. Faced insulation may deliver higher values.
3. Water vapor permeability, expressed in terms of maximum perms, is for unfaced insulation. Permeability is a property for 1" thick material. Permeance depends on thickness and decreases (improves) as material thickness increases. Permeability can be improved with the addition of film facers. Consult manufacturers for specific data and availability.
4. Higher percentages of recycled content are available, but vary by material and plant location, and may adversely affect other properties such as R-value or compressive strength.
5. These numerical ratings are not intended to reflect hazards presented by these materials under actual fire conditions.
6. IBC 2003 2603.4 and 2603.5 and IRC R318.2.1 require foam boards to be protected with a 15 minute thermal barrier (e.g., 1/2" gypsum board or an equivalent material, such as 1" of concrete).
7. Water absorbed by unfaced insulation after 24 hours of full immersion in water.
8. EPS and XPS foam boards withstand repeated wetting, are non nutritive, and do not provide a food source for mold growth.
9. Water absorbed by unfaced insulation after 2 hours of full immersion in water.
10. EPS foam boards sourced as PerformGuard® EPS are specially treated to provide termite resistance in accordance with ICC ES EG 239 (see ICC ES ESR-1006).



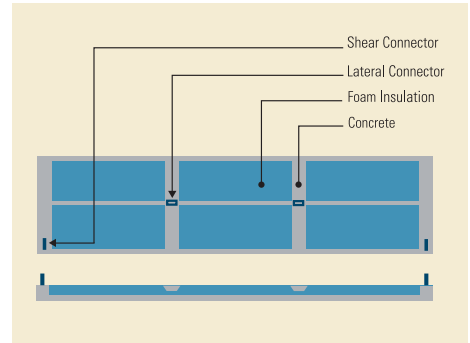
NON-STRUCTURAL COMPOSITE PANELS



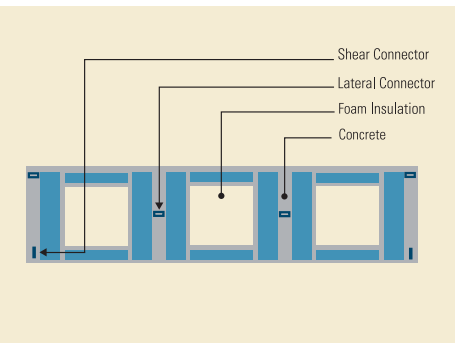
Insulated Architectural Panel



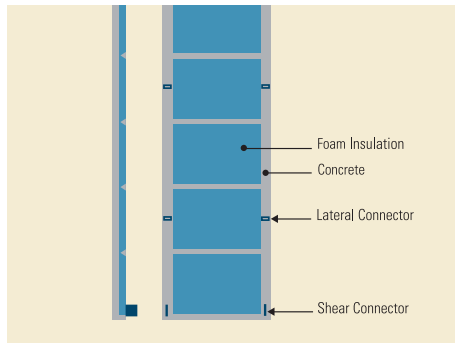
Vertical Back Ribs



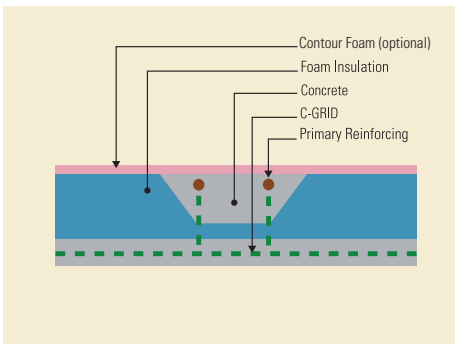
Horizontal Back Ribs



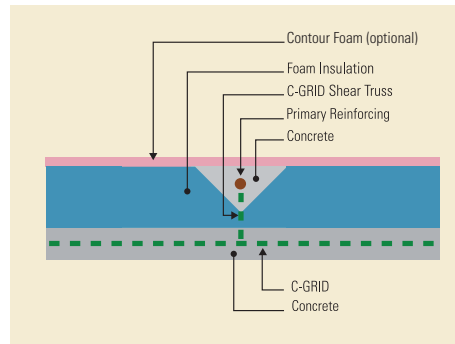
Punched Openings



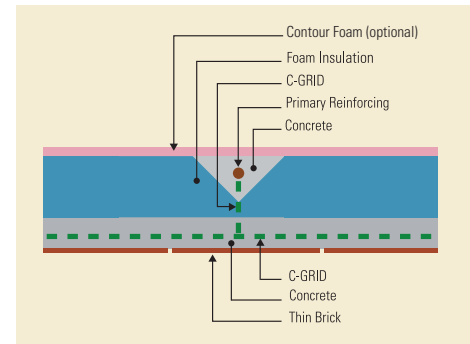
Vertical Orientation at Back Ribs



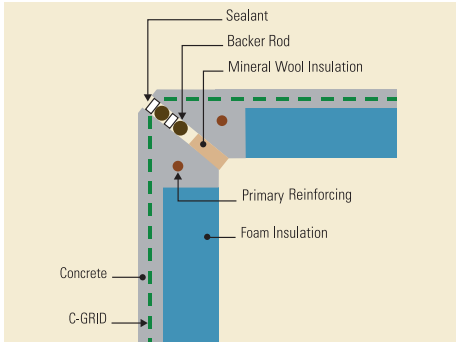
Primary Vertical Rib



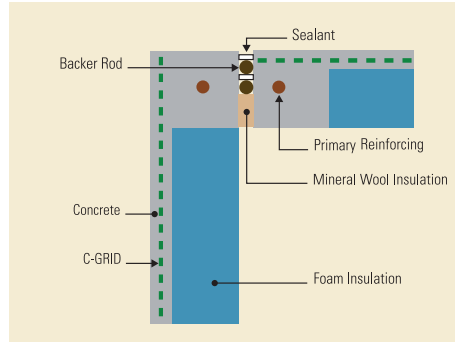
Secondary Vertical Rib



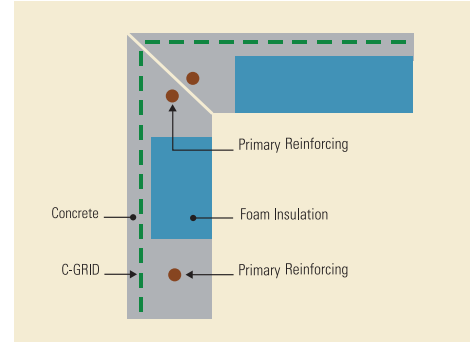
Thin Brick Veneer



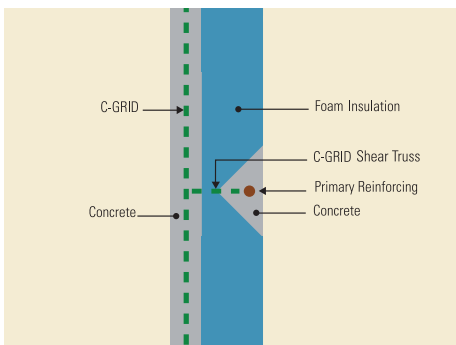
Miter Corner



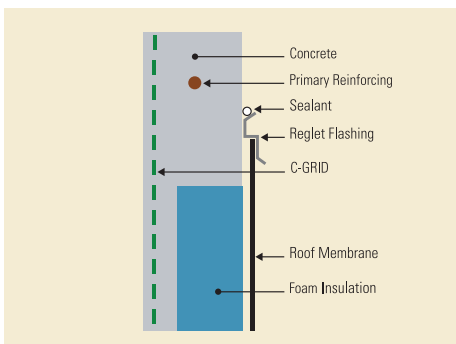
Butt Corner



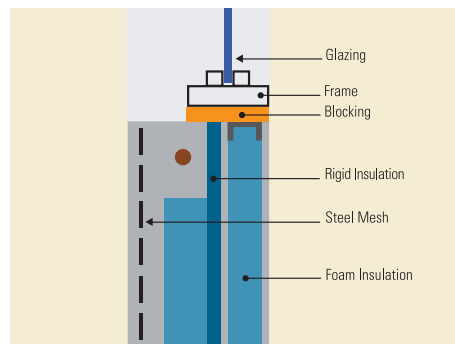
Return Corner



Horizontal Structural Rib

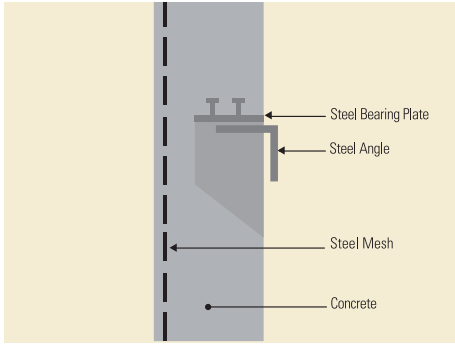


Parapet (Uninsulated)

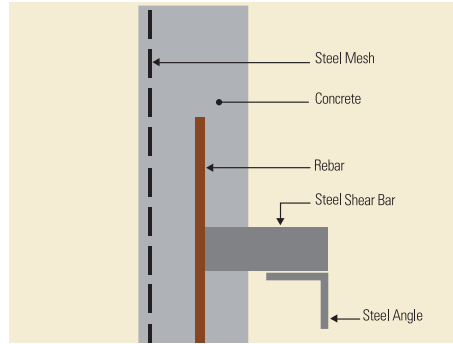


Architectural Panel-Window Sill

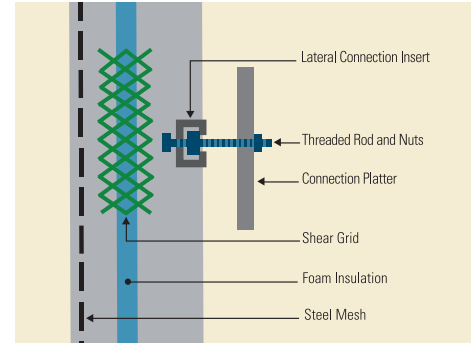
NON-STRUCTURAL COMPOSITE PANELS



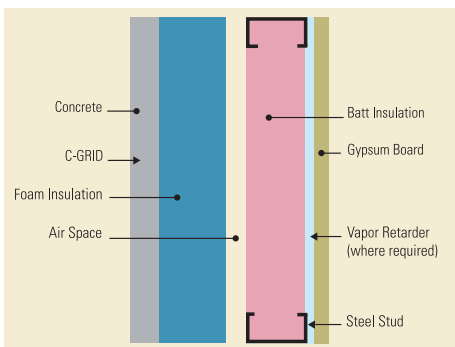
Architectural Panel-Pocket Bearing



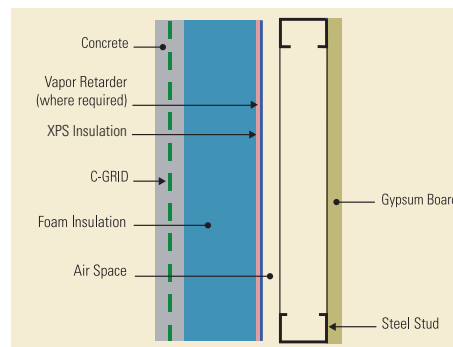
Architectural Panel-Shear Bar Bearing Detail



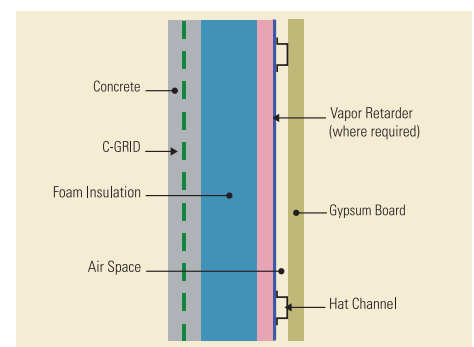
CarbonCast® Architectural Panel-Lateral Connection



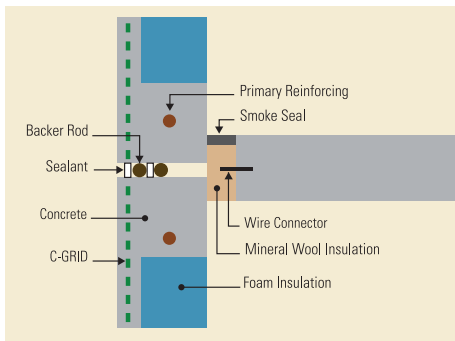
Steel Studs, Batt Insulation & Gypsum Board Assembly



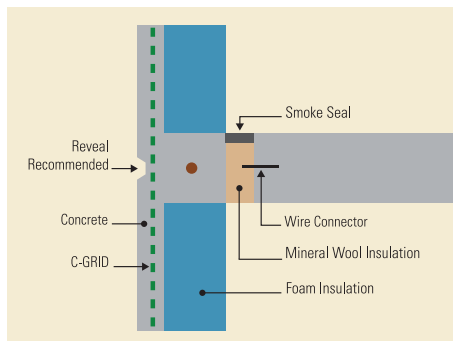
Steel Studs & Gypsum Board Assembly



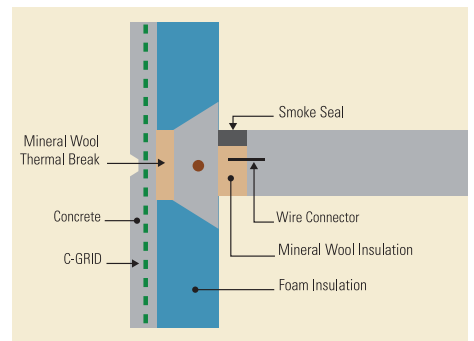
Furring & Gypsum Board Assembly



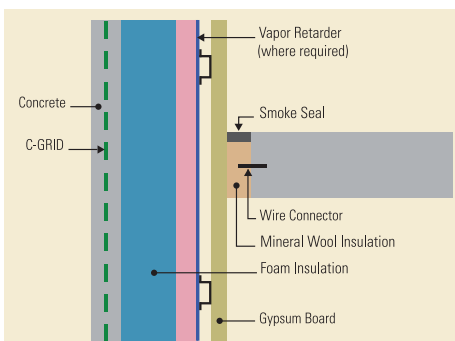
Panel-to-Panel Firestop



Solid Firestop

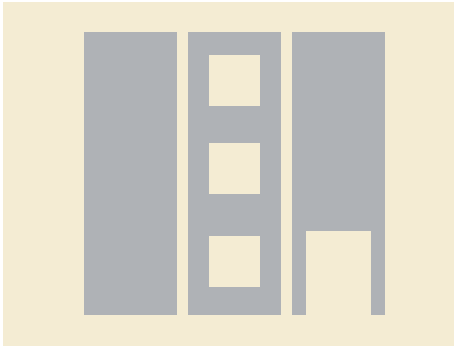


Thermally Broken Firestop

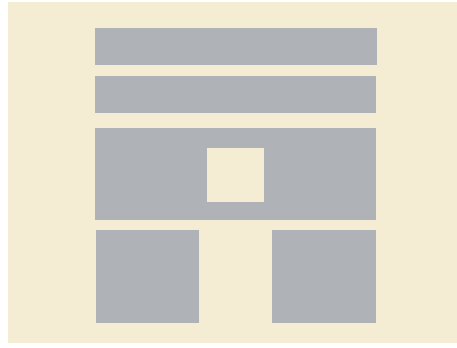


Furring & Gypsum Board Firestop

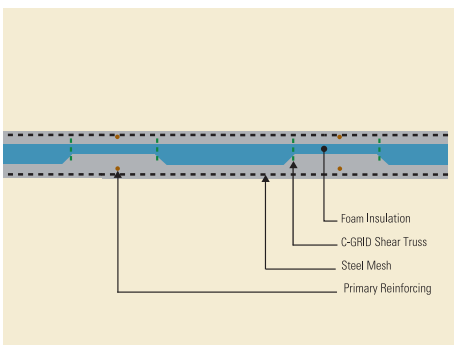
STRUCTURAL COMPOSITE PANELS AND NON-STRUCTURAL HARDWALL PANELS



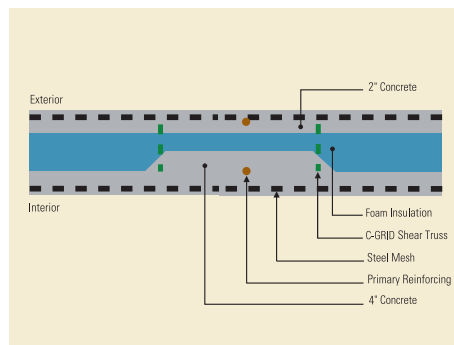
Wall Panels



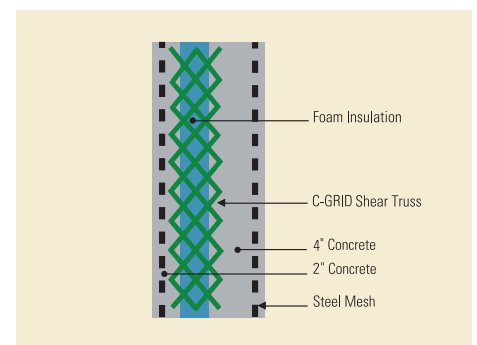
Hard Wall Panels



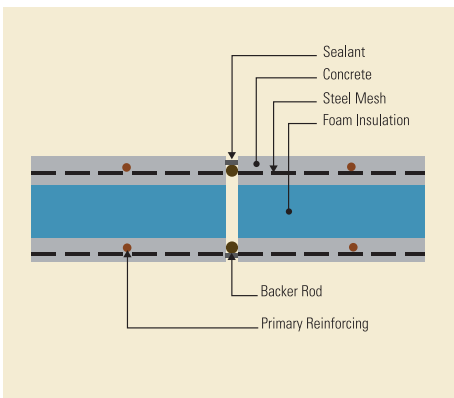
Wall Panel



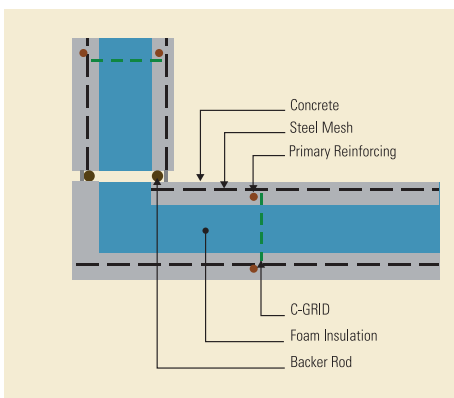
Internal Pilaster Detail



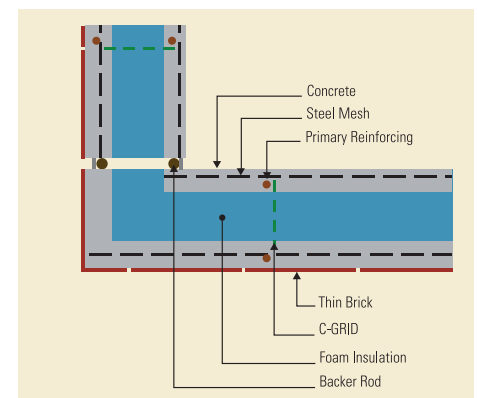
Shear Truss



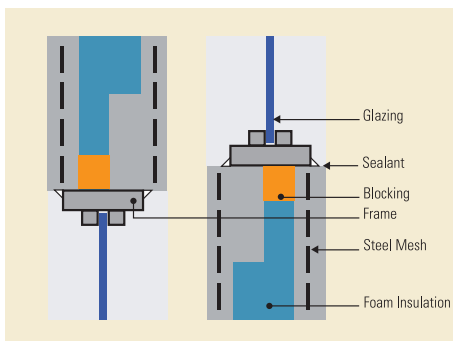
Butt Joint



Corner Detail



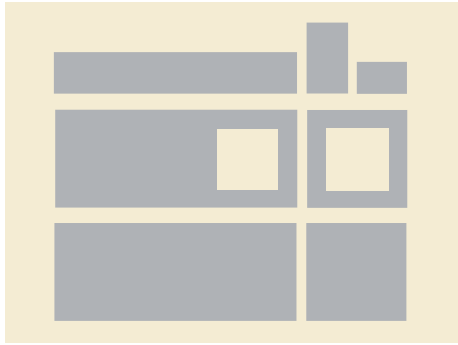
Corner Detail with Thin Brick



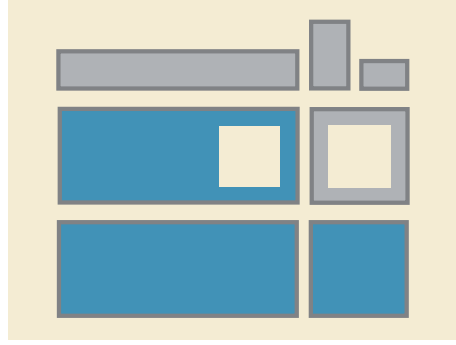
Window Door Head & Seal



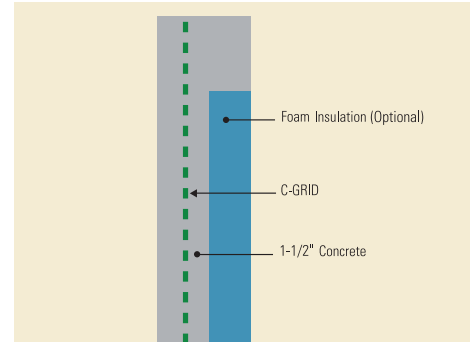
CARBONCAST® STRUCTURAL & VENEER PANELS



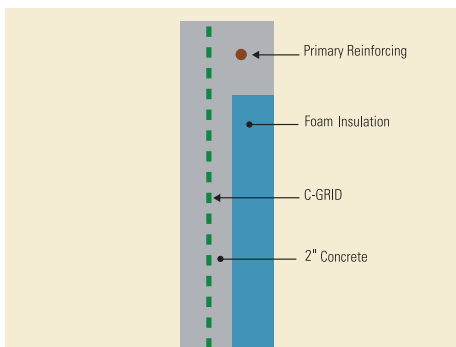
Veneer & Screenwall Panels



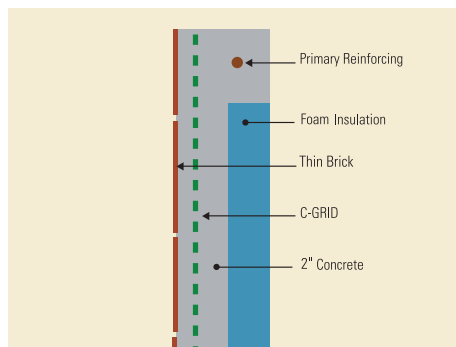
Veneer Panels with Perimeter Ribs



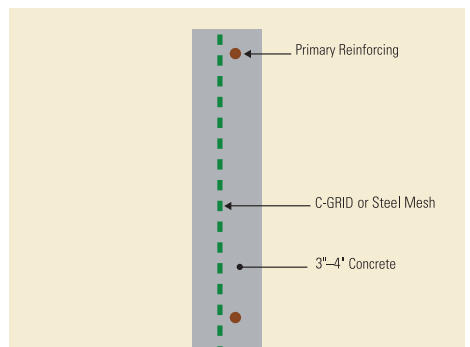
Vertical Panel



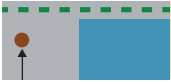
Veneer Panel with Perimeter Rib



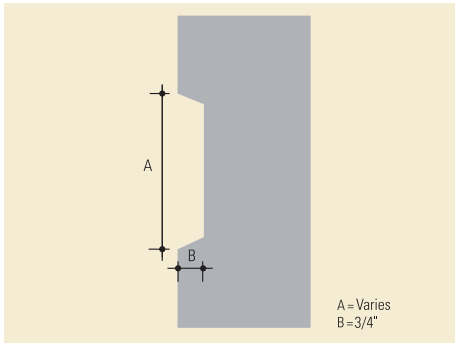
Veneer Panel with Thin Brick



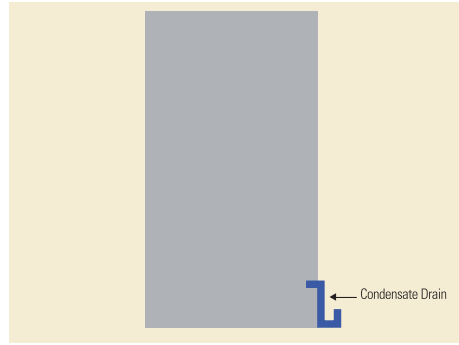
Screenwall



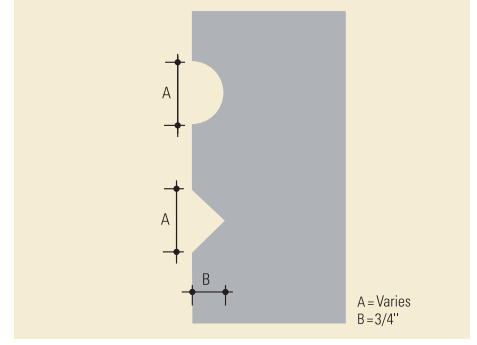
JOINT & EDGE DETAILS



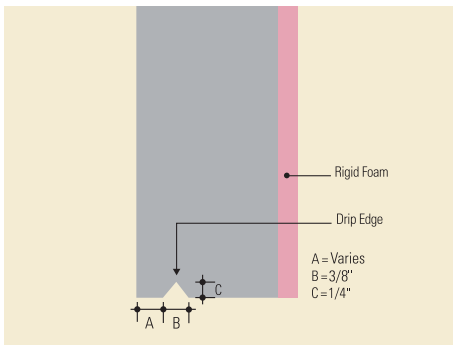
Reveal



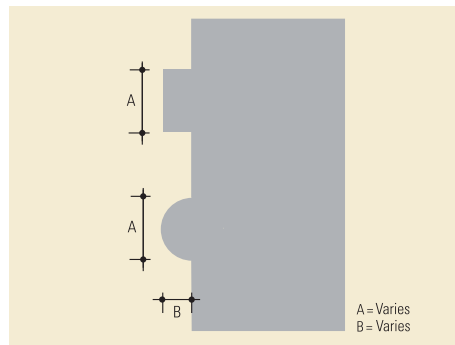
Condensate Drain



False Joints



Drip Edge & Continuous Insulation



Architectural Features

Note: 1/8" typical. Reveal depth increase may increase panel thickness.

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