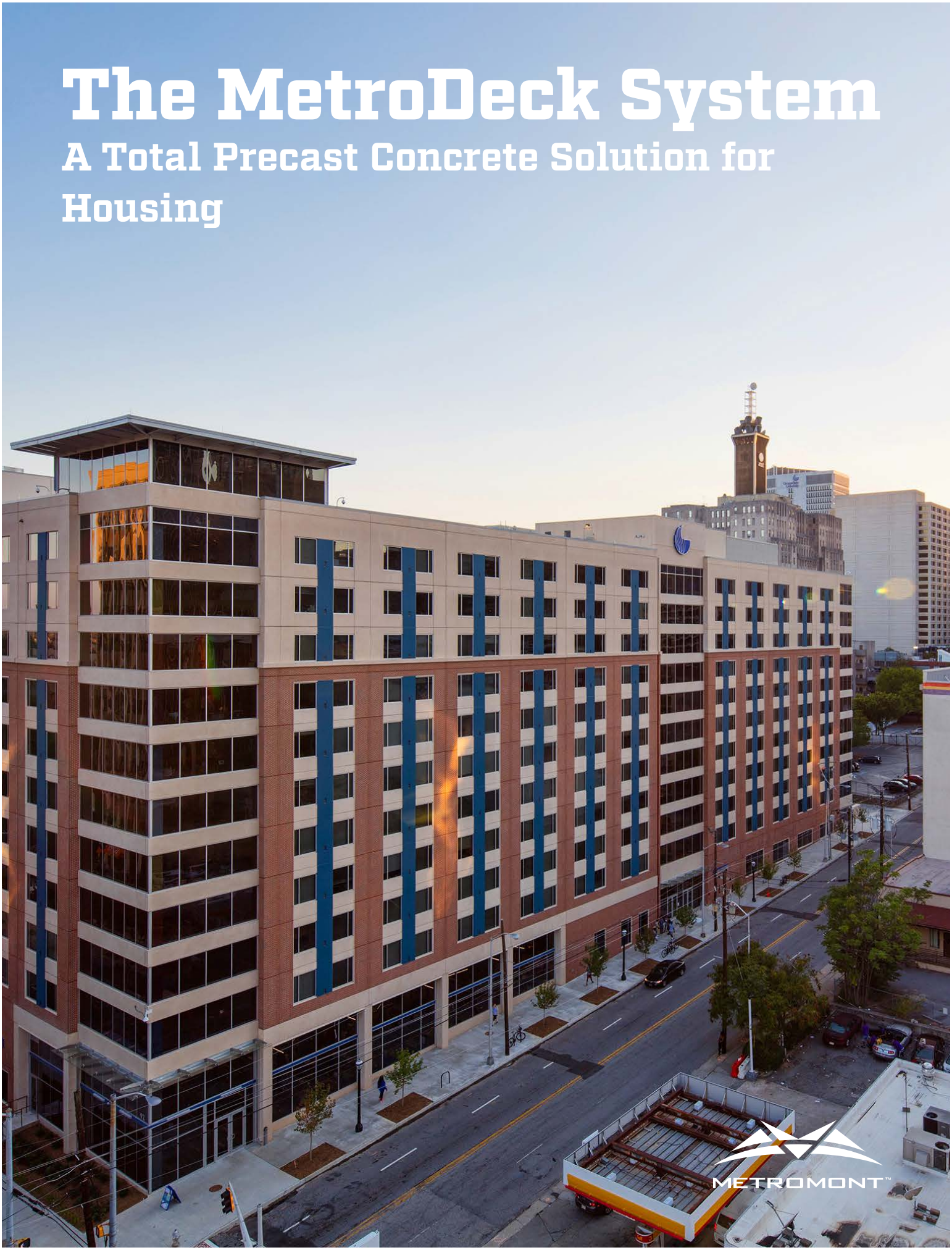
The MetroDeck System

A Total Precast Concrete Solution for Housing



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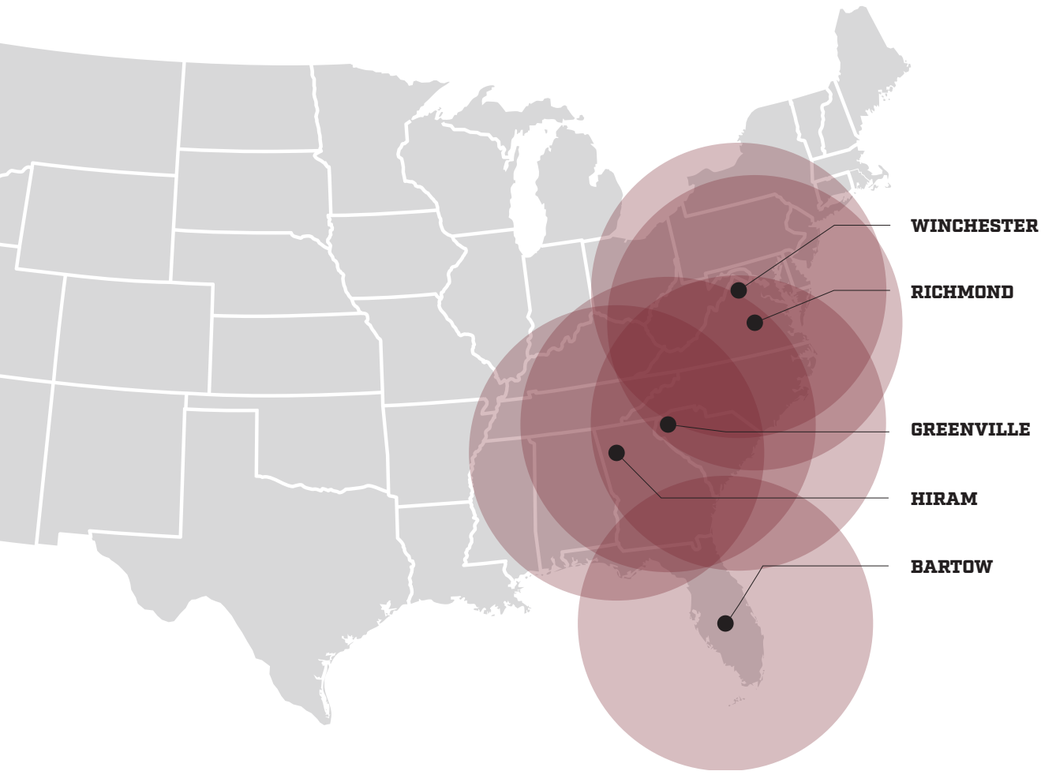
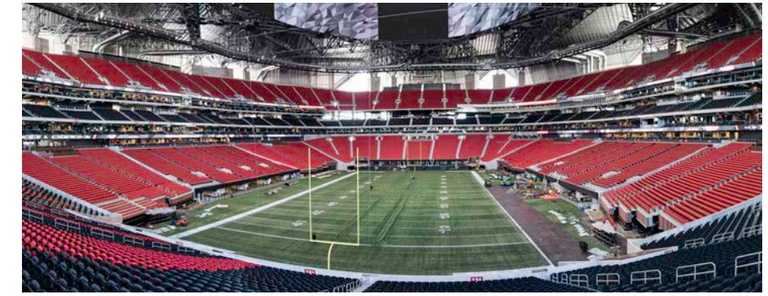
About Us

Metromont Corporation was founded in 1925, when Captain J. Roy Pennell founded Pennell & Harley Construction Engineers. He became known as the "Father of the South Carolina highway" and built many of the roads and bridges that still stand in South Carolina today. Over the years, Metromont has become a leader and pioneer in the engineering and manufacturing of precast concrete for multi-family housing, schools, parking decks, data centers, office buildings, industrial plants, and stadiums.

Today, Rick Pennell continues the family legacy as President and CEO of Metromont, with manufacturing facilities in Greenville and Spartanburg, South Carolina; Hiram, Georgia; Bartow, Florida; Richmond, Virginia, and most recently, Winchester, Virginia. In February of 2018, Metromont acquired **Shockey Precast Group**, a manufacturer and provider of structural and architectural precast concrete based in Winchester. The company now operates as Shockey Precast, a Metromont Company. Together, Metromont and Shockey Precast have completed more than 11,000 precast projects across the Mid-Atlantic and Southeast. The acquisition solidifies the Metromont brand as the premier precast concrete supplier in the Southeastern United States.

Our Locations





Metromont provided architectural cladding for two office buildings and a total precast parking structure for Capitol Towers in NC.

Buckhead Atlanta is a mixed-used development in downtown Atlanta.

Tucker High School is a total precast concrete structure with integral architectural features in Tucker, GA.

What We Do

Metromont knows precast. In fact, we've completed more than 11,000 precast concrete construction projects from schools and office buildings to stadiums and parking garages in the last 20 years alone.

We provide the highest level of custom-engineered precast concrete solutions by leveraging the time-tested expertise of our people. We are not precast concrete manufacturers. We are pioneers, thought leaders, experts and teachers. We are innovators, constantly seeking ways to improve our products and systems to meet the demands of an ever-changing market.

Our job is to make our customers' job easier by sharing our knowledge and expertise about precast concrete with architects, general contractors, engineers, developers, and building owners. After all, the best customer is an informed customer. And when it comes to prefabricated multi-family/student housing, we're paving the way for total precast systems. Single structures to multi-structure complexes. Three stories to 14+ stories. We've completed more than 30 multi-family buildings across eight states, and as the largest precast manufacturer in the southeast, we continue to lead the way as an innovator of precast systems for multi-family/student housing.

OUR MARKET SEGMENTS

- Schools
- Parking Structures
- Office Buildings
- Data Centers
- Commercial & Retail
- Mixed-Use Structures
- Multi-Family Residential
- Warehouse & Distribution
- Industrial & Food Processing
- Institutional & Municipal
- Sports & Entertainment

Using This Guide

The information contained in this guide is for illustrative purposes only, to highlight the range of possibilities available with the MetroDeck system. Please consult a Metromont professional for information and details regarding the use of the MetroDeck system for specific project applications.

The details shown in this design guide are intended to be helpful in the preparation of complete project plans. These details are not to be used as working drawings. Working drawings and details must be prepared and approved by qualified professionals certified in the jurisdiction in which the project is to be built. Metromont accepts no responsibility for any errors or oversights in the use of this material or in the preparation of plans. This publication is intended for use by professional personnel competent to evaluate the significance and limitations of its contents and able to accept responsibility for the application of material contained herein. Special conditions and specific local requirements on your project will require specific evaluation and practical engineering judgment by the project's Engineer of Record and Specialty Engineer.

Why Precast

Precast's durability, safety, quality, and aesthetic flexibility make it the right choice for almost any project. Precast provides flexibility in space planning and increased return on investment, making it the optimal choice for parking decks, office buildings, data centers, and multi-family housing. Precast also contributes to the overall sustainability of a building and allows for integrated project delivery — reducing schedule and project costs. When you know what we know, the question isn't why precast…it's why not precast?

BENEFITS

- Speed-to-Market
- Durability
- Safety
- Aesthetics
- Quality
- Sustainability
- Integrated Project Delivery
- Flexibility of Space Planning

Speed-to-Market

Unlike CIP concrete, which is produce and placed in the field and is dependent upon favorable weather conditions, precast concrete is manufactured in a controlled plant environment. Once produced, precast components are then shipped to the jobsite for erection. Typically erected more quickly than CIP, precast can contribute to an overall shorter construction schedule and reduced overhead costs.

Durability

Precast concrete is highly resistant to impact, corrosion, weathering, abrasion and other ravages of time, which reduces maintenance and operating costs. A low water/cement ratio combined with high concrete strength and curing in a controlled factory environment ensures a dense, highly durable concrete that's more durable than field-placed concrete.

Safety

Precast concrete is non-combustible with built-in fire-resistant capability. It creates a safe envelope that helps protect people, equipment, and the building itself. It can also be helpful in reducing property insurance premiums.

Aesthetics

Precast concrete provides the designer with an unlimited architectural vocabulary of expression. Incredibly responsive to the designer's needs, precast can be shaped in a cost effective manner, with the only limits being imagination and creativity. Design flexibility is possible in both color and texture by varying aggregate and matrix colors, size of aggregates, finishing processes, and depth of exposure.

Quality

Precast concrete components produced by PCI-certified plants are produced under strict, factory-controlled conditions to ensure the highest quality in the desired shapes, colors, and textures along with applicable tolerances. PCI inspections focus on the process by which the units are produced, as well as the plant's general operation. PCI Certification pays off for owners and architects because it produces fewer worries about on-site discovery of units out of tolerance, connection details that are incorrectly cast, or mismatched finishes from panel to panel. It also minimizes the need for continuous inspections, again saving the project money.

Sustainability

Metromont's thermal-efficient precast concrete building systems with continuous insulation offer several sustainability benefits during the construction process and long after the building has been completed. We help increase each building's sustainability by reducing its embodied energy and assist in contributing to LEED® points in several ways. Precast concrete's ability to store energy and dampen the effect of temperature change on heating and cooling systems which may save a considerable amount of energy over the long term and can result in significant cost savings as well.

Integrated Project Delivery

Structural precast components interlock to support one another so they can be erected in a relatively short period of time. Simpler installation requires fewer crew members, which means less traffic and waste on a job site. A cleaner and safer job site means less risk and more assurance of a smooth and successful project flow.

Flexibility of Space Planning

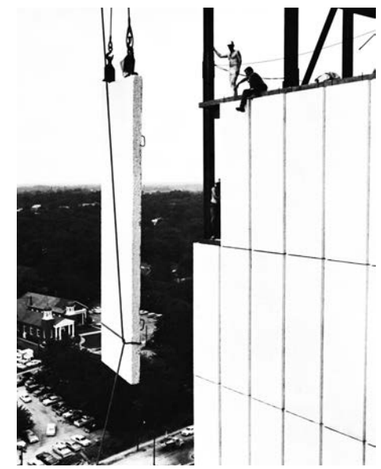
In parking structures, office buildings, or total precast structures, precast allows for longer spans. In office buildings and total precast structures, longer spans create larger open floor plans and increase the flexibility of design.

NOVA Southeastern University Mako Residence Hall

Why Metromont

We're a family-owned company that excels at innovation. Over the past 85 years, we've built a name as a leader and pioneer in the precast concrete industry. We're the southeast's leader in prefabricated multi-family/student housing, and we continue to set the bar for total precast systems. From the beaches of South Florida to the 50-yard line in Foxborough to the banks of the mighty Mississippi - we've helped engineer and manufacture precast building projects all over the eastern half of the U.S. And Metromont's precast manufacturing facilities are strategically located where growth and development are happening.

Let us do the heavy lifting for you. Our team of experts can assist with layout development and erection sequencing to identify efficiencies in design, budget, and schedule. By involving Metromont early in the design process, you get a single point of contact for the full range of precast activities, from initial coordination and design through turnover of the building to the owner. With 50+ years of experience in the production and erection of precast concrete, Metromont's unmatched quality, integrity, and dedication to customer satisfaction are what continue to set us above the competition.



Metromont has more than 50 years experience in the production and erection of precast concrete.

MetroDeck Overview

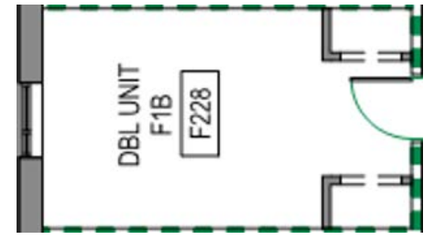
The projects featured in this design guide represent the successful application of a building system Metromont Corporation has developed to meet the unique needs of the multi-family and student housing markets. This prefabricated solution, known as the MetroDeck system, is a comprehensive building package whose application has reduced both construction time and project costs for the jobs included in this guide.

As you explore this guide and learn about the methods and components that comprise the MetroDeck System, you'll see that we've addressed not only the building system, but design considerations and solutions, as well as job site logistics and specifications and details. This guide is intended to introduce you to the MetroDeck system and to invite a potential in-person conversation about MetroDeck and its potential applications. We hope this guide provides a valuable resource for the design of your next multifamily or student housing project.

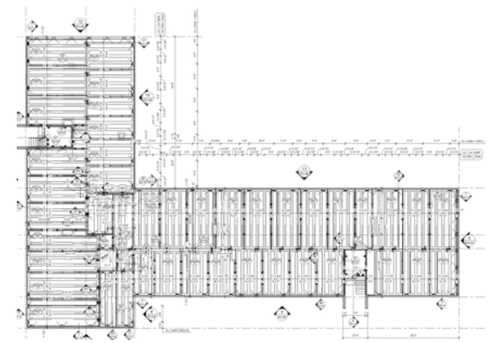
Introducing the MetroDeck System

The MetroDeck system is more than a total precast structural solution for multi-family and student housing. It provides the inherent durability and fire resistant traits of precast concrete with integrated insulation and finishes.

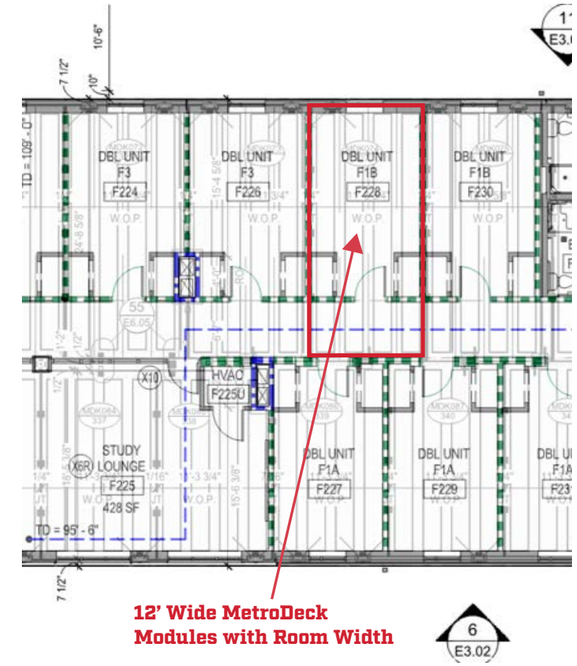
The structure typically consists of a MetroDeck slab system that spans from one interior corridor wall to the exterior wall. Unlike hollowcore, the widths can be customized to reduce the amount of visible joints. The bottom of the MetroDeck or ceiling for the room below is a paint-ready, smooth finish.



Framing Plan



Dormitory Floor Plan



12' Wide MetroDeck Modules with Room Width

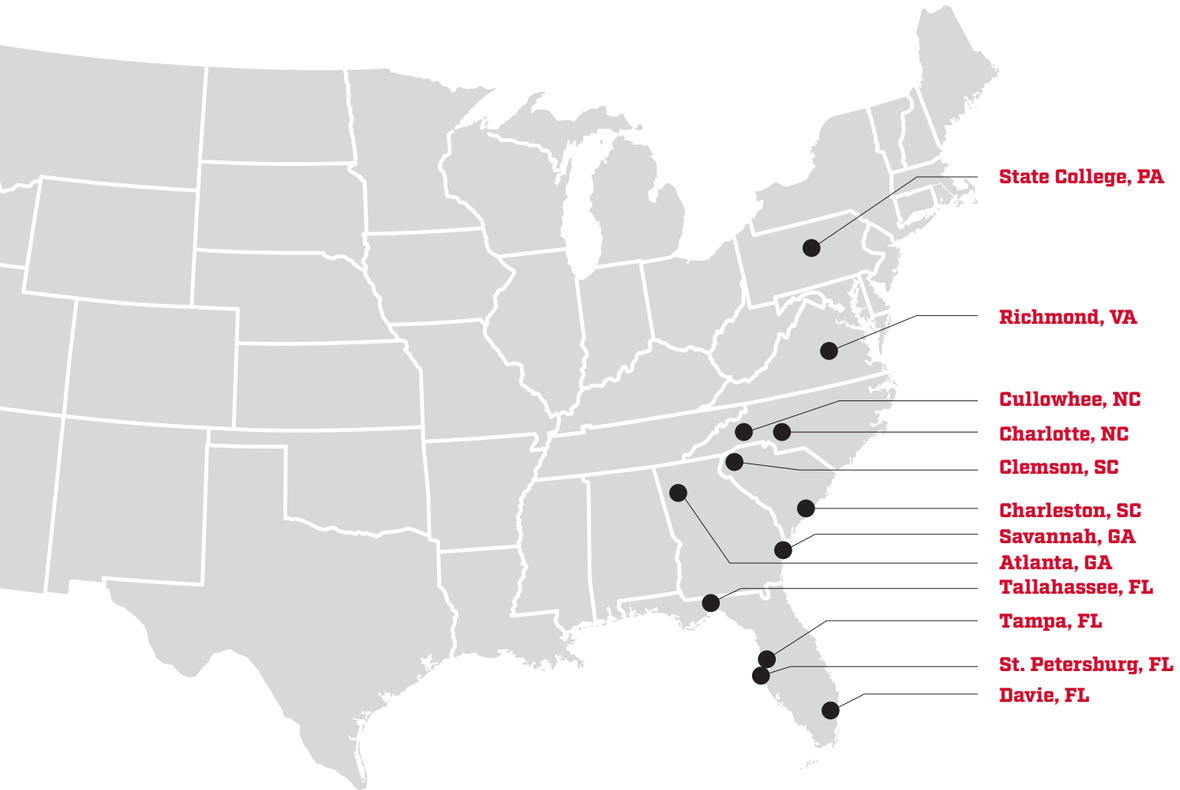
The exterior walls are load-bearing and provide lateral bracing for the overall structure. They can also be cast with a wide range of architectural finishes such as simulated limestone and clay products. Additional information on finishes are available on page 32. The interior finish is a paint-ready hard trowel, smooth finish. These walls are typically cast with insulation to meet and/or exceed local energy code requirements. Cast with a proprietary carbon fiber truss system, these panels are able to meet c.i. (continuous insulation) requirements.

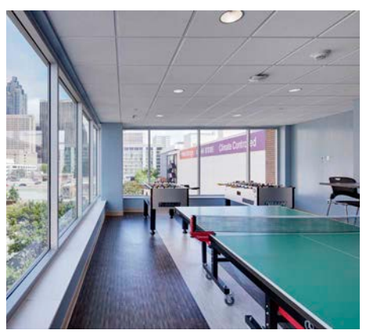
The interior wall is a solid concrete load-bearing wall panel. One side has a smooth form finish and the other a hard trowel finish with sides being paintable.

The MetroDeck System is most efficient in 3-14+ story buildings when compared to steel or C.I.P., though we have completed projects that were 3 or 5 stories when life safety, durability, and speed were the determining factors.

This system is customizable to meet your project requirements which can include residential integrated with retail, amenities, and parking.

Project Locations & Resume





Total Precast Multi-Family Residential Projects

Project Name	Sq Ft	Status
DCC Hawkins Street	113,000 sq ft	Under Construction (Expected completion date of Spring 2020)
The Pearl, Building 1	130,423 sq ft	Completed Spring 2018
The Pearl, Building 2	142,750 sq ft	Completed Spring 2018
The Locks Tower	301,814 sq ft	Completed Fall 2019
Metropolitan at State	163,331 sq ft	Completed 2017
South Falls Tower	314,544 sq ft	Under Construction (Expected completion of Spring 2021)
AC Hotel - Marriott	108,667 sq ft	Under Construction (Expected completion of Spring 2021)
Cascades Multi-Family Residential	406,209 sq ft	Under Construction (Expected completion of Spring 2021)

Total Precast Student Housing Projects

Project Name	Sq Ft	Status
University of South Florida - St. Petersburg	121,527 sq ft	Completed October 2019
The Standard at State College	355,242 sq ft	Under Construction (Expected completion date of 2020)
The Standard at Atlanta	320,950 sq ft	Completed Fall 2018
Western Carolina University Residence Hall	166,896 sq ft	Completed Fall 2019
NOVA Southeastern University Residence Hall	307,000 sq ft	Completed Fall 2019
Charleston Southern University Residence Hall	48,968 sq ft	Completed Spring 2019
SCAD Spring House Residence Hall	139,133 sq ft	Completed January 2019
Douthit Hills at Clemson University - Building A	47,853 sq ft	Completed Fall 2018
Douthit Hills at Clemson University - Building B	103,242 sq ft	Completed Fall 2018
Douthit Hills at Clemson University - Building C	76,776 sq ft	Completed Fall 2018
Douthit Hills at Clemson University - Building D	52,027 sq ft	Completed Fall 2018
Douthit Hills at Clemson University - Building E	51,000 sq ft	Completed Fall 2018
Douthit Hills at Clemson University - Building F	32,820 sq ft	Completed Fall 2018
Douthit Hills at Clemson University - Building G	50,417 sq ft	Completed Fall 2018
Georgia State University Piedmont Central Residence Hall	253,843 sq ft	Completed 2015
SCAD Montgomery House	162,000 sq ft	Completed 2013
Georgia Tech TKE Fraternity House	8,424 sq ft	Completed 2012

Douthit Hills
Student Housing
Clemson, SC

OWNER
Clemson University

ARCHITECT
Clark Nexsen; Boudreaux Group

GENERAL CONTRACTOR
Holder Construction

Clemson University wanted to increase its enrollment from 18,000 students to 25,000 students. But in order to do that, it needed to be able to accommodate its growing student body. Insert Douthit Hills – the largest undertaking, both in size and in cost, in Clemson's history. Spanning 80 acres of Clemson University's campus, Douthit Hills is a state-of-the-art, mixed-use development that will include student housing, a residential dining center, bookstore, a new campus recreation center and retail spaces.

Metromont has worked on a number of total precast structures, particularly for the student housing market. Having heard about a total precast student dormitory we did for the Savannah College of Art & Design, Holder thought a total precast solution would give them an edge over their competition. With competitive pricing and a schedule that couldn't be beat, a total precast solution was the obvious choice.

Metromont worked closely with the two architectural firms on the project to rework the layout in order to achieve an open feel. Horizontally stacked wall panels enabled us to incorporate more punch outs for windows and doorways without compromising load bearing ability. In order to appeal to both incoming freshmen and upperclassmen, the design team wanted to incorporate two living arrangements – standard dormitory style housing as well as apartment style housing. With Metromont's MetroDeck system, we were able to create a modular system capable of accommodating both living arrangements with fewer ceiling joints and pieces than with other systems.

Douthit Hills is divided into 3 zones – the west, central and east zones – and totals 7 buildings. Below is an outline of when erection began and was completed for each building.

BUILDING A:

435 Pieces

198 MetroDeck

219 Insulated Wall Panels

BUILDING B:

798 Pieces

376 MetroDeck

363 Interior & Exterior Wall Panels

BUILDING C:

625 Pieces

276 MetroDeck

296 Interior & Exterior Wall Panels

BUILDING D:

409 Pieces

195 MetroDeck

185 Interior & Exterior Wall Panels

BUILDING E:

549 Pieces

205 MetroDeck

234 Interior & Exterior Wall Panels

BUILDING F:

308 Pieces

138 MetroDeck

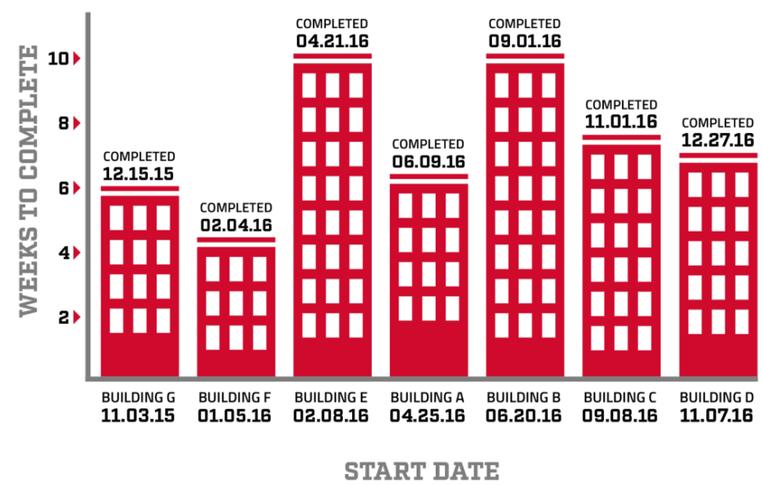
131 Interior & Exterior Wall Panels

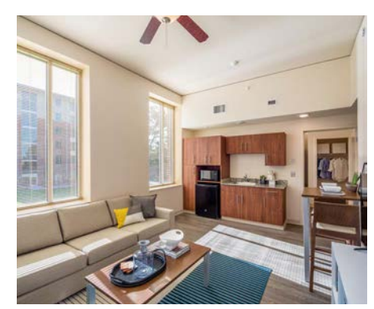
BUILDING G:

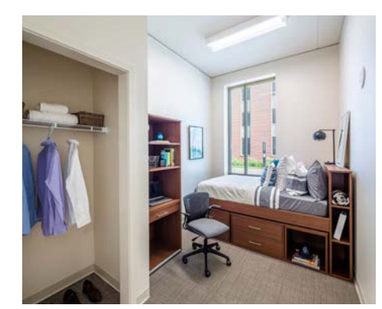
470 Pieces

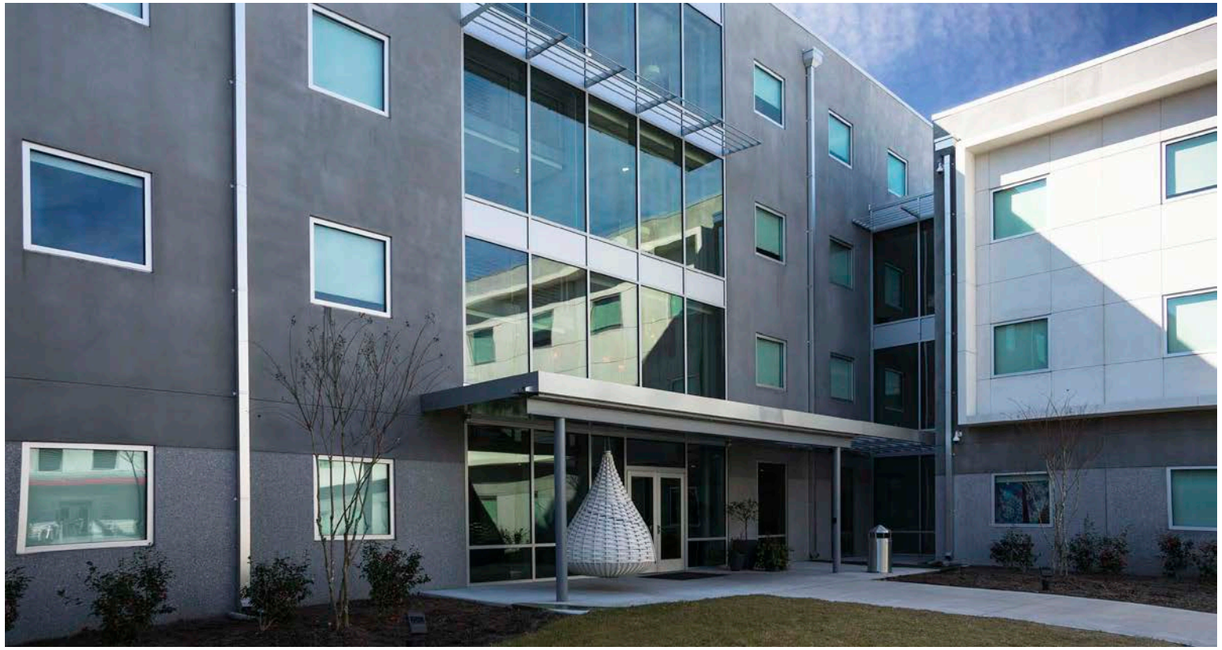
196 MetroDeck

209 Insulated Wall Panels









SCAD Montgomery House

Student Housing
Savannah, GA

OWNER
SCAD

ARCHITECT
Mackley Mitchell Architects

GENERAL CONTRACTOR
Clayco Corporation

Located on a former industrial site in Savannah's Jackson Park neighborhood, Montgomery Hall is home to approximately 500 SCAD students and features study rooms, group lounge spaces and studios as well as a dining hall. Montgomery Hall, better known as "Monty" to students and staff, is a total precast facility with a modern design, reflective of SCAD's global reputation for cutting-edge facilities and creative culture.

The original design called for a steel frame with a brick and block exterior. It wasn't until the durability of the building became a focal point of discussion that the design team began to consider the benefits of a total precast structure. Metromont delivered a one-stop solution for the total structure of the building including insulated, exterior wall panels with a variety of architectural colors and finishes. A total precast solution enabled the design team to meet time and budget requirements while also delivering a modern, state of the art facility.

PROJECT DETAILS

- Four level total precast system with 8.5" R-13 Insulated Load bearing walls with 10" MetroDeck floor system
- 114,129 sq. ft. - 568 pieces
- 112,000 sf of elevated floor and roof
- Erected in 11 weeks

ARCHITECTURAL DETAILS

- Exterior wall panels were designed with four different colors and finishes to break up scale of building
- Standard gray concrete mix with light sandblast finish
- White concrete mix with light sandblast finish
- Charcoal tinted gray concrete mix with light sandblast finish
- Standard gray concrete mix with heavy sandblast finish

The Metropolitan

Student Housing
State College, PA

OWNER
Landmark Properties

ARCHITECT
Niles Bolton Associates

GENERAL CONTRACTOR
Landmark Construction

Designed to meet the needs of both students and non-students in the community, The Metropolitan is a 12-story, U-shaped mixed-use building with urban convenience. The building combines a total of 132 residential units with office space, 40,000+/- SF of retail/amenity space and three levels of underground structured parking. The three below-grade parking levels are constructed of cast-in-place retaining walls and stair shafts and precast vertical and deck members. Levels 1-3 are comprised of precast beams and slabs and topped at level 3 with cast-in-place beams on top of precast columns with a precast deck forming a podium for the 10 levels of MetroDeck above. Levels 3-13 utilize the MetroDeck System with insulated pre-finished (inside and out) precast bearing walls and the MetroDeck floor system. The architectural details and finishes include medium sandblast finish with a limestone color and cast-in brick.

PROJECT DETAILS (METRODECK LEVELS 3-13)

- 12-level total precast system
- 109,398 sq ft of wall panels
- 8" MetroDeck floor system
- 997 total precast concrete pieces
- Erected in 6 months

ARCHITECTURAL DETAILS

- Limestone colored concrete mix with medium sandblast finish
- Cast-in thin brick

GSU Piedmont Central

Student Housing
Atlanta, GA

OWNER
Corvias Campus Living

ARCHITECT
Cooper Carry

GENERAL CONTRACTOR
Choate Construction Company

In order to accommodate a growing need for housing, Georgia State University (GSU) recently added Piedmont Central, a 253,843-SF student housing development which includes 1,152 beds in 320 suite & semi-suite style dormitory units, a dining hall, classroom space, community rooms, laundry rooms, and a green space courtyard.

The total precast structure used an innovative design with load-bearing, thermally efficient insulated wall panels for the exterior. The wall panels had an R-value that exceeded the energy code with the back sides hard-troweled and painted as the finished interior surface, thus satisfying all requirements for the wall system in one precast panel. The floor system was a prestressed MetroDeck system the width of a room that became the finished ceiling with no joints. The MetroDeck system was cast with voids (formed by foam) to reduce weight. A precast, load-bearing corridor wall supported two spans (one across one row of rooms and the other across a row of rooms and the corridor) and was the final finish on both sides after painting.

The design/build team opted to use precast concrete for this project when preparing the winning proposal to the owner. Metromont joined the design team and helped to prepare the proposal, then assisted with construction designs. The two primary reasons for selecting a total precast structure were speed of erection to meet a truncated schedule, and to move the labor and staging from a tight urban job site to the manufacturer's plant. The precast structure was erected in six months, allowing the general contractor to jump start all trades and interior finishing in order to timely complete the dormitory for the start of the 2016 fall school year. The structure was erected by a six-man crew, loads were delivered just in time and only the space to park two loads was required on the job site.

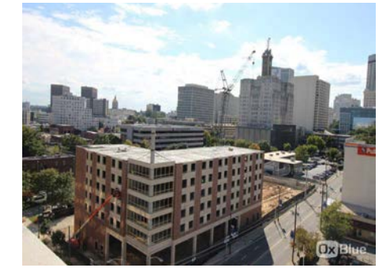
Metromont produced 200,670 SF of wall panels, 237,223 SF of prestressed decking, 27 beams, 69 columns, and 46 stair tread and riser sections for the project. Architectural details and finishes include medium sandblast finish with a limestone color, cast-in red thin brick, and selected runs of precast panels painted blue of school logo.

PROJECT DETAILS

- Total Precast Concrete Structure
- 14 months from groundbreaking to move-in to 1,152 beds
- 1,803 precast concrete pieces
- 200,670 sq ft wall panels, 237,223 sq ft of prestressed MetroDeck, 27 beams, 69 columns, and 46 stair tread and riser sections
- Insulated Wall System

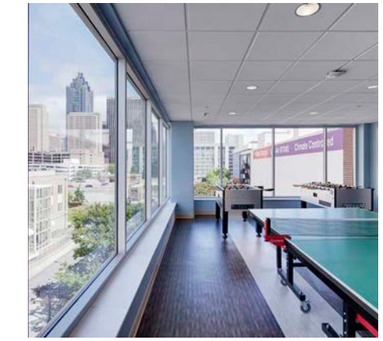
ARCHITECTURAL DETAILS & FINISHES

- Medium sandblast finish with a limestone color
- Cast-in red thin brick
- Selected runs of precast panels painted blue of school logo



A total precast system helped to reduce congestion at the tight urban site which was bounded by two streets and property boundaries. Loads were delivered just in time and only the space to park two loads was required on the job site. The structure was erected in six months, allowing the general contractor to jump start all trades and interior finishing.




WCU Upper Campus Residence Hall

Student Housing
Cullowhee, NC

OWNER
Western Carolina University

GENERAL CONTRACTOR
James R. Vannoy & Sons

ARCHITECT
Clark Nexsen

The WCU Upper Campus Residence Hall is a five-story, 165,000-SF, 612-bed dormitory at the central part of Western Carolina University's main campus. When completed, the new residence hall will include double occupancy and single occupancy living units, kitchen/living room spaces, laundry rooms, study rooms, resident assistant apartments, university office suite, and building support spaces. A total precast design and exterior skin was selected to help aide the expedited 17-month construction schedule. The project is scheduled to be ready for students for the Fall 2019 semester.

As part of an increase in student enrollment, the University established a strategic plan for guiding the growth of the institution. A significant portion of the master planning goal is dedicated to the replacement of its residence halls, which were built during the 1950s. The Upper Campus Residence Hall project is the first step in moving the University forward towards that goal. The Upper Campus Residence Hall project acts as a gateway between the steep topography, giving students an on-grade internal and external pathway to traverse campus.

PROJECT DETAILS

- 1,372 pieces total
- 151,950 SF (324 pieces) of 11" (3'-4"-4") sandwich wall panels
- 148,530 sq ft (501 pieces) of 9.5" deep MetroDeck
- Buildings A & B erected in 47 working days
- Building C was erected in 26 working days

ARCHITECTURAL DETAILS & FINISHES

- Medium sandblast finish
- Light sandblast finish
- Form-Liner
- Red cast-in thin brick with running bond and soldier pattern
- Steel trowel finish on interior

NOVA Southeastern University MAKO Residence Hall

Student Housing
Davie, FL

OWNER
RISE: a Real Estate Company

GENERAL CONTRACTOR
Juneau Construction Co.

ARCHITECT
Niles Bolton Associates

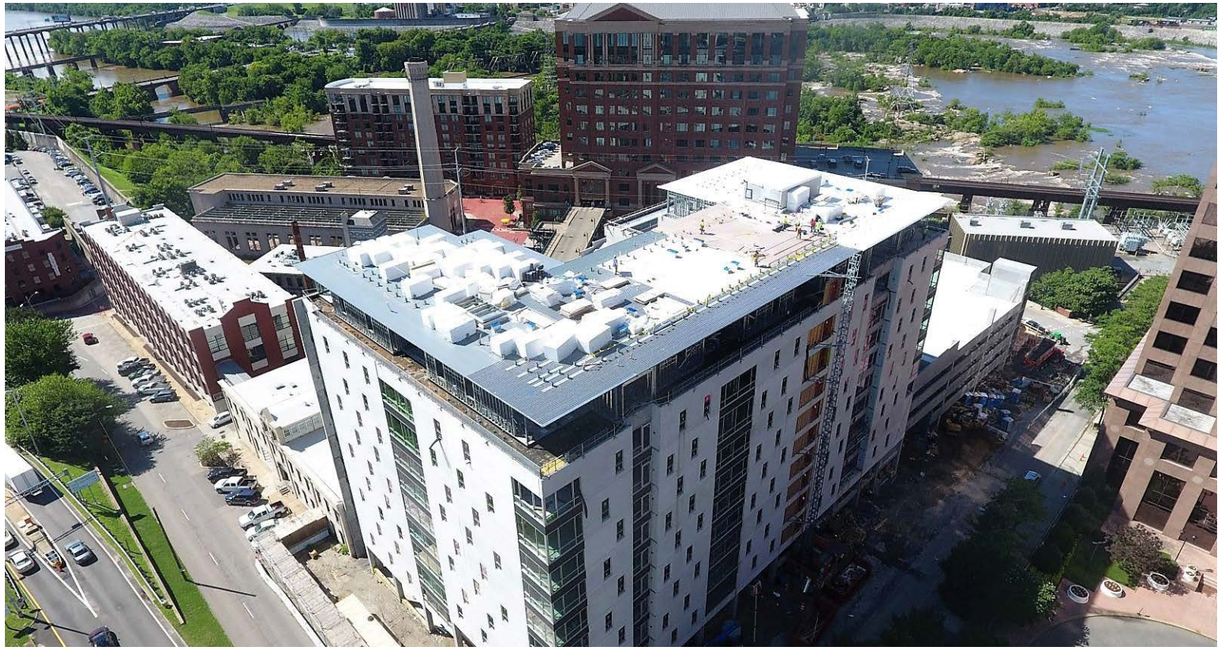
Located in Davie, FL, the seven-level NOVA Southeastern University Residence Hall project was converted from an original design of cast-in-place with block and stucco to a total precast mid-rise structure incorporating Metromont's MetroDeck floor system, which was used because of its low profile to create a higher finished ceiling. The continuously insulated, load-bearing wall panels include integral architectural colors, four architectural sandblast finishes, and a formliner to create a unique look that complements the surrounding buildings while taking advantage of lower life-cycle costs. Metromont produced 315,000 SF of MetroDeck System for the project. One of the key advantages of the MetroDeck system was speed of construction. The NOVA Southeastern University Residence Hall project was constructed in just 14 months from contractor mobilization to student move-in.

PROJECT DETAILS

- 315,000 SF MetroDeck System
- 2,118 precast concrete pieces
- Finished interior and exterior walls
- 14-months construction from contractor mobilization to move-in
- Erected in 5 months
- Total precast 7-story mid-rise building

ARCHITECTURAL DETAILS & FINISHES

- 4 architectural sandblast finishes
- 1 Form Liner finish



The Locks Tower Apartments

Multi-Family Residential
Richmond, VA

OWNER
WVS Companies

GENERAL CONTRACTOR
KBS, Inc.

ARCHITECT
Walter Parks

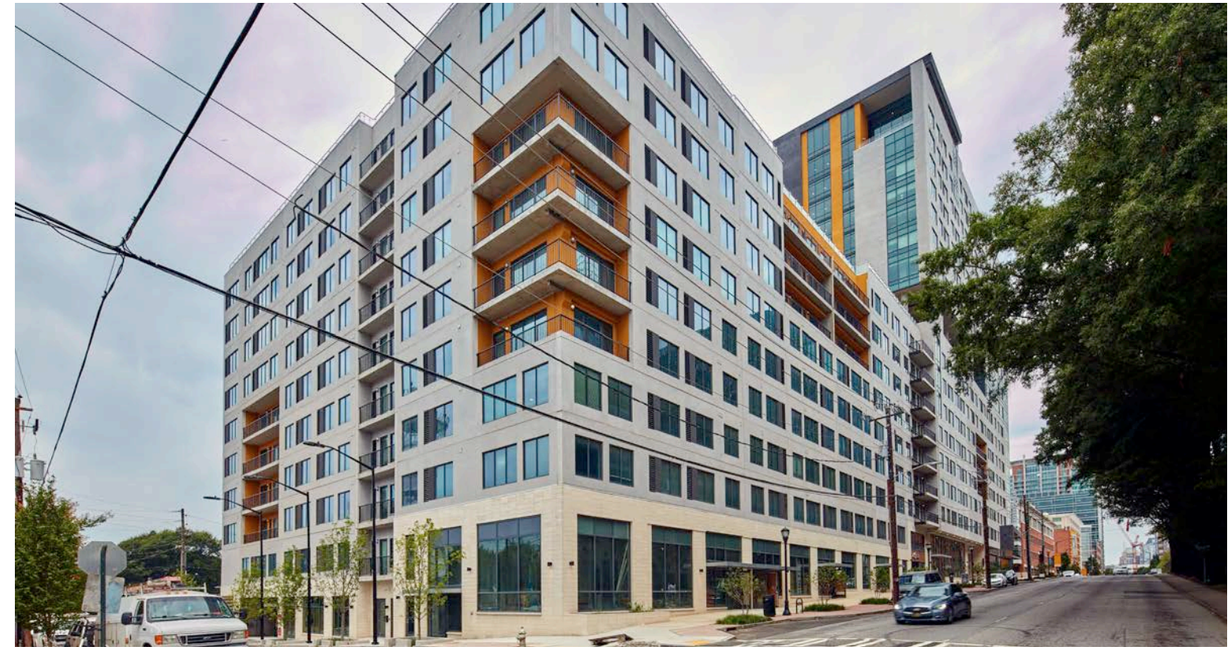
PROJECT DETAILS

- 11 precast levels
- 301,814-SF MetroDeck System
- 10th floor indoor/outdoor amenity level with swimming pool over residences.

ARCHITECTURAL DETAILS & FINISHES

- White color precast
- Architectural precast finish and paintable interior precast walls
- Steel trowel finish on interior

Located at East Byrd and South 10th streets in the Locks development, the 12-story Locks Tower apartment building is the first total precast building in downtown Richmond. With 11 precast levels, the 301,814-SF MetroDeck System structure features 237 Market Rate apartments, a two-story steel penthouse, and an indoor/outdoor amenity level with a swimming pool on the 10th floor. The structure also includes precast parking levels, partially inside the tower and 12,000 SF of commercial space on the first level. For Metromont, The Locks Tower was an opportunity to showcase the versatility and performance of its total precast structures. Metromont developed the project's initial design directly with the owner's architect at the request of the owner. The MetroDeck System's cost efficiency and speed of construction played a significant role in the owner's desire for a precast building and Metromont provided a total precast complete building envelope (except roofing and glass), including an architectural precast finish and paintable interior finish on precast walls. The project included several unique aspects, including an architectural finish on the transfer beams and a pool over the residences rather than on the parking deck.



The Standard at Atlanta

Multi-Family Residential
Atlanta, GA

OWNER
Landmark Properties

GENERAL CONTRACTOR
Landmark Construction

ARCHITECT
Niles Bolton Associates

PROJECT DETAILS

- 320,952 sq ft; 1,584 pieces
- Provided M-Shell cladding for 19-story tower
- Total precast 10-story mid-rise building and parking garage with amenity level

ARCHITECTURAL DETAILS & FINISHES

- Steel trowel finish on inside of exterior walls in mid-rise residential wings
- Light sandblast

The Standard at Atlanta is a mixed-use student housing development that serves the undergraduate and graduate student population in Midtown Atlanta. The 19-story, high-rise tower includes 257 units furnished residential units with a mix of studios, one, two, three, four and five bedroom units.

Metromont was engaged by the building owner and contractor to provide cladding for the 19-story cast-in-place tower. Rather than using standard precast concrete cladding, Metromont incorporated its proprietary M-Shell system. This lightweight system, ideal for high rise construction, is comprised of a 2 ½" concrete face with 6" of light gage metal studs The M-Shell panels were sprayed with closed cell insulation in plant or field. To ensure the panels are continuously insulated, a small gap is left between the steel back and concrete face to allow space for insulation.

Metromont was contracted to engineer and construct the total precast concrete mid-rise structure and 10-story parking garage with a rooftop pool which was completed in the spring of 2019.

The Pearl
Multi-Family Residential
Tampa, FL

OWNER
SoHo Capital

ARCHITECT
Mesh

GENERAL CONTRACTOR
Batson-Cook Construction

The Pearl is a mixed-use apartment complex in Tampa's historical neighborhood, Tampa Heights. Two of the three apartment buildings (Buildings #1 and #2) are comprised of architectural and structural precast concrete, while building #3 was constructed with block and precast concrete hollowcore. The 3-story block and plank structure took 55% longer to construct with half the square footage as the two MetroDeck structures.

Building #1 is a seven-level, 128,939-SF total precast structure with 107 units. Construction was completed in 13 weeks. Building #2 is a seven-level, 157,771-SF total precast structure with 117 units. Construction was completed in 18 weeks. Building #3 is a four-level, 137,879-SF CMU and Hollowcore structure with 90 units. Construction was completed in 48 weeks.

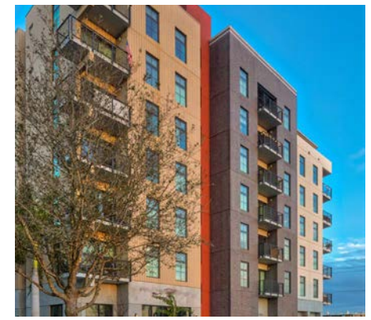
PROJECT DETAILS

- Load-bearing precast concrete wall panels with continuous insulation
- MetroDeck floor & roof system
- Precast concrete balconies
- Precast concrete stairs and stair towers
- Integral architectural finishes on interior and exterior of wall panels

ARCHITECTURAL DETAILS & FINISHES

- Six architectural finish combinations on exterior
- Formliner
- Cast-in thin brick
- Various architectural mixes with sandblast finish
- Interior concrete wythe left exposed

The project utilized a MetroDeck floor and roof system, load-bearing precast concrete wall panels with continuous insulation, precast concrete balconies, precast concrete stairs and stair towers, and integral architectural finishes on interior and exterior of wall panels. The architectural details and finishes on the three buildings include six architectural finish combinations on the exterior, formliner and cast-in brick, various architectural mixes with sandblast finish, and an interior concrete wythe left exposed.



With a near identical scope and smaller overall structure, the building constructed of concrete block and hollowcore took more than double the construction time compared to the total precast buildings.

SCAD Atlanta

Student Housing
Atlanta, GA

OWNER
SCAD

MANUFACTURING & INSTALLATION
Metromont

ENGINEER
Uzun + Case

ARCHITECT
Mackey Mitchell Architects

GENERAL CONTRACTOR
Clayco

THE CHALLENGE

An Award of Excellence winner in the ACI GA Chapter's 2019 Dan Brown ACI Awards, the new 14-story FORTY student housing community located on the Atlanta campus of the Savannah College of Art & Design (SCAD) is an all-precast structure that offers both apartment and suite-style housing for SCAD students. The ground floor of the 183,000-SF residence hall contains lounge space, residence life office space, and a coffee bar. A terrace located above the ground floor lounge is accessed from the first floor, with tensile sails supported between the residence hall and the outer terrace providing shade for the terrace. The first floor includes a central laundry room lounge, resident director apartment, and student suites.

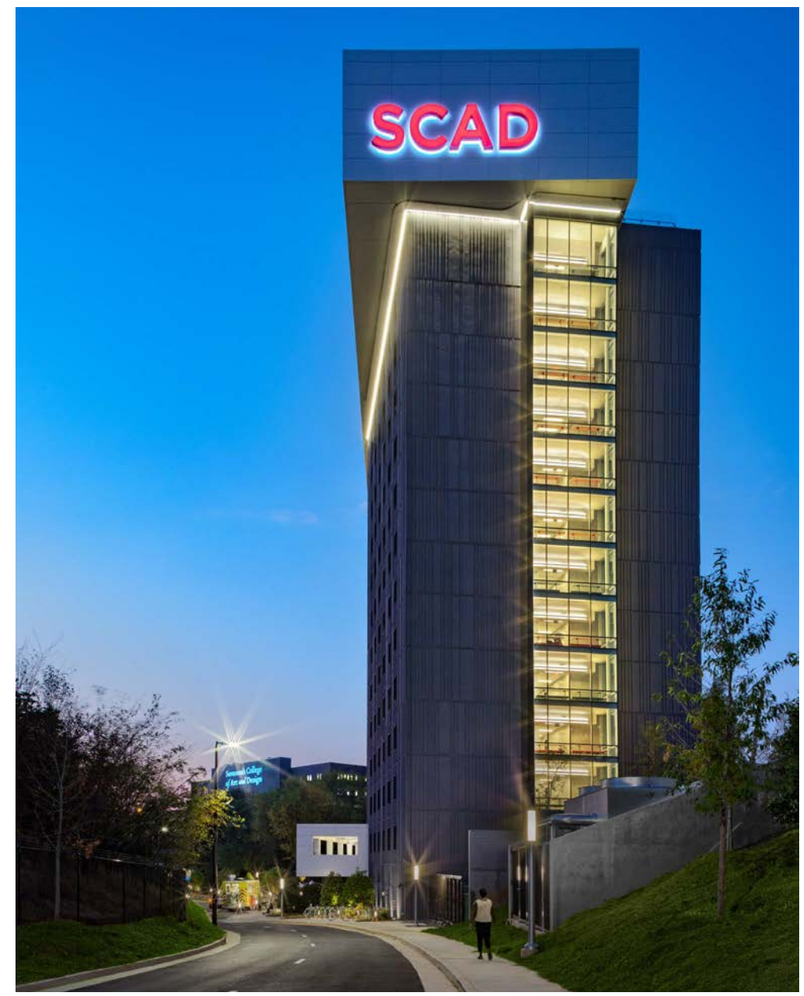
PROJECT DETAILS

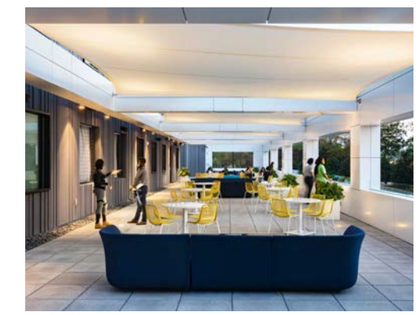
- 183,000 sq ft, 14-story, Total Precast Concrete Structure
- 71,695 sq ft Insulated, Load-bearing Wall Panels with Thermal Value of R-12
- 134,658 sq ft 9.5" MetroDeck Floor and Roof System
- Construction Completed in 6 Months

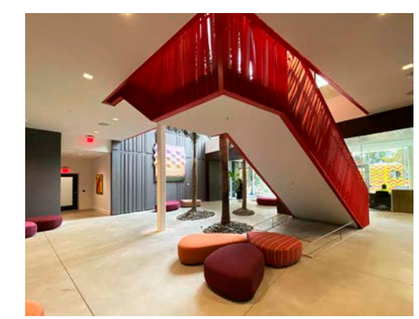
ARCHITECTURAL DETAILS

- Ribbed Formliner
- Moderate Sandblasting
- Paint applied in field by others

The upper floors of the residence hall contain a mix of student residential units, providing a total of 592 student beds in the building. The top level serves as a partial story for event space, support space, or a rooftop terrace. Produced at Metromont's Hiram, GA plant, the structure is comprised of exterior, loadbearing walls with EPS insulation with a gray color concrete mix and cast-in form liner. The floor and roof are constructed with Metromont's proprietary MetroDeck precast slab system, which includes insulation cast-in at our plant and a field-applied topping to help transfer diaphragm loads and provide a level floor. Construction of the SCAD Atlanta residence hall was completed in an amazing six months, beginning March 2019 and ending August 2019.







Design Assistance - Why Get Metromont Involved Early?

Our experience has been that meaningful, early engagement is the surest path to rapid deployment and accelerated construction schedules. By involving Metromont at the earliest stages of design development, we can guide the design team toward a precast solution that meets the owner's schedule and financial needs, while also providing a structure that satisfies the design team's aesthetic vision. Early involvement also allows us to identify potential design issues and make recommendations before they become issues that could jeopardize the project schedule or budget. Below is a sample of our typical design-assist proposal document:

General Principles:

A. Metromont Corporation shall become a member of the Design Team (Architect/Structural Engineer/MEP Engineer), attend regularly scheduled meetings with other members of the Design Team, provide information, and make recommendations to the other members of the team in regard to development of the design, feasibility, constructibility issues, time requirements for construction, safety issues, and development of the precast costs. Metromont, along with the Design Team, shall work together to complete the Construction Documents with the understanding and based on the condition that they will mutually cooperate and collaborate to enable each phase of the completion of the construction documents to be completed timely, efficiently, and with the highest possible quality.

B. Metromont shall work with the Owner and the Design Team to analyze various design options, as required to maintain the precast budget established within the control estimate. At various stages of design, Metromont shall provide "Best Cost Solutions" that accomplish the intent of design. Such recommendations shall consider not only first cost of implementation, but also the time required for construction, resultant quality, maintenance, operational cost, and functionality.

C. Metromont will be responsible to assist the Design Team in ensuring that the systems meet applicable codes, performance specifications, work within the physical constraints of the architectural/structural design and meet budget and schedule goals. Metromont will also assist in the development of precast/prestressed concrete specification section 03 41 00.

D. Throughout the project, Metromont shall participate in the design, offering details and overall system design suggestions and aid the Design Team in the development of the drawings. All precast erection drawings, including cast-unit (shop) drawings will be created by Metromont, through its in-house Engineering staff or its Precast Engineering Consultant(s). At the request of Owner, Metromont will develop a 3D BIM coordination model of the precast structure to level 300.

Building Information Modeling (BIM)

The following levels of model development/detail can generally be provided by Metromont Corporation.

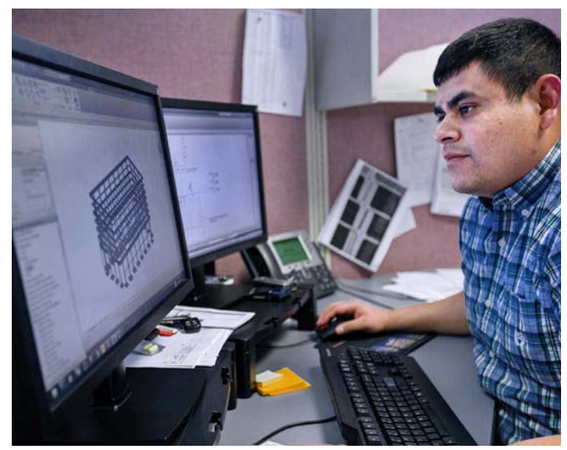
LOD 100: Conceptual design, overall building massing, including basic footprint and number of floors. May contain generalized assemblies w/approximate interfaces, quantities, sizes and shapes, but not necessarily dimensionally specific. Appropriate for $/sq ft cost estimates such as preliminary lump sum price. Deliverable largely limited to screen captures of model views with little text editing. Likely modeling platforms: Sketchup, Revit, Tekla.

LOD 200: Schematic design development, specific assemblies with quantities, sizes, and shapes as would be shown in a "panelization submittal." Precast elements modeled as solid objects, dimensionally specific, but with no internal elements like reinforcing or connections. These drawings are suitable for MEP and other trade coordination. Deliverables include fully annotated plan, elevation, and building section drawings, as well as product take-off. Likely modeling platforms: Revit or Tekla. Standard default for design-assist agreements.

LOD300: Specific assemblies and detailed model elements suitable for the generation of traditional construction documents and shop drawings. Some conceptual connections included, but no reinforcing. Likely modeling platforms: Revit or Tekla.

LOD400: Full connections, reinforcing, lifting devices, etc. included in model. Model object granularity includes "the nuts and bolts, but not the threads." General arrangement (GA) and cast unit (CU) drawings generated at this level are equivalent to Metromont "Erection Drawings" and shop tickets. Modeling platforms: Revit and Tekla

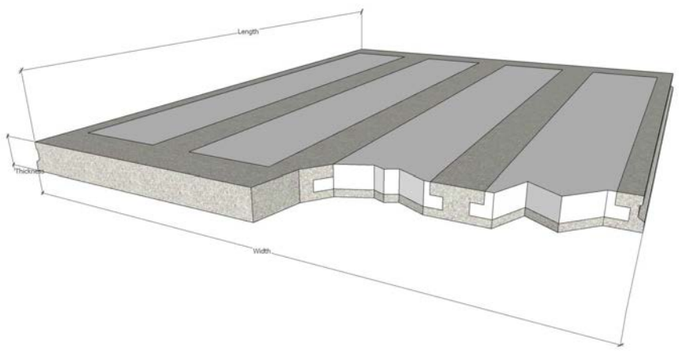
LOD500: Model as-built.



Products

MetroDeck

The MetroDeck precast/prestressed concrete framing system incorporates a floor and roof product based on proven engineering principles and applications. The flat floor plate design offers all the benefits of commercially available concrete systems and much more. The wet cast floor and roof components are typically 9.5" minimum to varying depths with a typical width of 12'. When the components are integrated with precast/prestressed columns, beams and walls, the framing system can be competitive on projects of all sizes from mixed-use, retail/condominium structures to multi-story office buildings and dormitories.



METRODECK DETAILS
Function: A voided horizontal spanning member. Generally used when a flat ceiling is required and thinner floor section
Design: Prestress
Width: Typical 12'
Length: Spans up to 45' and longer have been achieved
Depth: Topping will vary from 3 1/2" at ends to 2 1/2" at mid-span

MetroDeck is the ideal product designed specifically for Total Precast Structural Systems. The long span capability makes it compatible with typical floor-to-floor heights while also reducing bearing requirements allowing for open floor plans. They are typically supported by the exterior precast walls, corridor walls, or beams for office buildings. Open floor plans at the first level is achieved with precast columns and precast transfer beams.

MetroDeck is wet cast. This allows for significant design flexibility and reduces framing elements. Cast-in plates or inserts can be added at minimal cost and stem spacing can be modified to allow for shafts and large penetrations.

Customizable depths allow for variations between projects and within the same project. Depths can also be increased for longer spans or heavier loads. Minimum depth is 9.5".

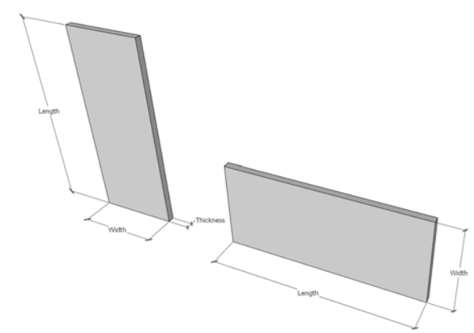
Customizable widths allow for it to be project specific. With widths up to 14' wide, we can design MetroDeck to module with unit layouts and penetrations. For example, it's common to make the deck the width of the rooms for hotels and student housing.

MetroDeck provides for an exposed smooth ceiling that is paintable. As mentioned earlier, with customizable widths, the joints can be eliminated in rooms. There isn't a need for a drop ceiling other than those typically found in kitchens and baths.

Wall Panels

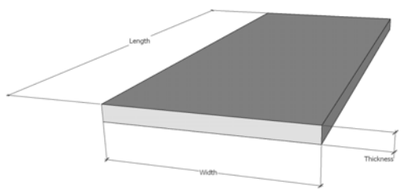
Precast wall panels come in various shapes and sizes to meet your design needs. Typical story heights include 10', 12', and 13'-4" wide and panels turned vertically to accommodate floor to floor heights greater than 14', typical of the first level. Other custom widths are available. Typical wall panel heights range from 10' up to 50' for a single element (to accommodate three-level structures). Structures with multi-stacked wall panels can reach heights of more than 180'. Products can be insulated to provide superior thermal efficiency. Exterior finishes include cast-in brick, sandblasting, formliners, reveals and custom mix designs.

- Horizontal
- Solid or Insulated
- Openings and minimum areas of precast
- Continuous insulation (c.i.)
- Shearwalls



WALL PANEL DETAILS
Function: Load bearing or non-load bearing vertical spanning element that can provide decorative finishes, soundproofing, and fire resistance. Panels can also act as shearwalls
Design: Prestress or conventionally reinforced
Width: Typical 12'
Length: Typical up to 45'
Depth: Typically 8"-12"

Flat Slabs



FLAT SLAB DETAILS

Function: Horizontal spanning member where MDK is not appropriate

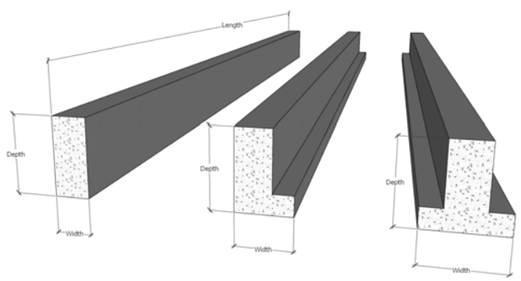
Design: Prestress or conventionally reinforced

Width: Typical 12'

Depth: Depends on application

Length: Varies depending on loading and depth

Beams (R Beams, L Beams & T Beams)



BEAM DETAILS

Function: Spanning members that provide support for floor or roof members

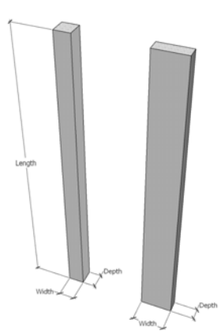
Design: Prestress or conventionally reinforced

Width: Varies depending on loading & spans

Depth: Varies depending on loading & spans

Length: Varies depending on loading and depth

Columns (Interior Columns & Wall Columns)



COLUMN DETAILS

Function: Vertical members that provide support for floor or roof surface

Design: Prestress or conventionally reinforced

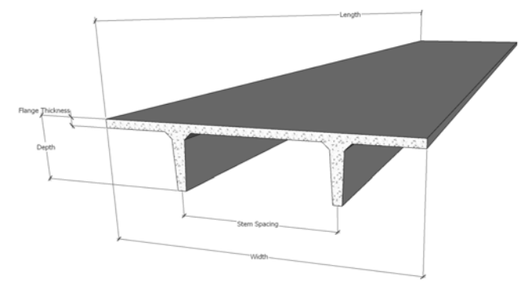
Length: Typical 45'

Size: Minimum column size is 12" x 24"

Double Tees

Precast Double Tees have traditionally been used in parking structures. Over the past decade, double tees have been integrated into the building envelope for use in floor and roof systems varying between 30' to 40'. There are numerous benefits including inherent fire resistance, speed of construction and sustainable design – contributing to LEED®.

- Longer Spans
- Applications are Podiums, Amenity Levels, and Integral Parking
- Profiles Vary by Plant



DOUBLE TEE DETAILS

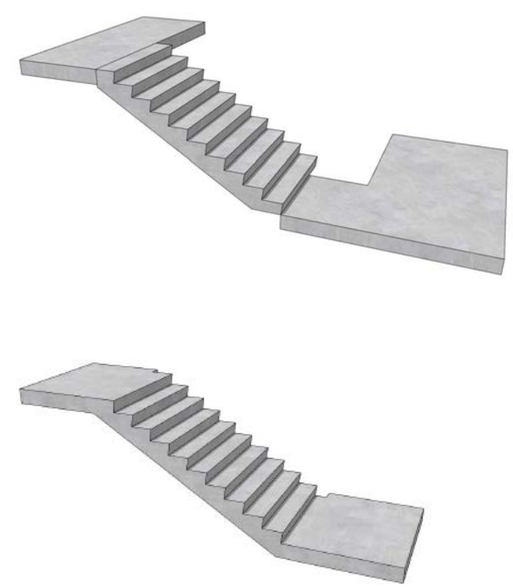
Function: Horizontal spanning member where MDK is not appropriate

Design: Prestress or conventionally reinforced

Width: Typical 12'

Depth: Depends on application

Length: Varies depending on loading and depth



BEAM DETAILS

Function: Provide vertical egress in an elevated structure

Design: Prestress or conventionally reinforced

Width: Typical 4'-12'

Depth: Varies depending on loading & spans

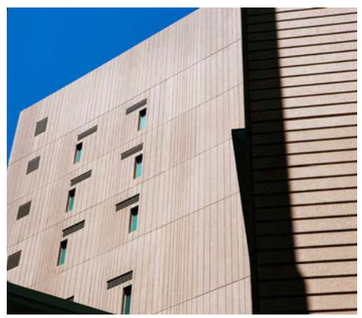
Length: Varies depending on loading and depth

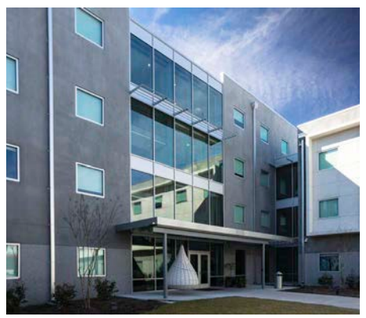
Aesthetics

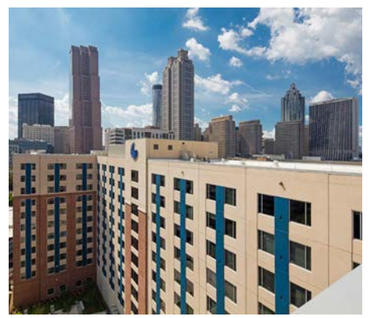
Precast concrete offers owners and designers near limitless design freedom and the ability to create structures that blend seamlessly with the surrounding landscape. Metromont works with owners and designers to help them realize their unique project visions with individualized precast solutions that are durable, cost effective and beautiful.

Color, Textures, & Applied Finishes

Through a variety of aggregates, choice of matrix colors, varying depths of exposure, and finishing techniques, precast can meet almost any color, form, or texture that may be specified by the designer. The beauty of natural aggregates is greatly accentuated when the aggregates are fused with the color and texture benefits of precast.







Applied Finishes

There are a variety of post-applied techniques used to achieve the desired appearance and character of the facade. The structure's final appearance is obtained through the combination of the concrete mix design selection and the choice of applied finish.

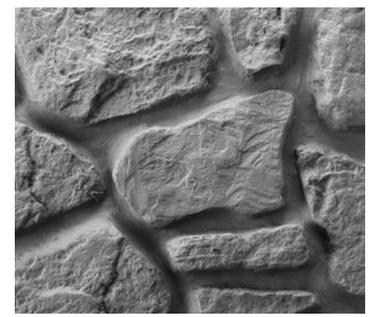
Retarder

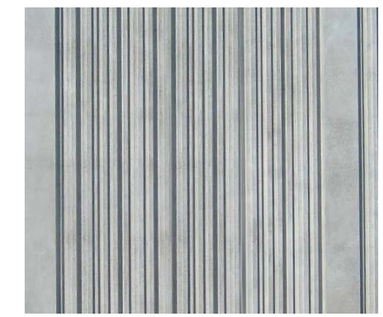
Sandblast

Acid Etch

Formliners

Formliners offer a wide array of possibilities in shapes, patterns, textures and designs. Any combination of applied finishes can be utilized in conjunction with formliners.

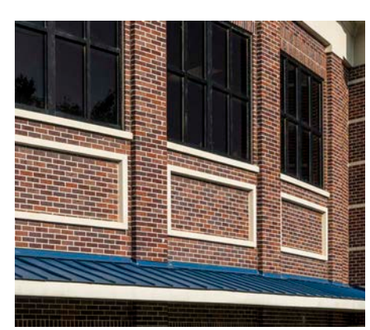


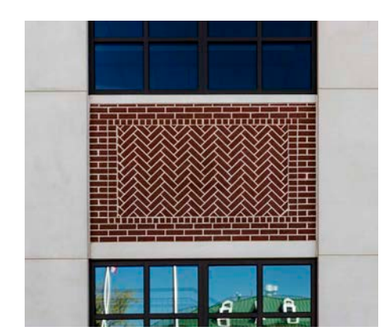


Thin Brick

There is no faster way to install brick on a building than concrete-faced wall panels. Brick liner systems offer diverse options for producing creative brick facades by accommodating any brick size, shape, pattern, and point devised. The advantages of brick-embedded concrete over conventional masonry include:

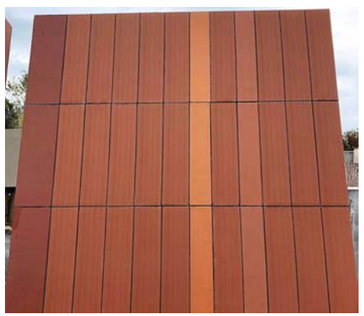
- Structural and aesthetic value
- Simplified engineering
- No flashing, lintels or weep cavities
- Reduced construction time
- Recommended in seismic zones
- No sand, mortars or mixers on site

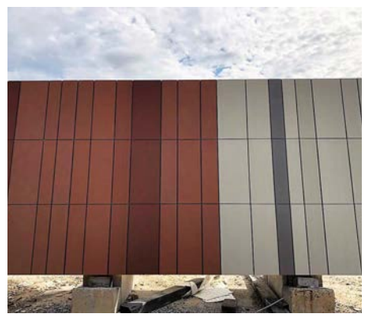




Terra Cotta-Faced Precast Concrete

Terra cotta tiles have been used for decades by designers to give commercial and residential structures an aesthetically distinct character. Today, designers are realizing the options and advantages of embedding terra cotta into precast concrete panels as a way to more efficiently use terra cotta in the design and construction of commercial buildings. Terra cotta-faced precast panels offer aesthetic versatility, enable accelerated construction, provide high thermal performance, and reduce the number of joints and maintenance costs. For more in-depth information about designing with terra cotta-faced precast concrete, The Precast/ Prestressed Concrete Institute (PCI) offers its Terra Cotta-Faced Precast Concrete Designer's Notebook on its website, www.pci.org.





Interior

Precast concrete wall panels can be left exposed on the interior and painted or furred out with drywall. A MetroDeck floor and roof system can be left exposed and painted. Drop ceilings are typically used to conceal MEP.

Design Considerations & Solutions

This section covers just a few items to consider when designing a total precast building.

MEP

All vertical and horizontal penetrations must be addressed whether cored or cast-in. Metromont only casts in penetrations over 10" square or diameter.

MetroDeck is customizable up to 14' in width which makes it easier to cast in horizontal penetrations without the need for additional framing.

By having Metromont on board early, we can assist on efficient framing analysis to determine how to most cost effectively frame out for chases or other horizontal penetrations for MEP work. By continually being involved in assisting with the coordination of penetrations, we can make sure that the project stays on schedule and within budget.

Job Site & Logistics

One of the first things to determine during preconstruction is how the project will be constructed and sequenced. Similar to cast-in-place structures, the MetroDeck system involves horizontal construction with each floor being constructed one level at a time. However, the building can be separated into phases at expansion joints. If there are no expansion joints, it may be possible to engineer a construction joint to achieve the same thing as an expansion joint for construction purposes. The construction joints may require additional cost based on unit layouts and stability.

Projects are typically erected with a 275T-325T crane with a Luffer, although they can be erected with a tower crane (this could change piece sizes). Determining that at the outset of the project allows for the project to be designed and panelized based on the installation type.

By getting Metromont involved early on, our team can provide answers to critical questions such as:

A. How the crane will swing when others are working in the building
B. How many levels will be erected before other trades can begin work
C. How the Contractor will control access every day.
D. Where is the crane path, access and crane removal?
E. How product is delivered to the site.
F. Address street closings, traffic control, existing utilities (overhead and underground).

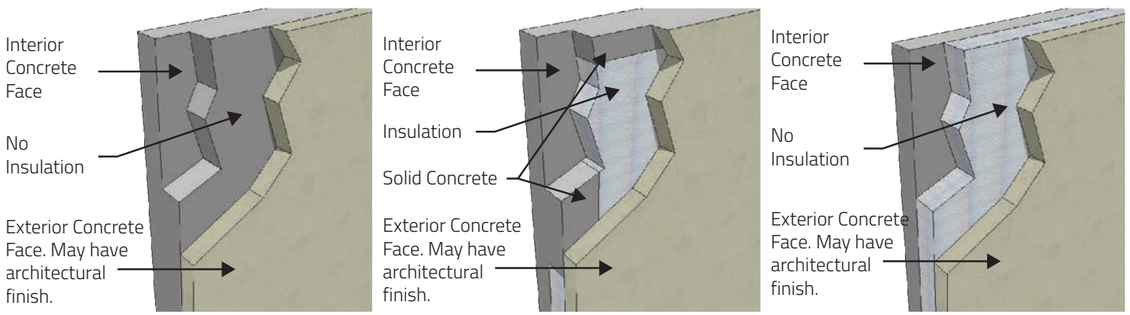
Each project is different and has different solutions. Answering these questions up front ensures a more accurate price and allows for proper scheduling of overall project.

Energy Efficiency

Case studies have shown energy savings of 30% to 40% using the MetroDeck envelope system versus traditional construction.

Exterior precast concrete walls are continuously insulated (c.i.). Each project should be calculated individually according to its layout and floor to floor height. The typical 11" exterior panel has provides a mass wall c.i. with an R-value of 13.3. Higher R-values can be achieved by incorporating more insulation and/or a different variety than the EPS insulation typically used.

The MetroDeck floor and roof is not a c.i. product and requires continuous insulation as well as a vapor barrier where exposed to the outdoors. A good example of this would be in roofs and/or ceilings over parking. For preliminary calculations, it is safe to assume a steady state value of R=5.5 for MetroDeck. When used over parking, the underside must be protected from the atmosphere.



Solid

Has very little R-value. Generally used in areas of unconditioned space or where walls will be furred out with other material.

Semi-Solid

R-Value is significantly impacted by the amount of solid areas. Generally used as solid panel. Insulation is introduced to reduce material cost and allow multiple pieces to be shipped per load.

Continuous Insulation (c.i.)

Has highest R-value because insulation runs from edge to edge with no thermal breaks. R-value is dependent on insulation thickness and type, but can easily exceed R-20.

Thermal Breaks

- All columns and beams do not have insulation.
- The balcony/beam combination is not insulated.
- The parapets are solid above the roof, but insulated below.
- Stair and elevator shafts are insulated when required at exterior exposure.
- As with CIP, the cantilevered balcony slabs are not insulated.
- The underside of precast deck that is exposed to unconditioned space is not insulated.
- In cases where there is a shared wall between a precast parking deck and the occupied space, the wall panel is not insulated and needs to be furred out on the conditioned side.

Moisture Barrier & Waterproofing

When it comes to buildings, water has an unfortunate habit of getting where building owners don't want it to go. Once inside a building, it has the potential to do significant damage. Buildings gain, lose, and store moisture along with heat energy through a variety of physical mechanisms. Operating durability, efficiency and serviceability of the structure can be affected by moisture flow. Controlling moisture flow in a building also has significant impacts on occupant health, safety and comfort.

The concrete, typically over 5,000 psi in strength, absorbs and passes very little liquid water. Panel joints should have either two layers of sealant or sealant and a secondary method of defense against water penetration. Joints around openings should have primary and secondary seals. It is also important to determine the locations of joints and type caulking used along with the small details of slopes, offsets and flashing to direct water and reduce the risk of water intrusion.

Vibrations in Mixed-Use Structures with Parking

Mixed-use structures combining retail, residential, or commercial tenant space with ancillary parking areas have become a widely accepted use of precast concrete construction. Such structures commonly incorporate and isolate the required parking levels above, below, or even at the same level as the occupied space, thus allowing the structure to serve multiple functions. With the simultaneous presence of moving vehicles and building occupants, there may be concern that vibrations from the vehicles will prove uncomfortable to the tenants under certain conditions. While there is no authoritative collection of research data on this topic, the widespread successful use of such systems endorses their suitability. Metromont can provide component and connection configuration and/or solutions that have proved effective on previous projects. Vibration sensitivity varies greatly depending on the intended use and special considerations may be necessary for structures housing vibration-sensitive equipment or processes.

Acoustical

The MetroDeck System can provide a STC rating of 51 or greater as has been verified through lab tests. With 2.5" of topping, an IIC rating of 25 or greater can be obtained. Field testing of some configurations confirms lab tests and can be increased depending on various floorings provided in finished construction. For exterior 11" insulated panels, STC is calculated at 54.6. IIC is not applicable.

Windows

Window and door openings are cast directly into the precast wall. When determining locations for windows and door openings, there are several things to consider. Is the panel load bearing or non-load bearing? Is the panel being used for lateral stability? By engaging Metromont early, we can provide answers to those questions and help determine optimal window and door locations and dimensions that meet structural and aesthetic project requirements. See typical cross section detail for reference in the Appendix on page 65.

Partitions

Slide Track. Drywall ceiling track should allow for floor deflections.

Ornamentals

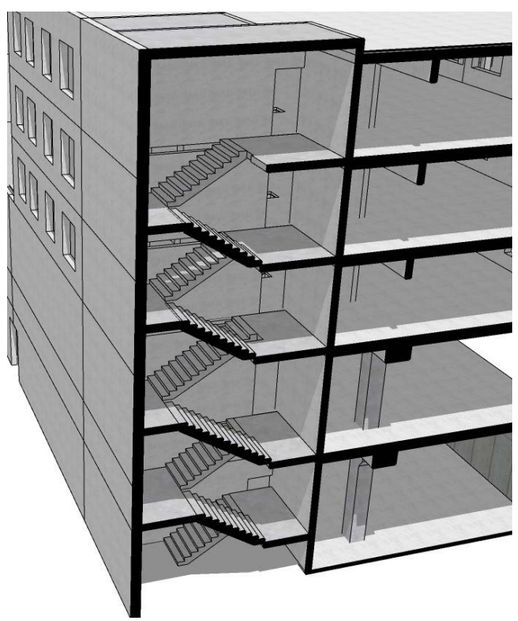
Architectural features can be added, but build-outs with other materials can be less costly.

Balconies

Balconies can be precast integral to the structure or add ons with other materials also known as a Juliet Balcony.

Precast Concrete Stairs

Precast concrete stairs can be installed with the structure. Temporary safety barriers provide instant access to the elevated levels, allowing other trades to begin work.



Contact Us

Metromont's MetroDeck System is a comprehensive building package with the potential to reduce both construction time and project costs for total precast multi-family and student housing projects. We hope that you've found the information and project profiles in this guide to be valuable and informative to your design process. If you have any questions regarding the MetroDeck System, please contact one of Metromont's experienced sales professionals listed below:

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Precast Structural Concrete Specifications

Part 1 General

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Precast structural concrete.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
2. Division 04 Section "Unit Masonry" for inserts or anchorages required for precast concrete slab connections.
3. Division 05 Section "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
4. Division 05 Section "Metal Fabrications" for kickers and other miscellaneous steel shapes.
5. Division 07 Section "Sheet Metal Flashing and Trim" for flashing receivers and reglets.
6. Division 07 Section "Penetration Firestopping" for joint-filler materials for fire-resistance-rated construction.
7. Division 07 Section "Joint Sealants" for elastomeric joint sealants and sealant backings.

1.3 DEFINITION

A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Architect.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design precast structural concrete, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated in contract documents.

B. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated in contract documents.

C. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Dead Loads: As indicated on contract documents
2. Concrete Topping Load: As indicated on contract documents
3. Live Loads: As indicated on contract documents
4. Roof Loads: As indicated on contract documents
5. Snow Loads: As indicated on contract documents
6. Seismic Loads: As indicated on contract documents
7. Wind Loads: As indicated on contract documents
8. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318 (ACI 318M).
   a. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of minus 18 to plus 120 deg F.
9. Fire-Resistance Rating: Select material and minimum thicknesses to provide indicated fire rating on contract documents.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units.

1. Indicate joints, reveals, and extent and location of each surface finish.
2. Indicate separate face and backup mixture locations and thicknesses.
3. Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.
4. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
5. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
6. Include and locate openings larger than by 10 inches (250 mm).
7. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
8. Indicate relationship of precast structural concrete units to adjacent materials.
9. Indicate locations and details of stone facings, anchors, and joint widths.
10. Indicate estimated camber for precast floor slabs with concrete toppings.
11. Indicate shim sizes and grouting sequence.
12. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including design calculations signed and sealed by the qualified professional engineer responsible for their preparation.

E. Qualification Data: For Installer, fabricator and testing agency.

F. Welding certificates.

G. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Structural-steel shapes and hollow structural sections.
6. Stone anchors and accessories.

H. Material Test Reports: For aggregates.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Participates in PCI's Plant Certification program and is designated a PCI-certified plant as follows:
   a. Group C, Category C1 - Precast Concrete Products (no prestressed reinforcement) Category C2 - Prestressed Hollowcore and Repetitively Produced Products Category C3 - Prestressed Straight Strand Structural Members Category C4 - Prestressed Deflected Strand Structural Members.

B. Installer Qualifications: A precast concrete erector qualified, as evidenced by PCI's Certificate of Compliance, to erect Category S2 - Complex Structural Systems.

C. Installer Qualifications: An experienced precast concrete erector who, before erection of precast concrete, has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in Category S2 - Complex Structural Systems and who produces an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."

D. Field Testing Agency Qualifications: Qualified according to PCI Certified Program.

E. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

F. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

G. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D.1.1M, "Structural Welding Code - Steel."
2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."

H. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets the prescriptive requirements of authorities having jurisdiction or has been calculated according to PCI 124 Specification For Fire Resistance of Precast/Prestressed Concrete

I. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERING, STORAGE AND HANDLING

A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
2. Place adequate dunnage of even thickness between each unit.
3. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that would cause cracking or damage.

D. Lift and support units only at designated points shown on Shop Drawings

1.8 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

Part 2 Products

2.1 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized[, and chromate wash treated after fabrication and bending].

D. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 , deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

E. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 , deformed bars, assembled with clips.

F. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized-steel wire into flat sheets.

G. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

H. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain or deformed, flat sheet, Type 1 bendable or Type 2 nonbendable coating if bending is not required.

I. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.3 PRESTRESSING TENDONS

A. Pretensioning Strand: ASTM A 416/A 416M, Grade 270 uncoated, 7-wire, low-relaxation strand.

B. Unbonded Post-Tensioning Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.6 and sheath with polypropylene tendon sheathing complying with ACI 423.6. Include anchorage devices and coupler assemblies.

C. Post-Tensioning Bars: ASTM A 722, uncoated high-strength steel bar.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin Admixture: ASTM C 618, Class N.
3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
   a. Gradation: Uniformly graded.
2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate unless otherwise approved by Architect.

D. Lightweight Aggregates: Except as modified by PCI MNL 116, ASTM C 330, with absorption less than 11 percent.

E. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M.

2.5 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.

C. Carbon-Steel Plate: ASTM A 283/A 283M.

D. Malleable-Iron Castings: ASTM A 47/A 47M.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A ; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 ; and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 or ASTM A 490 , Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436 .

1. Do not zinc coat ASTM A 490 bolts.

L. Zinc-Coated Finish: For exterior steel items, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.
3. Zinc Plating per ASTM B633 "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel"

M. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

N. Welding Electrodes: Comply with AWS standards.

O. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.6 BEARING PADS

A. Provide one of the following bearing pads for precast structural concrete units as recommended by precast fabricator for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D 2240; minimum tensile strength 2250 psi (15.5 MPa), ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D 2240; capable of supporting a compressive stress of 3000 psi (20.7 MPa) with no cracking, splitting, or delaminating in the internal portions of pad. Test 1 specimen for every 200 pads used in Project.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D 2240; complying with AASHTO's "AASHTO Load and Resistance Factor Design (LRFD) Bridge Specifications," Division II, Section 18.10.2; or with MIL-C-882E.
4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to stainless- or mild-steel plate, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.7 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
2. Limit use of fly ash to 25 percent replacement of portland cement by weight and granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Structural Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi or as indicated on the contract documents .
2. Maximum Water-Cementitious Materials Ratio: 0.40 for structural members.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 116.

F. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi or as indicated on the contract documents.
2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft, plus or minus 3 lb/cu. ft., according to ASTM C 567.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with ACI 318.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

I. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.9 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

2.10 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main

reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.

C. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

D. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to meet cover requirements according to ACI 318 (ACI 318M). Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses.

F. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.

1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
5. Protect strand ends and anchorages with a minimum of 1-inch- (25-mm-) thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.

G. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

H. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 116.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

K. Comply with ACI 306.1 procedures for cold-weather concrete placement.

L. Comply with PCI MNL 116 procedures for hot-weather concrete placement.

M. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that will not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

2.11 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product dimension tolerances.

2.12 COMMERCIAL FINISHES

A. Commercial Grade: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to 3/16 inch (5 mm).

B. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch (13 mm) caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch (6 mm) in width that occur more than once per 2 sq. in (1300 sq. mm). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch (3 mm).

C. Grade B Finish: Fill air pockets and holes larger than 1/4 inch (6 mm) in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch (3 mm) in width that occur more than once per 2 sq. in. (1300 sq. mm). Grind smooth form offsets or fins larger than 1/8 inch (3 mm). Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.

D. Grade A Finish: Fill surface blemishes with the exception of air holes 1/16 inch (1.6 mm) in width or smaller, and form marks where the surface deviation is less than 1/16 inch (1.6 mm). Float apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles. Discoloration at form joints is permitted. Grind smooth all form joints.

E. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.

F. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

G. Apply roughened surface finish according to ACI 318 (ACI 318M) to precast concrete units that will receive concrete topping after installation.

2.13 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.

1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements.

1. Test and inspect self-consolidating concrete according to PCI TR-6.

C. Strength of precast structural concrete units will be considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.

D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
2. Cores will be tested in an air-dry condition or, if units will be wet under service conditions, test cores after immersion in water in a wet condition.Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
3. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
   a. Project identification name and number.
   b. Date when tests were performed.
   c. Name of precast concrete fabricator.
   d. Name of concrete testing agency.
   e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups.

Part 3 Execution

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting, cast-in-place, building structural framing has attained minimum allowable design compressive strength or until supporting steel or other structure is complete.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.

B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, supports, and bracing as required to maintain position, stability, and alignment of units until permanent connection.

1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Field cutting of precast units is not permitted without approval of the Architect or Specialty Engineer.

E. Fasteners: Do not use powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.

F. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
4. Remove, reweld, or repair incomplete and defective welds.

G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

H. Grouting: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled.

1. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces.
2. Fill joints completely without seepage to other surfaces.
3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
4. Place grout end cap or dam in voids at ends of hollow-core slabs.
5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
6. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect precast structural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135 or ACI ITG7.

B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Erection of precast structural concrete members.
2. Special Inspections: As indicated on the contract documents.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Field welds will be visually inspected and nondestructive tested according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Prepare test and inspection reports.

3.5 REPAIRS

A. Repair precast structural concrete units if permitted by Architect.

1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units has not been impaired.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.6 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION

High Performance Insulated Wall Panel Specifications

Part 1 General

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 00 and 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes insulated precast concrete wall panels, including manufacture, transportation, handling, erection, and other related items such as anchorage, bearing pads, storage and protection of the units.

1. Precast concrete wall panels are insulated panels reinforced with prestressing strands, mild steel reinforcement, carbon fiber epoxy coated shear grid, and welded wire steel mesh.
2. Precast wall panels can act as either bearing or non-bearing building components, including shear walls.

B. Related work specified elsewhere:

1. Cast-in-place concrete
2. Masonry
3. Structural Steel
4. Miscellaneous steel
5. Waterproofing
6. Flashing and sheet metal
7. Sealant and caulking
8. Painting and prep

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Provide precast concrete wall panels and connections capable of withstanding design loads within limits and under conditions indicated.
2. The precast concrete wall panels shall be composite panels.

B. Thermal Performance:

1. Provide precast concrete wall panels with edge to edge continuous insulation (c.i.), with exception of cast-in blocking at window and door openings, or structural penetrations as required.
2. Definition of Continuous Insulation (c.i.) per ASHRAE 90.1 – 2007 "Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope."
3. There shall be no solid zones of concrete from exterior wythe of concrete to interior wythe of concrete, except as noted in paragraph 1 above. This includes no solid zones for lifting/erection devices, connection plates, shear plates, panel to panel connections, load bearing plates or corbels, etc.
4. There shall be no metallic wythe connectors from exterior wythe of concrete to interior wythe of concrete.
5. All corner conditions shall have insulation that returns to the adjacent panel providing continuous insulation.
6. Wall panel insulation at roof conditions shall break the interior wythe of concrete and return through the panel to meet the roof insulation providing continuous insulation.
7. Insulation shall be installed at all wall panel joints prior to being caulked. The R-value of the joint treatment shall be equal to or exceed the R-value of the wall panel. There shall be no thermal breaks at the joint locations.

C. Wythe Connector Performance: Provide precast concrete wall panels with a non-metallic, non-corrosive, relatively low conductive carbon fiber epoxy coated shear grid wythe connector between the exterior concrete wythe and the interior concrete wythe.

D. Warranty: Manufacturer shall warrant that the precast concrete wall panel units will not spall or show visible cracking beyond accepted industry standards, splitting, deformation, or loosening resulting from inferior materials or workmanship by this trade for a period of one (1) year effective from the date of the substantial completion of the precast erection. Precast units showing such defects will be repaired or replaced at the precaster's option and made acceptable to the Owner or his representatives at no expense to the Owner.

1.4 SUBMITTALS

A. General: Refer to and comply with Division 01 Section 01330 "Submittals", for procedures and additional submittal criteria.

B. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

C. Design Mixes: For each concrete mix.

D. Shop Drawings:

1. Erection Drawings:
   a. Member piece marks and completely dimensioned size and shape of each member.
   b. Plans and/or elevations locating and defining all products furnished.
   c. Sections and details showing connections, cast-in items and their relation to the supporting structures.
      i. Details, dimensional tolerances and related information of other trades affecting precast concrete work should be furnished to the precast concrete manufacturer.
   d. Joints and openings between members and between members and structure.
   e. Description of all loose, cast-in and field hardware.
   f. Field installed anchor location drawings.
2. Production Drawings: Typical member production drawings will be furnished only upon request.
   a. Elevation view of each member.
   b. Sections and details to indicated quantities, size, and position of reinforcing steel, anchors, inserts, etc.
   c. Handling devices.
   d. Dimensions and finishes.
   e. Tension for strand.
   f. Concrete strengths.
   g. Methods for storage and transportation.

3. Product design criteria:
   a. Loadings for design:
      i. Handling stress limits.
      ii. All dead, live loads, seismic and wind loads as specified on the contract drawings.
      iii. All other loads specified for members, where applicable.
      iv. As directed on the contract drawings, design calculations of products shall be performed, sealed and submitted for approval by an engineer registered in the state where the project is located, who is experienced in precast, prestressed concrete design.
      v. Design shall be in accordance with applicable codes as specified in the contract documents.

E. Engineering Data:

1. Submit complete design calculations for all precast members and connections. Indicate all design loads, including live loads, wind loads, seismic loads, and dead loads and including all handling stresses during shipment and erection and due to loads from construction procedures. Design calculations shall be performed, sealed and submitted by Precast Concrete Contractor's Professional Engineer, licensed to practice in the State where Project is located, who is experienced in precast, prestressed concrete design. Design calculations shall be based on requirements of Performance Requirements and product design criteria specified herein.

F. Samples:

1. Submit three samples, 12"x12", for each type of surface required showing finishes proposed for all exposed work. (Only required if the exterior is to have a finish other than as cast, paint or stain.)
2. Prior to product fabrication of precast concrete panel units, for projects where more than one finish is required, or where more than one type of reveal is required, prepare a (4'X 4'), partial panel mock up for final approval of the color and finish; arrange for architect's timely review of mock up at precaster's plant.
   a. Notify architect when sample is ready for review at precaster's plant, and advise of schedule impact if review is not made in a timely way.
   b. Do not start production fabrication of precast concrete panels with architectural finishes until sample units have received architect's written approval.
   c. The approved mock-up panels shall be a standard of quality for the color and range of required finishes.

G. Current welder certificates for welding of reinforcements, shop and field connections. (AWS 1.1 & 1.4 latest)

H. Current plant PCI certification.

1.5 QUALITY ASSURANCE

A. Manufacturer and Fabricator Qualifications:

1. The precast concrete manufacturer shall have 5 years of proven experience in the design and manufacture of precast concrete wall panels.
2. The precast concrete manufacturing plant shall be capable of manufacturing precast concrete wall panels with epoxy-coated carbon-fiber.
3. The precast concrete manufacturing plant shall be certified by the Precast/Prestressed Concrete Institute Plant Certification Program to manufacture per PCI MNL 116. Certification shall be current at time of bidding.

B. Erector Qualifications: PCI-certified or regularly engaged for at least 5 years in the erection of precast concrete panels similar to the requirements of this project.

C. Design Standards: Comply with governing code including, IBC, ASCE7, ACI 318 and the design recommendations in the current edition of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete."

D. Quality-Control Standard: Comply with PCI MNL 116, "Manual for Quality Control; Precast and Prestressed Concrete."

E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. Requirements of regulatory agencies: All local codes plus the following specifications, standards and codes are a part of this specification.

1. ASCE 7 – Minimum Design Loads for Buildings
2. ACI 318 – Building Code Requirements for Structural Concrete.
3. ACI 347 – Recommended Practice for Concrete Formworks.
4. AISC – Manual of Steel Construction.
5. PCI MNL 116, "Manual for Quality Control; Precast and Prestressed Concrete."
6. PCI Design Handbook, Precast and Prestressed Concrete.
7. AWS D1.1 – Structural Welding Code – Steel.
8. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
9. ASTM Specifications – As referred to in Section 2 Products of this Specification.
10. CRSI – Manual of Standard Practice.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and handling:

1. Precast concrete units shall be handled only at the lifting or supporting points, as shown on the shop drawings, and with suitable lifting devices. Lifting inserts shall have a minimum safety factor of 4. Rigging shall have a minimum safety factor of 5.
2. Transportation, site handling and erection shall be performed by the precaster, or its agents, with equipment and methods employed by qualified personnel acceptable to the precaster.

B. Storage:

1. Store all units off ground and clear of other staining influences.
2. Place stored units so that identification marks are discernible.
3. Separate stacked members by battens across full width of each bearing point. Protect all edges.
4. Protect all holes and reglets against water and ice in freezing weather.

Part 2 Products

2.1 MANUFACTURER

A. Provide precast concrete insulated wall panels as manufactured by Metromont Corporation

B. The precast concrete manufacturing plant shall be certified to manufacture per PCI MNL 116.

2.2 MATERIALS

A. Concrete:

1. Portland Cement: ASTM C 150, Type I or Type III.
2. Other cementitious materials:
   a. Fly ash or natural pozzolans: ASTM C618.
   b. Ground granulated blast furnace slag: ASTM C989.
   c. Silica fume: ASTM C1240.
3. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33.
4. Admixtures:
   a. Air-entraining admixtures: ASTM C260.
   b. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C494 or C1017.
   c. Viscosity-Modifying Admixture.
   d. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, non-fading, and alkali resistant.
   e. Metakaolin Admixture: ASTM C 618, Class N.
   f. Calcium chloride or admixtures containing chlorides shall not be used.
5. Water: Potable or reclaimed and recycled process water that has been tested to meet requirements for batching of concrete.

B. Steel Reinforcing:

1. Reinforcing Bars: ASTM A 615/A 615M, deformed.
2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
3. Galvanized reinforcing bars: ASTM A767.
4. Epoxy-coated reinforcing bars: ASTM A775.
5. Plain-Steel Wire: ASTM A82, as drawn.
6. Deformed-Steel Wire: ASTM A 496.
7. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
8. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
9. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 116.
10. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270, uncoated, 7-wire, low-relaxation strand.

C. Epoxy Coated Shear Grid Wythe Reinforcement:

1. Product construction in accordance with minimum MARV tensile strength tow values (reported in pounds force per single end).
2. Yarn Type: Industrial Grade PAN based carbon fiber with suitable epoxy sizing as approved by the manufacturer (24K - 50K carbon fiber tows).
3. Binder Chemistry shall be Chomarat Formulation: Epoxy D1156 (standard Tg) and/or Epoxy D2047 (High Tg).
4. Yarn/Strand Direction: Warp and Weft Strands to be laid perpendicular to each other; warp yarns to be superimposed.
5. Cross over bond: Fully bonded to ensure proper tow integrity.
6. Strands: No missing, broken, or degraded strands.

D. Anchors and Inserts:

1. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
2. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.
3. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
4. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
5. Stainless steel: ASTM A666, Type 304.
6. Bolts: ASTM A307 or A325.
7. Threaded Rods: ASTM A36, A193 or A307.
8. Deformed bar anchors: ASTM A496 or A706.
9. Finish: For exterior steel items, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, or equivalent as applicable.
   a. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.
10. Shop-Primed Finish: Prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibiting primer, complying with performance requirements in FS TT-P-664 according to SSPC-PA 1.

E. Grout:

1. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 3 parts sand, by volume, with minimum water required for placement and hydration.
2. Non-shrink grout: Premixed, packaged ferrous or non-ferrous aggregate shrink-resistant grout.
3. Epoxy-resin grout: Two component mineral-filled epoxy resin: ASTM C881 of FS MMM-A-001993.

F. Bearing Pads:

1. Chloroprene (Neoprene): Conform to Div II, Section 18 of ASSHTO Standard Specifications for Highway bridges.
2. Random Oriented Fiber Reinforced: Shall support a compressive stress of 3,000 psi with no cracking, splitting or delaminating in the internal portions of the pad.
3. Plastic: Multi-monomer plastic strips shall be non-leaching and support construction loads with no visible overall expansion.

G. Insulation:

1. Expanded Polystyrene (EPS) Board Insulation: Rigid, closed cell, expanded polystyrene, ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450 respectively. Unfaced both sides.
2. Insulated wall panels should have a minimum steady state R-value of R-10 which exceeds ASHRAE 90.1-2007 by 30%.

2.3 CONCRETE MIXES

A. Self Compacting Concrete (SCC): Proportion mixes by laboratory trial batch or field test data methods in accordance with generally accepted practice to provide SCC with the appropriate balance of filling ability, passing ability and segregation resistance characteristics to produce materials meeting the following minimum properties:

1. Compressive Strength (28 Days): 5000 psi
2. Compressive strength at time of release for pre-tensioned members: 3500 psi.
3. Compressive strength at stripping for precast members: 2000 psi.

B. Normal-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.40.

C. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 116.

D. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

2.4 FABRICATION

A. Fabrication procedures shall be in general compliance with PCI MNL-116.

B. Formwork: Comply with ACI 347. Prefabricated mold shall be one-piece seamless rigid molds for exposed faces. Prevent deformation of molds and maintain mold surfaces free of irregularities, dents, sags, or damage of any kind.

C. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations.

D. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.

E. Cast-in reglets, slots, holes, and other accessories in precast concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

F. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 116 for fabricating, placing, and supporting reinforcement.

G. Reinforce precast concrete wall units to resist handling, transportation, and erection stresses.

H. Prestress tendons for precast concrete wall units by either post-tensioning or pre-tensioning method. Comply with PCI MNL 116.

I. Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.

J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.

1. The production of SCC shall be carried out in plants in which the equipment, operation and materials are suitably controlled.
2. All production staff involved in the production of SCC shall have been trained and possess experience in SCC.

K. Identify pickup points of precast concrete wall units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast concrete wall unit on a surface that will not show in finished structure.

L. Openings:

1. Manufacturer shall provide for openings 10 inch round or square or larger as shown on the contract drawings.
2. Other openings shall be located and field drilled or cut by the trade after erection. Openings shall be approved by both architect and precaster before drilling or cutting.

M. Cure concrete, according to requirements in PCI MNL 116, by accelerated heat curing using low-pressure live steam or radiant heat.

1. SCC can set faster than conventional concrete. Initial curing shall commence as soon as practicable after placement to minimize the risk of shrinkage cracking.

N. Fabricate precast concrete wall panels straight and true to size and shape, with exposed edges and corners precise and true so each finished panel complies with PCI MNL 116 product tolerances as well as position tolerances for cast-in items.

O. Patching: Shall be acceptable providing the structural adequacy of the product and the appearance are not impaired.

P. Damaged, chipped or discolored units shall be replaced, patched or refinished as directed by the Architect and/or Engineer, and to their approval.

2.5 FINISH

A. Finish exposed-face surfaces of precast concrete wall panels to match approved design reference sample and as follows:

1. Smooth-Surface Form Finish: Free of pockets, sand streaks, and honeycombs, with "as cast" color and texture.
2. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to provide a uniform finished surface or to expose aggregates and surrounding matrix surfaces.

B. Finish all other exposed surfaces of precast concrete wall panels to match face-surface finish.

C. Finish all non-exposed surfaces with a smooth "as cast" or float finish that does not interfere with the application of other materials.

2.6 SOURCE QUALITY CONTROL

A. Quality Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.

Part 3 Execution

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Site access: General contractor shall be responsible for providing suitable access to the building, proper drainage and firm, level bearing for the hauling and erection equipment to operate under their own power.

B. Preparation of structures to receive precast wall panels: General contractor shall be responsible for:

1. Providing true, level bearing surfaces on all field placed bearing surfaces.
2. Placement and accurate alignment of anchor bolts, plates or dowels in column footings, grade beams and other field placed supporting members.

C. Install precast concrete wall panels.

1. Erection shall be carried out by erectors meeting requirements of this Section.
2. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
3. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

D. Anchor precast concrete wall panels in position by bolting, welding, grouting, or as otherwise indicated.

E. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

1. Repair damaged steel surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces or by re-priming damaged painted surfaces.

F. Install precast concrete wall panels level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 125 or 127.

G. Repair exposed exterior surfaces of precast concrete wall panels to reasonably match color, texture, and uniformity of approved mock up panel(s) and surrounding precast concrete when repair is permitted by Architect and/or Engineer.

H. Subject to approval of the Architect and precast Engineer, precast concrete wall panels may be drilled or "shot" by other trades for attachment of other building components provided no contact is made with prestressing steel. Should spalling occur, repair of the spall shall be the responsibility of the trade doing the drilling or the shooting.

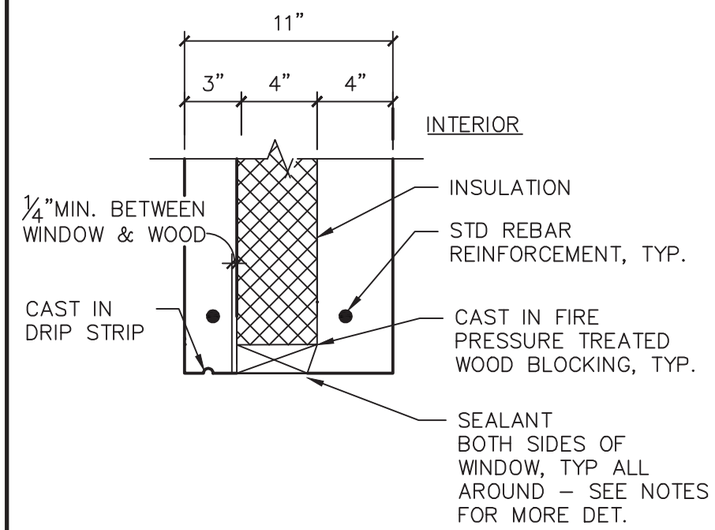
I. Clean exposed surfaces of precast concrete wall panels after erection to remove weld marks, other markings, dirt, and stains caused by the erector. If other trades cause damage, marks, dirt, or stains they shall be liable for the costs of cleaning or repair.

J. Inspection and Acceptance: Final inspection and acceptance of erected precast concrete units shall be made by the Architect and/or Engineer within a reasonable time after the precast wall panels are installed and final alignment of the units is completed.

END OF SECTION

Appendix

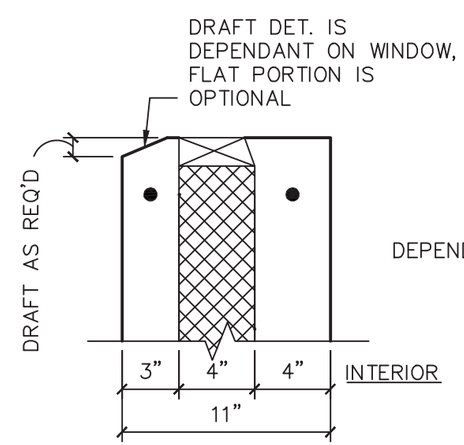
METROMONT	2802 WHITE HORSE ROAD GREENVILLE, SOUTH CAROLINA 29611 (864) 605-5000	PROJECT: WOOD BUCK DETAIL				JOB NO. –
		DATE: 10/14/2019	DWN. BY: RJK	DATE: –	CHK. BY: –	SHEET: MC–WB



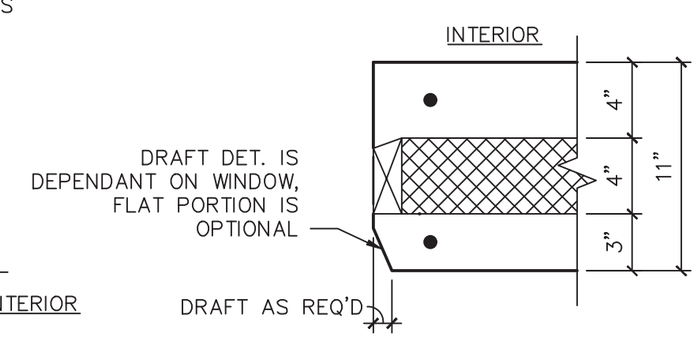
A PRECAST WINDOW HEAD DETAIL
1 1/2" = 1'-0"

NOTES:

1. CRITICAL – SEALANT SHOULD BE ON THE CONCRETE AND TO THE EXTERIOR SIDE OF THE BUCK/INSULATION PLANE. FOR EXAMPLE, EXTERIRO FACE OF WINDOW SHOULD BE LESS THAN 3"+TOLLERANCES FROM EXTERIOR FACE OF THE WALL.
2. WINDOW BLOCKOUT DIMENSIONS: PRECAST TOLERANCE IS ¼" EACH SIDE (OR ½" OVERALL). CAULKING WARRANTIES REQUIRE ¼" MIN. CAULK. THIS MEANS BLOCKOUT SIZES FOR EXTERIOR DOORS AND WINDOWS IN RESIDENTIAL SHOULD BE FRAME SIZE PLUS 1" SO A 6'x6' WINDOW REQUIRES A 6'–1" X 6'–1" BLOCKOUT.
3. IF THE OWNER, CONTRACTOR, OR ARCHITECT ELECT TO REPLACE THE WOOD BUCK WITH CONCRETE, THE MASS WALL C.I. R–VALUE IS NO LONGER VALID AND CONDENSATION INSIDE THE ROOM IS LIKELY. SAME RULES APPLY FOR DIMENSIONS AND CAULK. THERE WILL BE A MICRO CRACK IN THE SAME PLANE AS THE INSULATION THAT WILL ALLOW WATER INTRUSION.



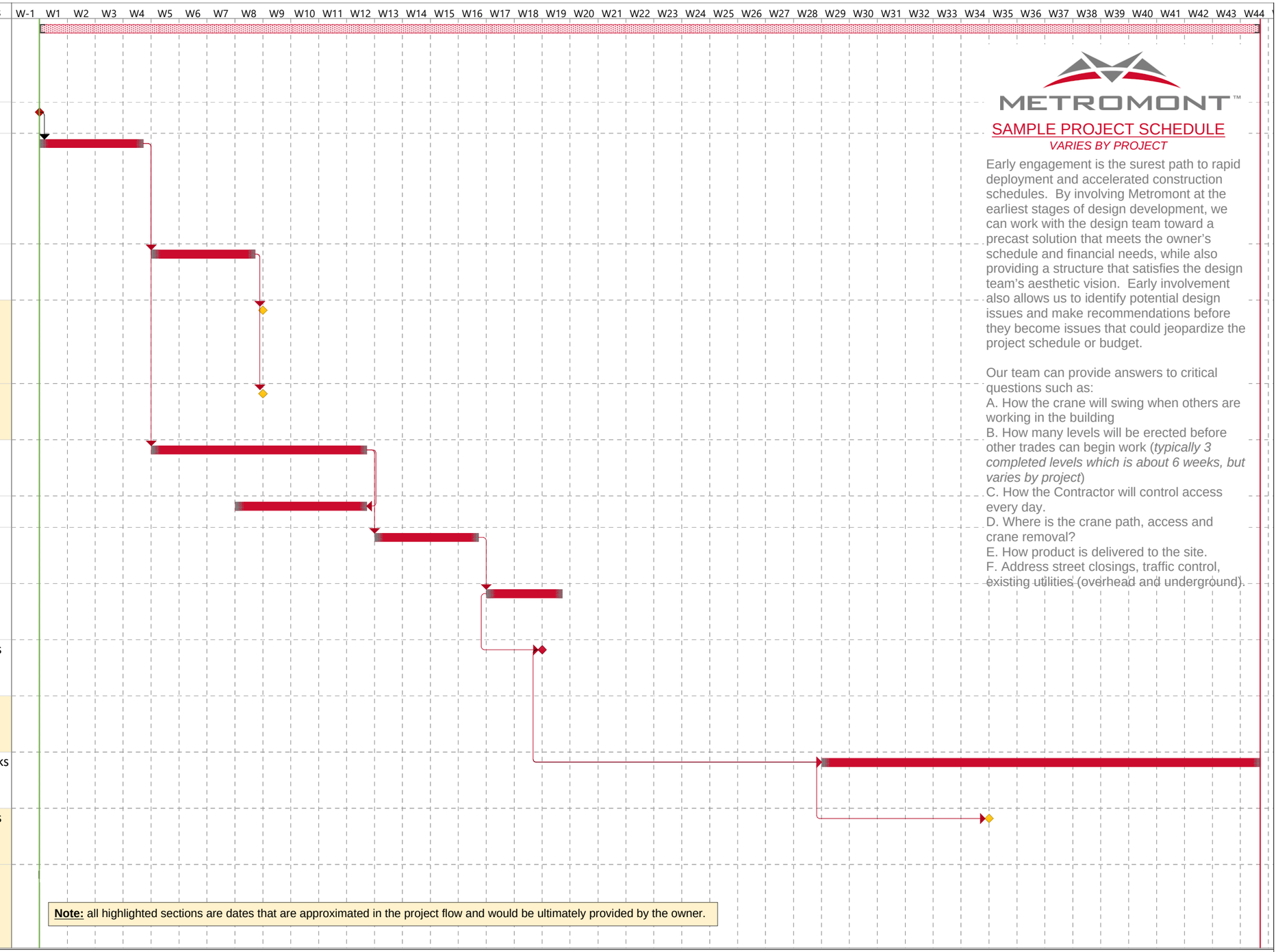
B PRECAST WINDOW SILL DETAIL
1 1/2" = 1'-0"



C PRECAST WINDOW JAMB DETAIL
1 1/2" = 1'-0"

MC–8 1/2" x 11" Detail

ID	Task Name	Duration	Predecessors
1	**Sample Project Schedule | 200,000 gsf | 10 Stories of Elevated Precast (incl. roof)**	**44 wks**	
2	Award - Engineering Release	0 wks	
3	Lock Down Geometry - Metromont working with Design Team (varies by proj. 0-90 days typ.)	4 wks	2
4	MC Submittal of foundation loads & reactions	4 wks	3
5	Funding In Place for Full Release to MC (Date supplied by Owner)	0 wks	4
6	Permit Submittal (Date supplied by Owner)	0 wks	4
7	MC Submittal Erection Drawings & Calculations	8 wks	3
8	MEP Coordination	5 wks	7FF
9	Revisions, Final Approvals & Start of production shop tickets	4 wks	7
10	Metromont Shop Drawings for Production	3 wks	9
11	Production Start (Early Start - lead time)	0 wks	10SS+2 wks
12	Site Construction Start (Date supplied by Owner)		
13	Metromont Precast Erection (based on 2,500 sf per day)	16 wks	11SS+10 wks
14	Other Trades in building during Level 4 erection	0 wks	13SS+6 wks
15	Certificate of Occupancy (Date supplied by Owner) - typically +/- 6 months post erection	0 wks	



METROMONT™

SAMPLE PROJECT SCHEDULE

VARIES BY PROJECT

Early engagement is the surest path to rapid deployment and accelerated construction schedules. By involving Metromont at the earliest stages of design development, we can work with the design team toward a precast solution that meets the owner's schedule and financial needs, while also providing a structure that satisfies the design team's aesthetic vision. Early involvement also allows us to identify potential design issues and make recommendations before they become issues that could jeopardize the project schedule or budget.

Our team can provide answers to critical questions such as:

A. How the crane will swing when others are working in the building

B. How many levels will be erected before other trades can begin work (*typically 3 completed levels which is about 6 weeks, but varies by project*)

C. How the Contractor will control access every day.

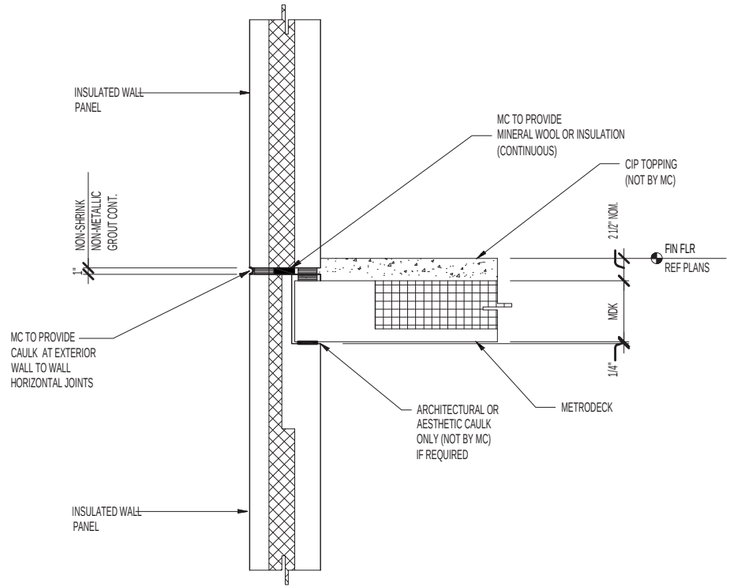
D. Where is the crane path, access and crane removal?

E. How product is delivered to the site.

F. Address street closings, traffic control, existing utilities (overhead and underground).

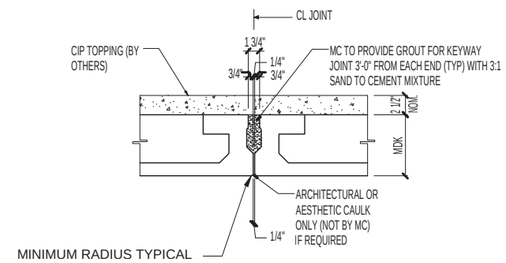
Note: all highlighted sections are dates that are approximated in the project flow and would be ultimately provided by the owner.

Critical Progress | Task | Split | Task Progress | Manual Task | Start-only | Finish-only | Duration-only | Critical | Critical Split | Baseline | Baseline Split | Baseline Milestone | Milestone | Summary Progress | Summary | Manual Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Deadline | Slippage



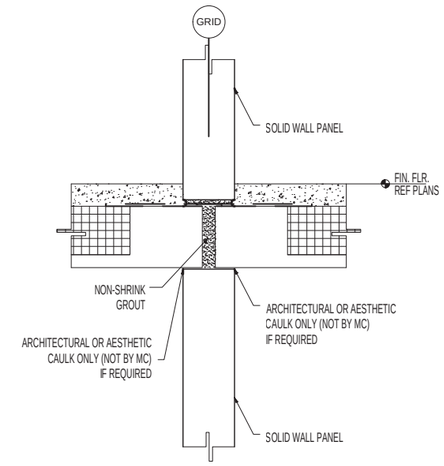
METRODECK - TO - EXTERIOR WALL HORIZONTAL JOINT

01



METRODECK - TO - METRODECK JOINT

02



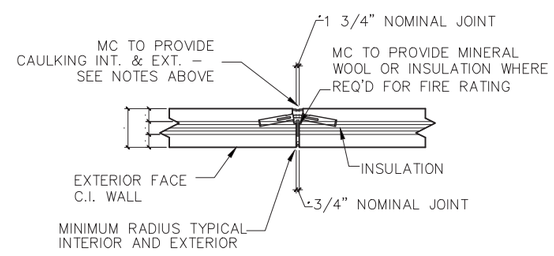
METRODECK - TO - INTERIOR WALL HORIZONTAL JOINT

03

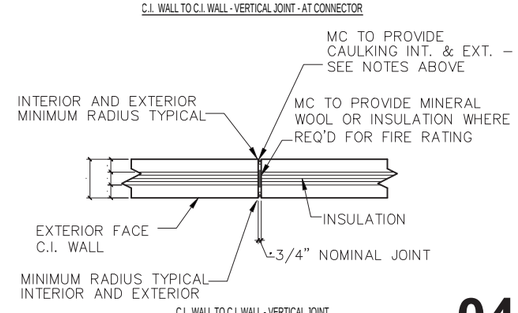
NOTES:

a. MC excludes all interior horizontal joints, CMU to precast joints, metal door frames, MEP penetrations, precast stair to precast walls, poured in place concrete to precast, and all others not shown on these drawings or not specifically noted in proposal.
b. MC excludes furnishing or installing any sealer, sealant, or expansion joint materials.
c. MC excludes furnishing or installing fire safe material, fire stop, fire caulk, etc. around openings, etc. whatsoever unless specifically noted in proposal.

1. PRECAST TO PRECAST WALLS ONLY
2. INTERIOR WITH 2 PART POLYURETHANE CAULK
3. EXTERIOR WITH SILICON CAULK.
   3.1. SILICON CAULK TYPICAL
   3.2. POLYURETHANE CAULK TYPICAL IN FL
4. USE ETHAFOAM BACKER ROD – COLOR TO BE SELECTED BY ARCH.
5. SURFACES MUST BE GROUND, NOT BRUSHED, BY CAULKING INSTALLER.
6. BONDING AGENT MUST BE USED PER MANUFACTURERS RECOMMENDATIONS



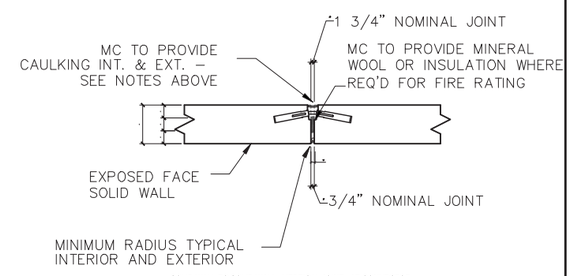
C.I. WALL TO C.I. WALL - VERTICAL JOINT - AT CONNECTOR



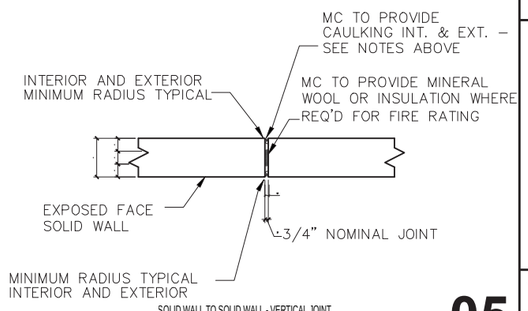
C.I. WALL TO C.I. WALL - VERTICAL JOINT

04

1. PRECAST TO PRECAST WALLS ONLY
2. INTERIOR WITH 2 PART POLYURETHANE CAULK
3. EXTERIOR WITH CAULK.
   3.1. SILICON CAULK TYPICAL
   3.2. POLYURETHANE CAULK TYPICAL IN FL
4. USE ETHAFOAM BACKER ROD – COLOR TO BE SELECTED BY ARCH.
5. SURFACES MUST BE GROUND, NOT BRUSHED, BY CAULKING INSTALLER.
6. BONDING AGENT MUST BE USED PER MANUFACTURERS RECOMMENDATIONS



SOLID WALL TO SOLID WALL - VERTICAL JOINT - AT CONNECTOR



SOLID WALL TO SOLID WALL - VERTICAL JOINT

05

DATE	BY	ISSUE	DESCRIPTION

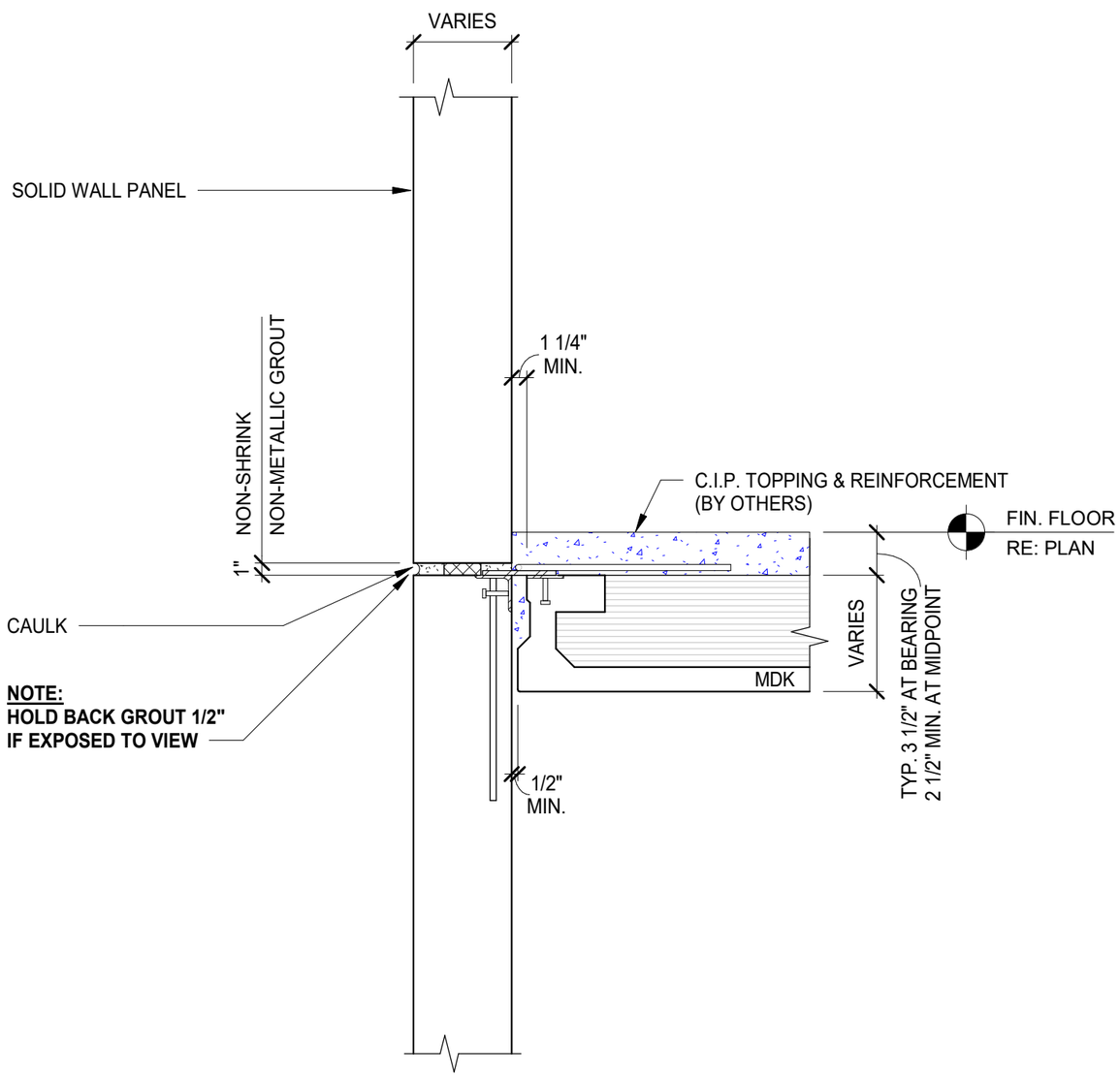
Dwg. Covers
Project
Location
Arch. or Eng.
Contractor
Drawn By: RJK Date: 8.23.2019 Checked By: Date:

METROMONT
2802 WHITE HORSE ROAD
GREENVILLE, SOUTH CAROLINA 29611
(864) 605-5000

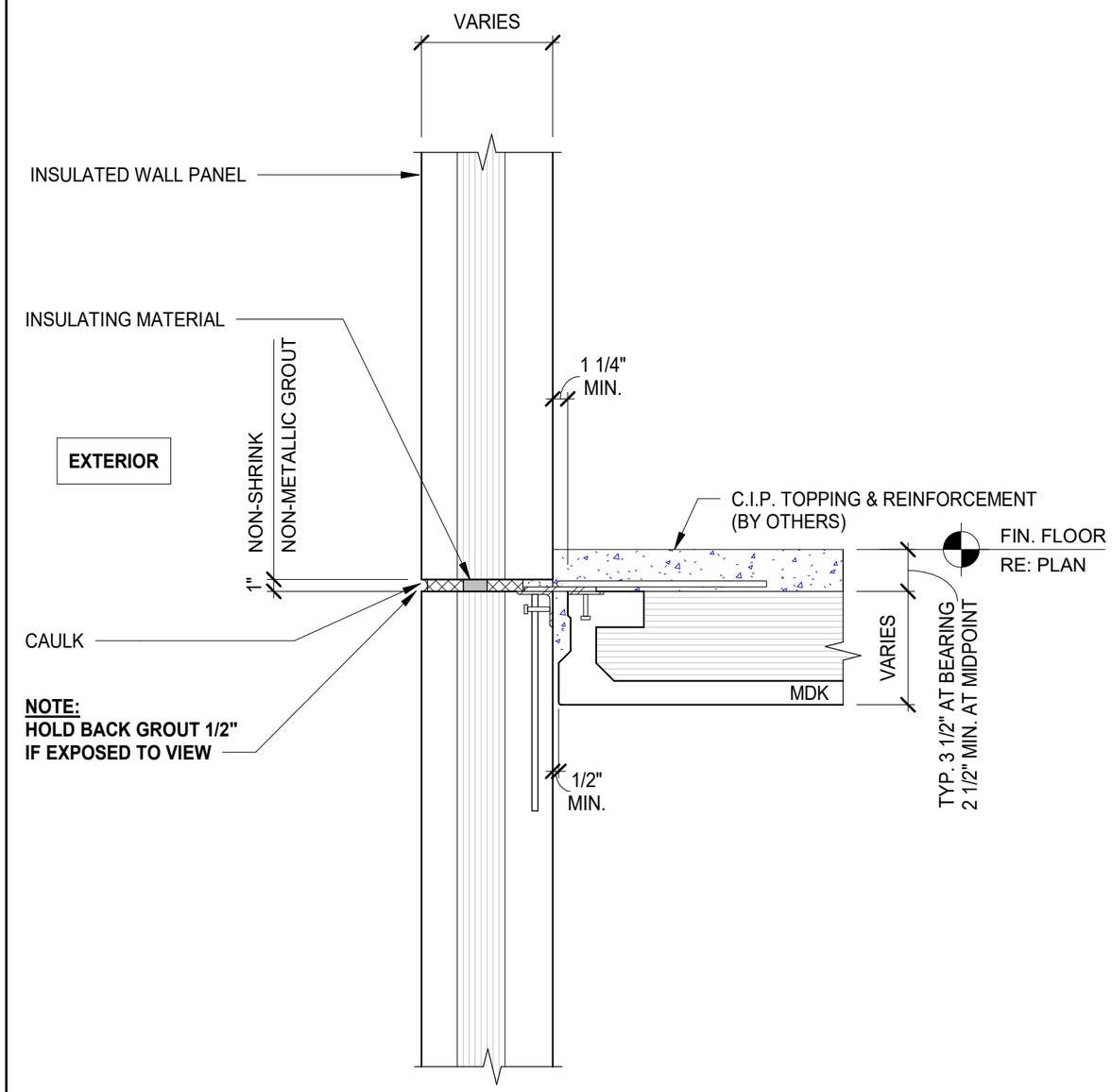
Job Number N/A

Drawing Number CAULKING

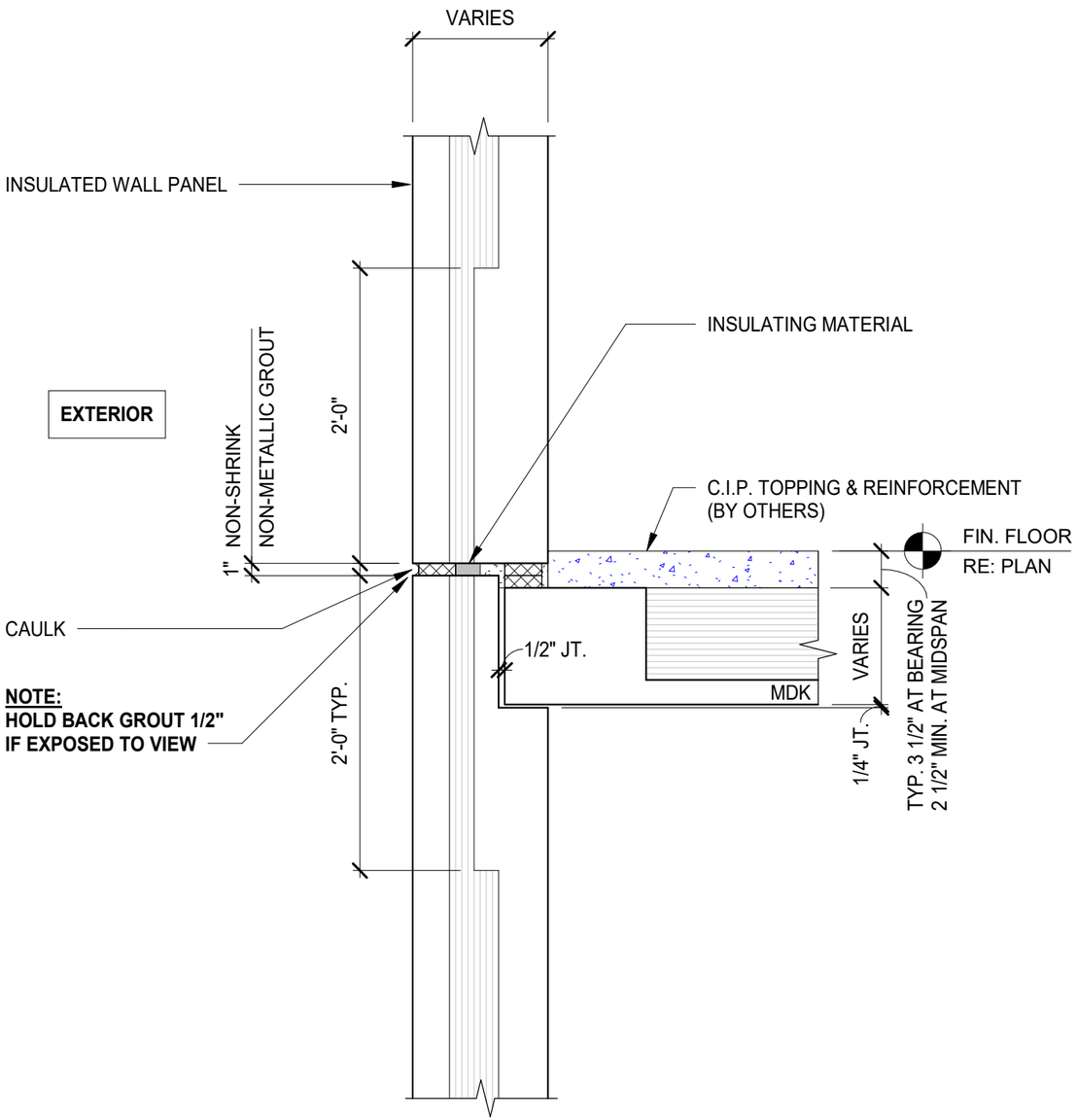
METROMONT™ 20 TWO NOTCH ROAD GREENVILLE, SOUTH CAROLINA 29605 (864) 295-0295	PROJECT METRODECK TO SOLID WALL PANEL NON-LOAD BEARING CONNECTION				JOB NO.
	DATE 2/13/20	DWN. BY STAFF	DATE 2/13/20	CHK. BY SA	SHEET 652



METROMONT™ 20 TWO NOTCH ROAD GREENVILLE, SOUTH CAROLINA 29605 (864) 295-0295	PROJECT METRODECK TO INSULATED WALL PANEL NON-LOAD BEARING CONNECTION				JOB NO.
	DATE 2/13/20	DWN. BY STAFF	DATE 2/13/20	CHK. BY SA	SHEET 653



METROMONT 20 TWO NOTCH ROAD GREENVILLE, SOUTH CAROLINA 29605 (864) 295-0295	PROJECT METRODECK TO INSULATED WALL PANEL EXTERIOR LOAD BEARING (SHIMS & BRG PAD)				JOB NO.
	DATE 2/13/20	DWN. BY STAFF	DATE 2/13/20	CHK. BY SA	SHEET 657



METROMONT 20 TWO NOTCH ROAD GREENVILLE, SOUTH CAROLINA 29605 (864) 295-0295	PROJECT METRODECK TO SOLID WALL PANEL INTERIOR LOAD BEARING CONNECTION (SHIMS & BRG PAD)				JOB NO.
	DATE 2/13/20	DWN. BY STAFF	DATE 2/13/20	CHK. BY SA	SHEET 661