

Total Precast Concrete Structures

Technical Brochure

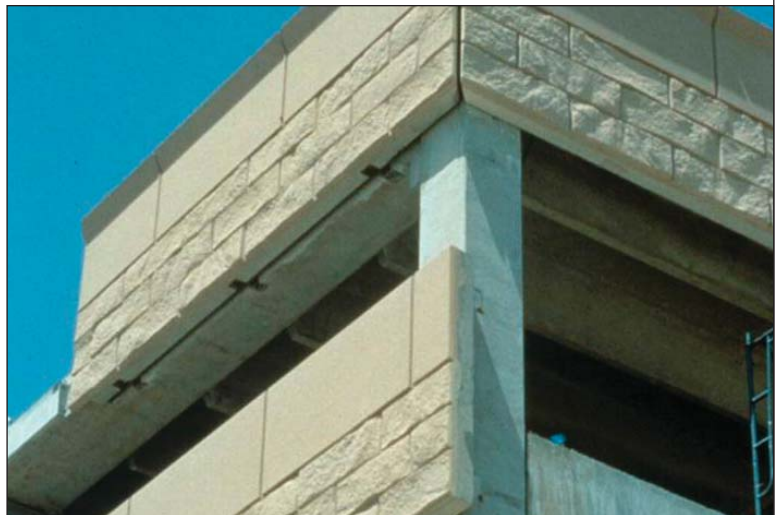


Canadian Precast/Prestressed Concrete Institute

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Total Precast Concrete Structures

Total precast concrete building systems are becoming a popular choice for many construction projects. Architectural and structural precast, prestressed concrete components can be combined to create the entire building.

This design approach can take several forms, including precast columns and beams with panelized cladding or load-bearing precast walls and double tee or hollow core flooring. These advantages benefit every member of the construction team - specially the owner, whose goals are always paramount.

ARCHITECT: In addition to helping to meet all of the building owner's goals, total precast concrete systems provide specific advantages to architects that can make the design process smoother.



ENGINEER: Structural engineers report no difficulty in learning to design with total precast concrete systems. They also benefit from the material's ease of use and efficiency.

CONTRACTOR: General contractors find the use of precast concrete components make their job easier at the site, ensuring a smooth process for the owner and designer in both the short and long terms. There are fewer trades to coordinate with precast construction.

Fast Construction

Developers who use total precast systems say precast can shorten the project timetable six to eight weeks when compared with steel and even more when compared with cast-in-place concrete construction. These savings can be critical in bringing a new building into a competitive marketplace or in meeting a tenant's need for occupancy on a specific date. A total precast system's speed helps keep projects on track.

Scheduling Advantages:

- One-stop shopping sources much of a building's shell in one efficient, precast contract.
- Fabrication of precast elements during permitting and/or site preparation saves time resulting in fast efficient construction regardless of weather conditions.
- Designing precast systems is easier thanks to assistance from CPCI member's engineering department.
- Precast components can be erected in winter conditions, maintaining tight schedules.

- With total precast systems, speedy erection allows the contractor to enclose the building quickly, giving interior trades faster access.
- Precast components are naturally fire protected because they will not burn. Precast's inherent fire resistance eliminates the messy and time-consuming fireproofing required for a steel structure and subsequent repairs caused by other trades.

Aesthetic Variety

Precast concrete panels offer a wide range of styles. Panels can be produced in a variety of colors, textures and finishes providing an almost endless range of aesthetic options. Precast panels can replicate granite, brick or stone, achieving a strong image at a fraction of the cost.

High Quality

CPCI members supply precast concrete components certified in accordance with CSA A23.4 Precast concrete – Materials and construction. Tight quality control ensures that components are produced with uniform consistency.

Low Maintenance

Precast structures require less maintenance than buildings built using other materials. Incorporating the architecture into the structure using large panel sizes, minimizes the number of joints.

Effective Pricing

Costs can be more accurately estimated earlier in the process with precast construction. Changes during design development can be quickly reassessed by CPCI member engineering departments to update estimates. The contractor, owner and design team are assured that project budgets are accurate and achievable.

Safety

Precast construction keeps the site cleaner and eliminates trades from the construction zone, improving logistics and enhancing worker safety. Site storage is usually not required – precast components are lifted by crane directly from the truck into position in a building. A clean site is particularly vital on building additions and existing campuses and in dense urban areas, where adjacent businesses can maintain near-normal activities.





Interior Design Flexibility

Long-span precast concrete systems help building owners adapt to changing client needs in future years. Hollow core slabs and double tees can span 14 to 16 m (45 to 50 ft) to match typical composite-steel framing and minimize the need for interior columns required with cast-in-place systems. Precast can span as far as 21 m (70 ft) to provide flexibility for challenging interior requirements. Precast also provides high loading capacity at little added cost.

Early Input

CPCI members can provide early and precise design assistance to help select the most efficient sizes and shapes for components, for structural efficiency and optimization for casting, transporting and erecting precast components. Member repetition reduces form costs and aids design speed while retaining design flexibility. These cost efficiencies can free up more of the budget for other critical design areas.

Strong Finish-Approval Process

Precasters can provide finish samples, range samples and large-scale mockups, ensuring that design concepts translate into reality. Designers can inspect window interfaces, joint connections and other critical elements to ensure they are visually acceptable and will properly interface between trades. Plant visits to discuss technical and aesthetic concerns provide control without requiring constant site supervision.

Sustainable Design

Precast concrete offers a number of benefits that make it environmentally friendly; a growing need as the Leadership in Energy & Environmental Design (LEED Canada) criteria become more popular. Precast's energy efficiency, recyclability, reusability, along with minimal waste in the precast plant and on the jobsite, are keys to meeting environmental standards that are gaining client interest.

Precast offers thermal mass, a valuable element of building design. With precast's ability to aid in meeting LEED standards, the benefits of thermal mass will become more apparent to designers in the future.

The use of fly ash, slag and other waste materials aid its environmental friendliness. Precast's high durability produces buildings with a total service life that far outpaces other designs.



All-Weather Construction

Contractors can minimize the added "cushion" created in schedules to accommodate bad weather conditions, since precast components can be produced and erected all year round.

Efficient Erection

Designs more exactly meet specifications because precast concrete pieces are fabricated in precast plants under controlled conditions using high-quality materials. Field adjustments are reduced, creating a smooth erection process with minimal surprises.



All-In-One Components

Total precast concrete systems allow the architectural panels to serve structural functions, limiting the need to incorporate multiple materials and trades. Combining architecture and structure provides efficiencies in a building's lateral support systems. Spandrel panels can support floor systems and windows while providing architectural exterior finishes. Precast elevator and stair cores can support floor systems while providing secure and fire rated enclosures.

Comprehensive Drawing

A total precast concrete system ensures one-stop shopping for the entire core/shell design. CPCI members can design and supply the entire system, generating a better

coordinated set of drawings to allow construction to proceed more efficiently. This eliminates the added effort needed to coordinate various trades when using mixed systems controlled by different suppliers.



Shape and Design

Precast/prestressed components are custom manufactured to match design requirements. Unusual shapes, sizes and specific technical requirements are expertly fabricated in CPCI member precast plants. Repetition of shapes and sizes will greatly enhance the economical use of precast components.



Precast Structural Components

Precast concrete beams, columns and stairs are the ideal solution for owners and builders who want to achieve wide-open spans, fire resistance, energy savings and attractive design with one structural system.

Precast beams may be either continuous with single storey columns or single span beams with multi-storey columns. The use of standardized forms accelerates the manufacturing process.

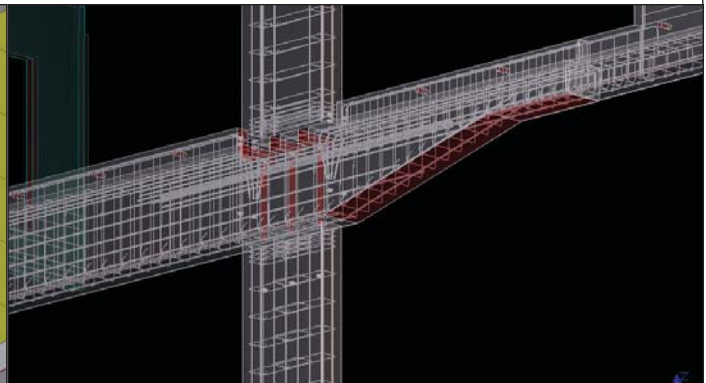
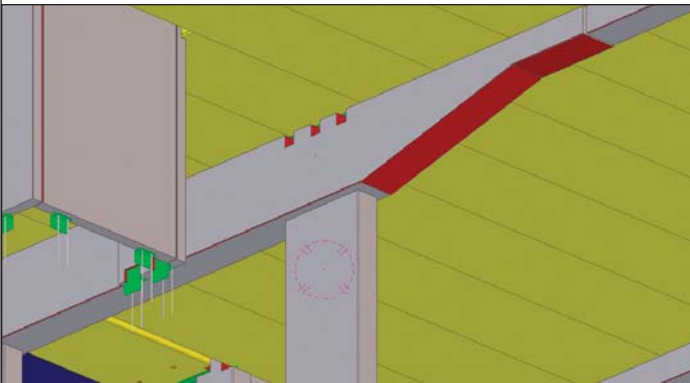
The quality of smooth formed finishes produced in a precast plant saves money by allowing designers to expose the structure in a finished building.

PC-3D

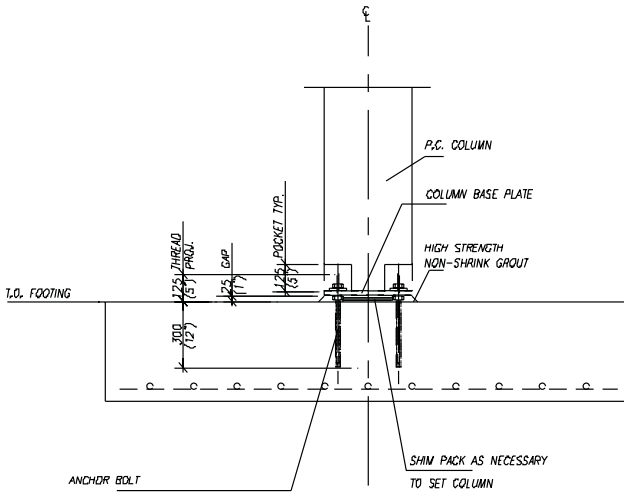
Total precast projects can now be modeled using PC-3D. The software allows manufacturers, designers, and consultants to readily develop and visualize the many facets of precast construction. Construction methods, layouts, details, reinforcing and erection procedures can all be readily visualized within the model. Drawings required to produce individual precast pieces and erection layout drawings are all generated directly from the software.



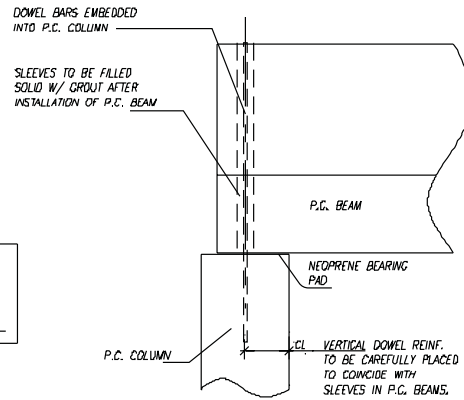
Projects can be “pre-built” within the virtual world of BIM software. Geometry, details, and connections can be developed. Design issues can be easily identified and resolved prior to manufacture and erection. Potential project complications can be examined within the model, and resolved prior to issuing drawings for construction. PC-3D modeling inherently removes the possibility of misaligned connections or geometry conflicts, and provides a database of information useful for estimating, production, and erection.



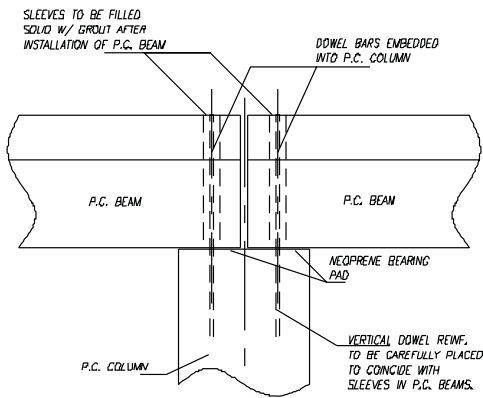




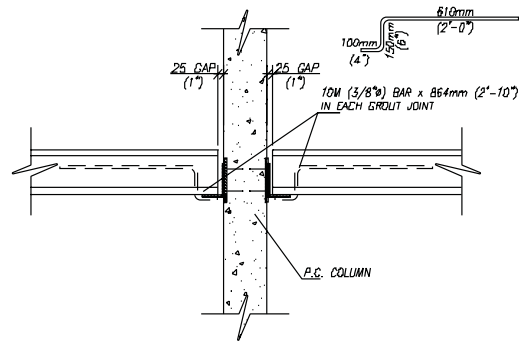
Column Footing Connection
N.T.S.



Beam - Column Connection
N.T.S.

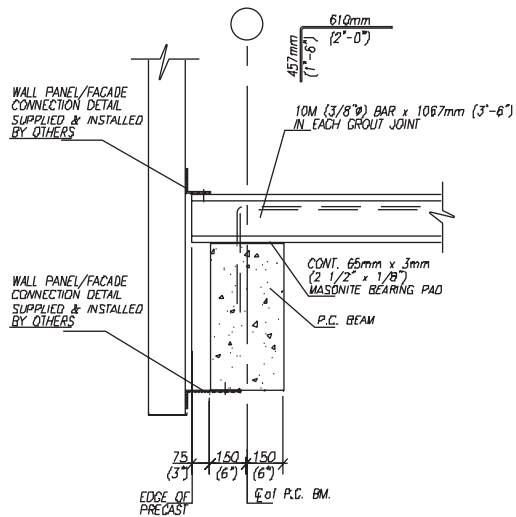


Multiple Beam - Column Connection
N.T.S.



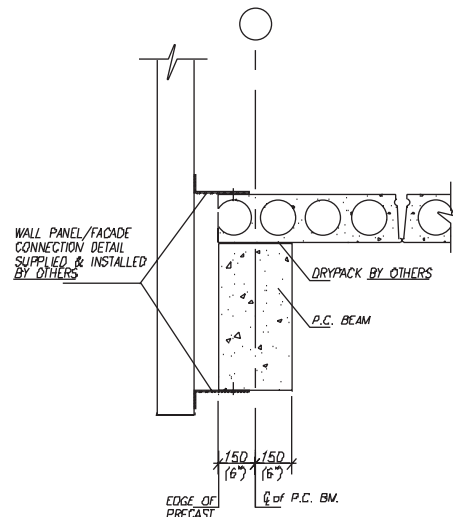
Precast Slab Connection to Column
N.T.S.

All connections shown are to be used for concept design only.



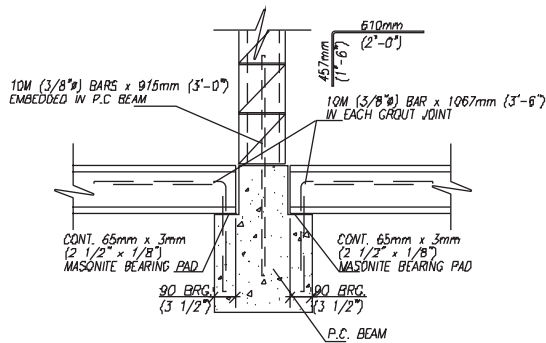
Precast Slab Bearing on Precast Beam

N.T.S.



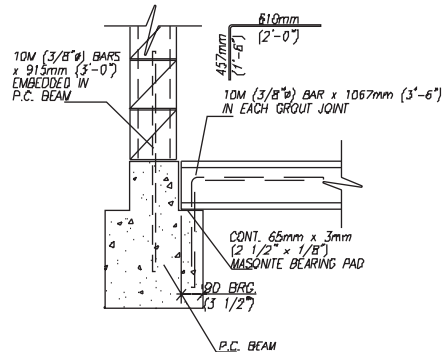
Precast Slab Side Bearing on Precast Beam

N.T.S.



Precast Slab Bearing on Precast Beam

N.T.S.



Precast Slab Bearing on Precast Beam

N.T.S.

All connections shown are to be used for concept design only.

Long Span Parking Garages



Parking structures often represent the first and last impression a visitor has when visiting a facility. Excellent parking structures are designed specifically for the types of visitors a structure will serve. Unless a parkade is safe, secure and easy-to-use, parkers will find other options.

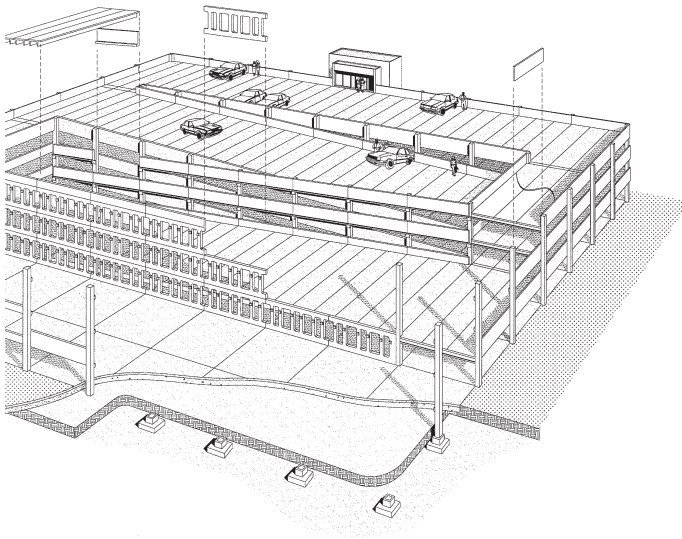
Creating the best parking structure to fit the site requires a careful balance of all elements and a logical plan from start to finish. The involvement of your local CPCI member from the beginning, while key design decisions are being made, can make a dramatic

difference to the final result. Their expertise and input can minimize the time and cost required to complete a project. Precast parkades offer fast construction, versatility of design, attractive exterior finishes, durability and economy making precast prestressed concrete a popular choice for commercial, municipal and institutional clients.

Loads and Forces

Precast concrete parking structures allow for volume changes from creep, shrinkage and temperature differences. Components are cured before they are delivered to the site. The connections between members allow a structure to relieve pressures from ordinary expansion and contraction that otherwise could cause cracking in structural elements. Lateral design loads due to wind, earthquake or earth can be resisted in a precast

concrete structure by transferring loads through the floor diaphragm to shear walls and/or to column beam frames. Care in locating shear walls and isolation (expansion) joints will enhance performance.



Loading walls with framing beams or floor members can minimize connections between shear walls to resist uplift forces. Connections can be designed to prevent beam rotation and absorb bumper loads without undue restraint against volume changes.



Bay Sizes

For maximum economy, bay sizes should be as large as practical and modular with the standard precast concrete floor elements selected.

For long span parking, the bay size selected need not be a multiple of the width of the parking stall. Clear spans with fewer columns create an open concept for added security.



Drainage

Sloping of floors to achieve good drainage is essential to quickly remove rain and salt laden water from the structure. The drainage pattern selected should repeat for all floors wherever possible to allow for repetition in manufacturing the precast elements. Locate isolation (expansion) joints at high points to minimize possible leakage. Slope the floors away from columns, walls and spandrels to promote proper drainage.

Durability

High strength precast concrete components are cast under controlled conditions in the precaster's plant. When precast concrete elements are prestressed, concrete is cast around highly tensioned pretensioning strands that run through the steel forms. After the concrete has cured, the pretensioning force is released into the beam placing the concrete in compression.





Prestressed slabs and beams are virtually crack-free and highly resistant to attack by chloride ions. Where cast-in-place composite topping is used over precast floor members, wire mesh reinforcement should be incorporated in the topping. A high strength concrete topping having a water/cement ratio of 0.40 or less, 6% entrained air and five days of curing under wet burlap will produce the best results (see CSA S413).

A series of crack control joints should be tooled into the topping above all joints in the precast members below.

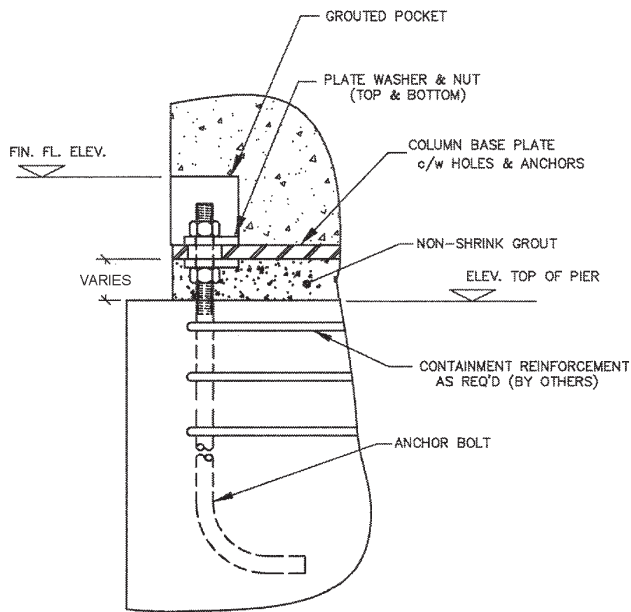
A V-shaped trowel will produce a 25 mm deep by 12 mm wide joint. Later these joints are prepared by grinding with a V-shaped abrasive wheel and filled with a polyurethane sealant.

Pretopped double tees are a recommended alternative to field-placed concrete toppings. This system has excellent 35 to 55 MPa plant produced wearing surface - broom-finished to provide improved driving traction. Standard details are used for adjacent camber differential, joint treatments, erection stability and drainage with this system.

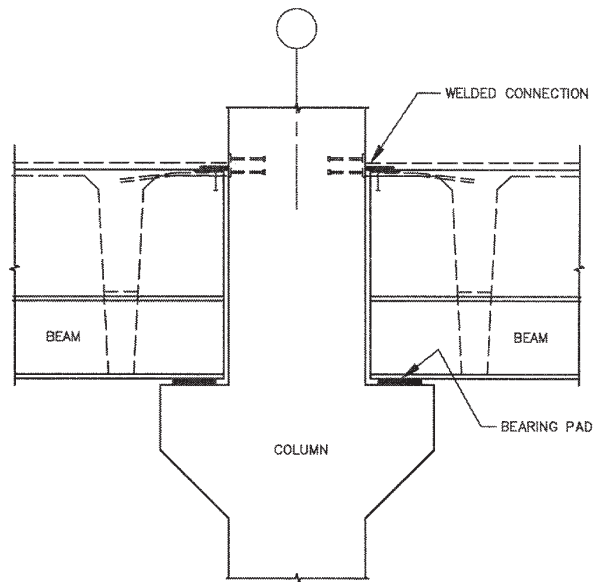
Except for column base plates, all connections and exposed hardware can use hot dipped galvanized or stainless steel for the double tee flange to flange and other connections.

Where connections are subsequently welded, the welds should be minimal and located where they can be covered or easily maintained.

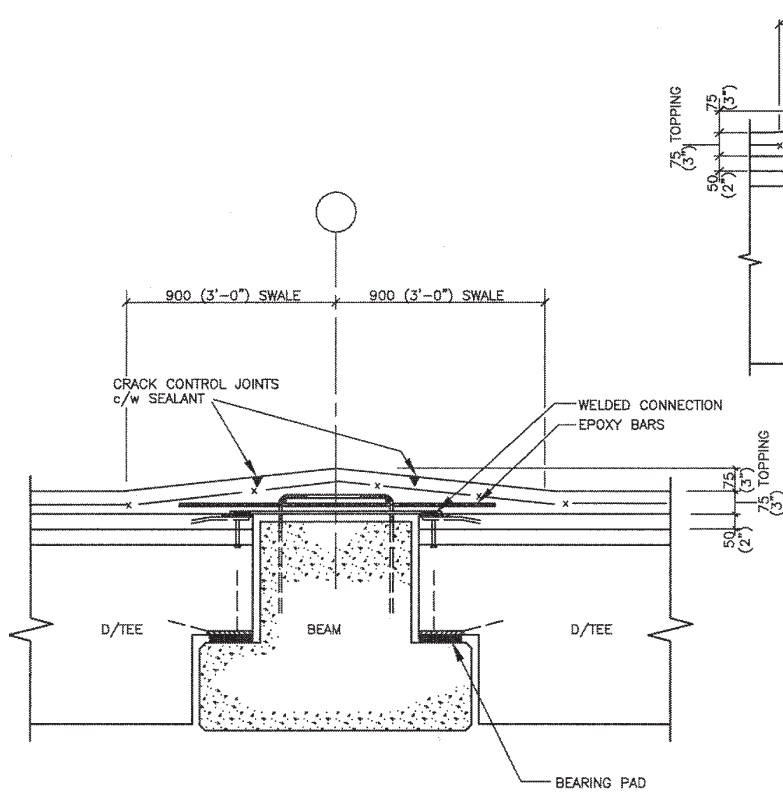




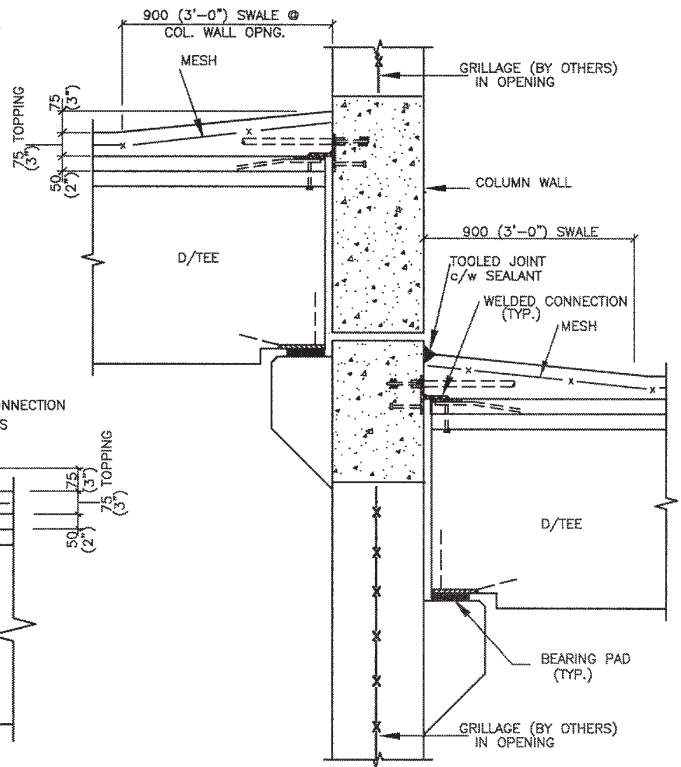
Column Base Detail



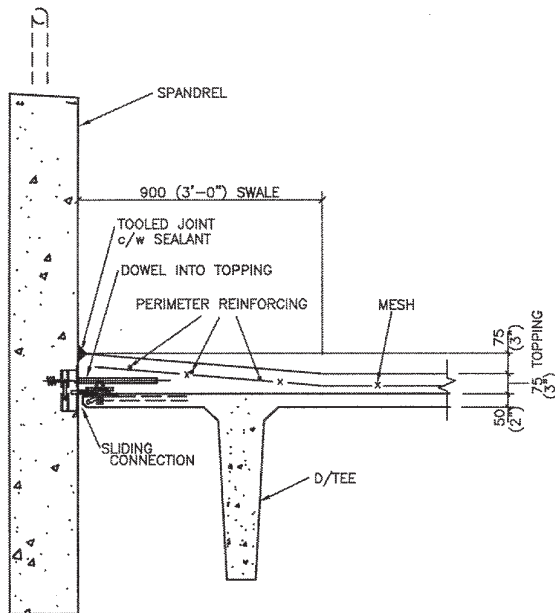
Inverted T/Beam to Column Connection



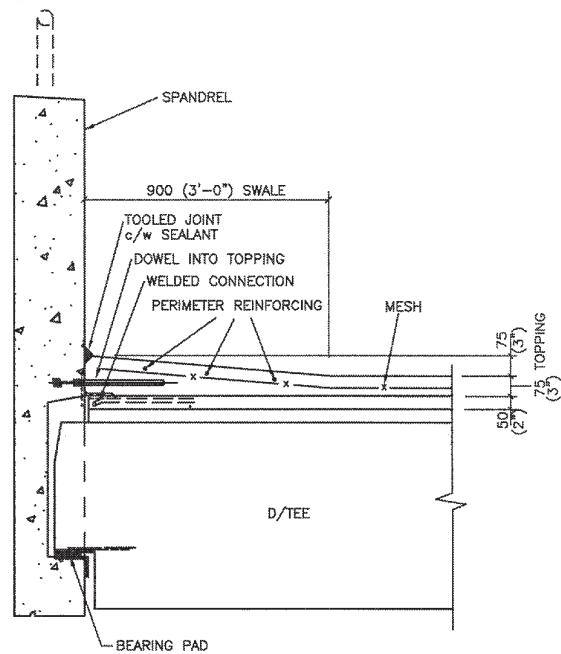
Inverted T/Beam to Double Tee Connection



Column Wall to Double Tee Connection

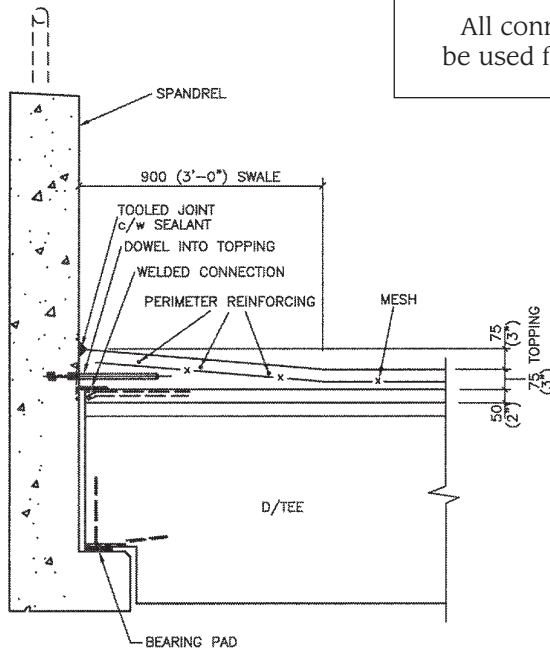


Non Load-Bearing Spandrel
To Double Tee Connection

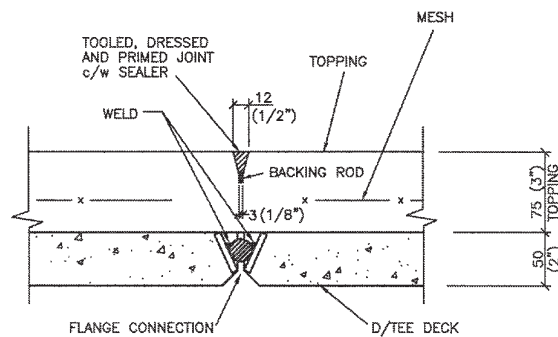


Load-Bearing Pocketed Spandrel
To Double Tee Connection

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be used for concept design only.

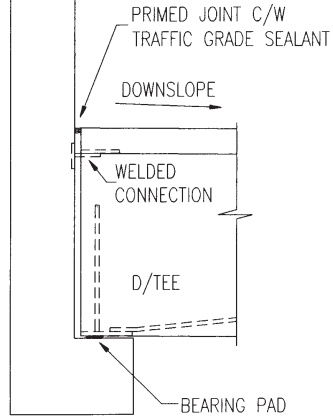


Load-Bearing Ledged Spandrel
To Double Tee Connection

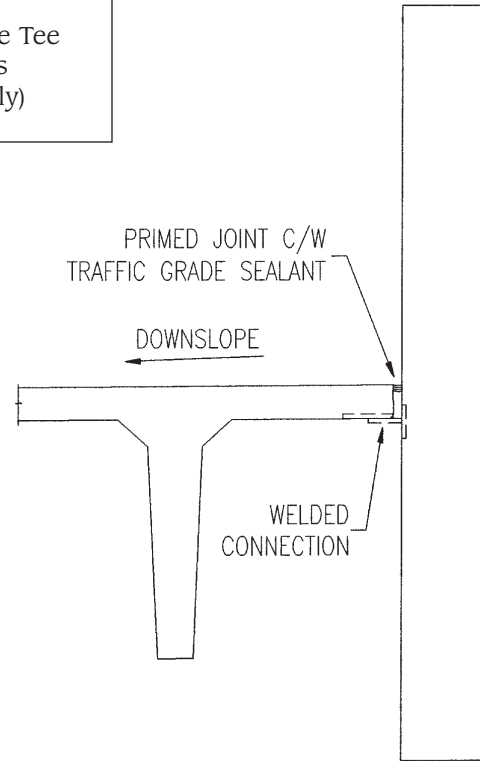


Crack Control Detail
@ Double Tee Joints

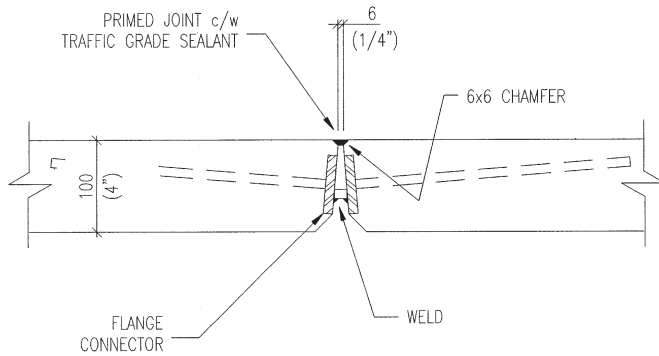
Pre-Topped Double Tee Typical Details (for concept only)



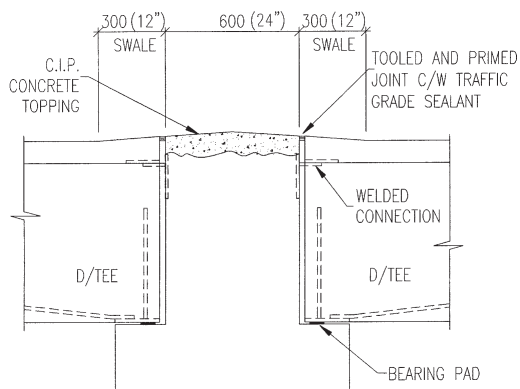
LB Spandrel to
Pre-Topped Double Tee
Connection



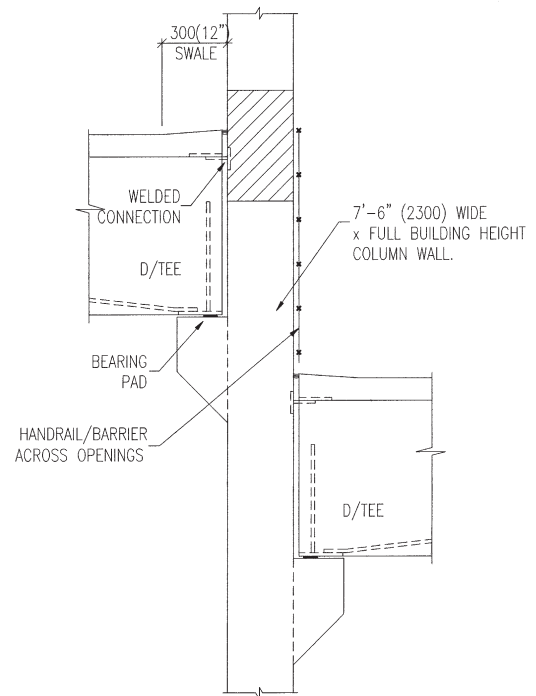
NLB Spandrel to Pre-Topped Double
Tee Connection



Pre-Topped Double Tee Joint



Pre-Topped Double Tee to Inverted
T/Beam Connection



Column Wall to Pre-Topped Double Tee
Connection

Residential Buildings

Precast and prestressed concrete enjoys broad acceptance in low-rise and mid-rise apartment buildings, hotels, motels, and nursing homes where the repetitive use of standard components manufactured in a factory can be fully utilized. The superior fire resistance and sound control features are specifically recognized by owners and developers.

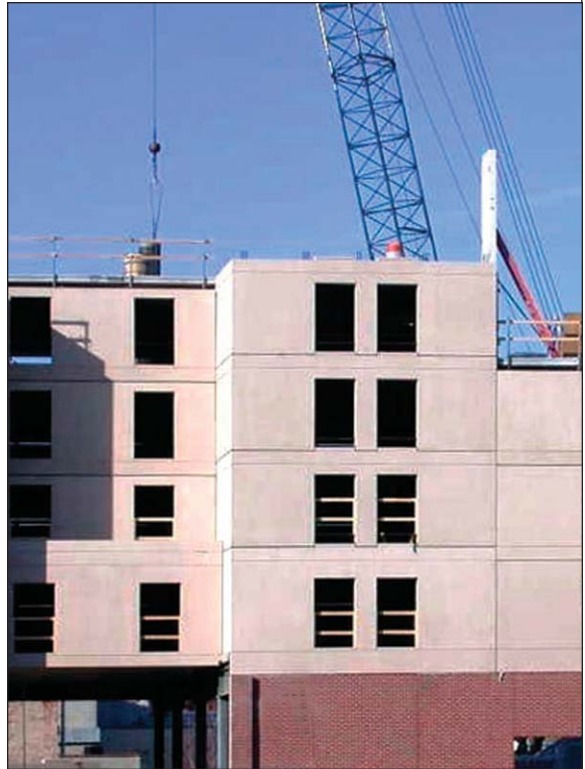
Floors and Roofs

Hollow core slabs are popular for this type of construction. The most common floor and roof elements employed are 203 mm (8 in) deep untopped hollow core units. These slabs can span up to 9 m or more without intermediate supports. Longer spans can be achieved by using 254 mm (10 in), 305 mm (12 in) or 355 mm (14 in) deep hollow core units.

For hotels, motels and apartments the hollow-core slabs are oriented to either span between load bearing shear walls or to span from the central corridor to an exterior wall. Balconies can be cast as separate units to provide a thermal break with the outside walls.

Speed of Construction

Precast components can be manufactured and erected by one trade more efficiently and quickly than any other building system. Speedy completion means buildings can be occupied and start generating revenue sooner.



The use of precast walls speeds the erection process. Construction rates of one floor per week and better are often achieved. Architectural insulated sandwich wall panels used for the exterior of a building can provide a durable, attractive, energy efficient envelope. Ancillary recreation, parking and convention facilities are commonly constructed using precast concrete framing with long span precast roof and floor members.

Faster Occupancy

Owners and developers are discovering that for low-rise and mid-rise apartment buildings, hotels, motels, and nursing and retirement homes, precast hollow core concrete floors combined with precast walls can be the true winner for getting projects finished fast, generating revenue sooner and maintaining quality, value and fire resistance.

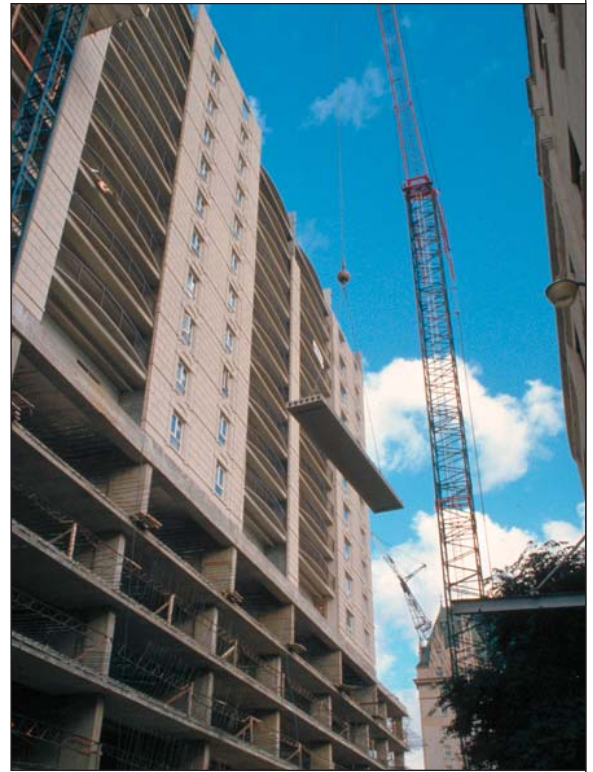
Comfort and Security

The solid, secure, high-quality look and feel of solid precast construction encourages greater occupancy at higher rents, with better selling and resale values.

Precast offers some of the lowest sound transmission of any building material used for multi-unit housing. When ceilings and floors are made with precast floors and walls, complaints about noise become a thing of the past. Tenants like the sense of security of a building that is solidly built, fire resistant and virtually decay-proof. They know their families are safe and their possessions are protected.

Precast and Fire Safety

A major concern when building assisted living/retirement multi-family housing is fire safety of lives and property. An effective approach to this fire containment problem is called Balanced Design that consists of three elements: containment, detection and suppression.



Containment, the key ingredient in Balanced Design, requires fire resistant building materials with a two-hour or higher fire rating. A multi-unit structure built with precast floors and roofs, combined with precast dividing walls, can contain a fire to within the unit of origin, leaving the occupants safe and the surrounding areas virtually undamaged.

Education Buildings

Precast prestressed concrete has been a favoured material for school, college and university building structures, providing design flexibility and fast construction.

The superior finishes achievable in a precast plant have enabled many designers to expose the structure in the finished building. Durable, good looking exterior finishes using architectural precast panels provide years of maintenance free use.

In addition to classroom and office facilities, student residences, auditoriums, gymnasiums and school swimming pools have been constructed using long span precast concrete floor and roof members.

More educational buildings are being designed using architectural and structural precast, prestressed concrete components that include:

- Load-bearing non load-bearing precast concrete wall panels
- Hollow core and double tee floor/ceiling slabs
- Precast columns and beams

Unmatched advantages realized when precast components are combined to form a total precast concrete school structure are:

- economy
- reduced construction time
- improved quality and durability.

A school building initially designed as a total precast system can provide the best design solution possible.

Fabrication & Erection Speed

Precast components can be fabricated in the precast plant while foundation work is in progress. Wall panels, double tees, and hollow core slabs can be erected quickly, allowing interior trades to begin work earlier, and often cutting weeks and months from the schedule. The fast enclosure reduces a contractor's costs and risks from weather or material damage during erection,





Instant Brick

Brick-faced precast panels can be provided to ensure a high-quality, even-spaced appearance that is difficult to achieve with actual brickwork. Thin-brick and/or half brick can be cast in the face of precast panels at the precast plant to supply the exterior finish that many school districts seek. Inset bricks eliminate the long construction time needed for laid-up brick and remove several trades from the site.

Optimized Floor Area

Insulated sandwich wall panels offer an energy efficient, thin cross-section that helps to maximize interior floor space. Typical precast panels are 250 mm (10 in) thick. Masonry walls may be up to 400 mm (16 in) thick. This space saving throughout a school can increase interior space, speed construction and produce a more energy-efficient building.

Long Spans

Precast hollow core and double tee slabs offer tremendous design flexibility by providing long clear spans. Load-bearing precast wall panels can reach heights of 17 m (55 ft), while double tees can span 24 m (80 ft) or more. This opens up the interiors of auditoriums, gymnasiums and pools while reducing material costs and interior columns.

Durability

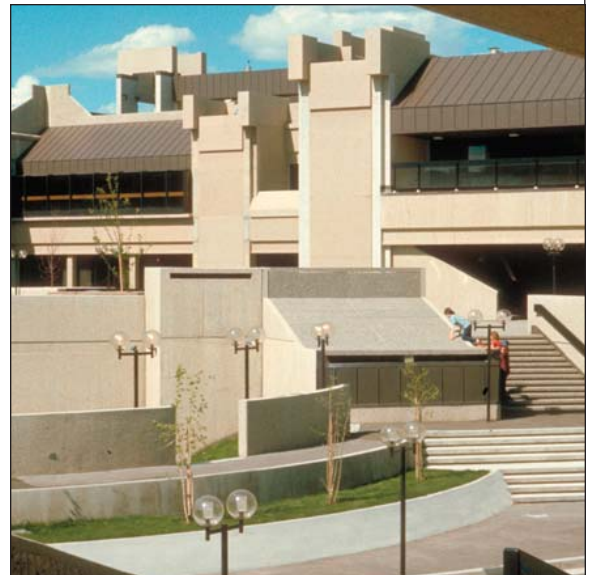
Precast concrete resists chloride penetration and will not corrode, ensuring long life with minimal maintenance. Sandwich insulated wall panels provide an attractive and durable interior finished surface, a particular advantage in gymnasiums and other areas that receive heavy-duty use.

Low Maintenance

Maintenance is minimized during a school's lifetime thanks to precast's durability. Panels only require recaulking every 15 to 20 years to maintain their reliability. Solid precast construction prevents unsightly stains or damage to interiors while alleviating concerns about mould formation.

Fire Safety

Precast concrete is a noncombustible material that meets all fire-code provisions without additional design or spray coatings required. This resistance speeds construction, eliminates added trades from the site and provides an inherent passive level of protection that does not need to be activated at the time of a fire. Precast construction will not give off lethal smoke and maintains its structural integrity even when subjected to the most intense heat. Designing with a total precast system maximizes the time for detection, evacuation and suppression.



Industrial Buildings

High strength precast concrete resists fire, damp conditions and a variety of chemical substances. The clean, smooth surfaces obtainable in a precast concrete factory make this material ideal for food processing, computer component manufacturing and wet processing operations where cleanliness is of concern.

The ability of precast prestressed concrete to span long distances (hollow core 9 to 15 m, double tees 20 to 30 m, single tees 25 to 40 m) and carry heavy loads with minimum span/depth ratios are particularly useful in the construction of warehouses and industrial buildings. Spans of 45 m or more can be obtained using custom solutions (segmental construction).

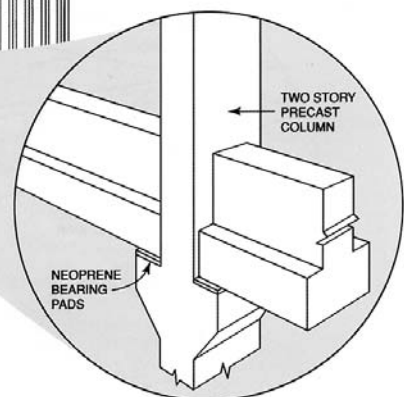
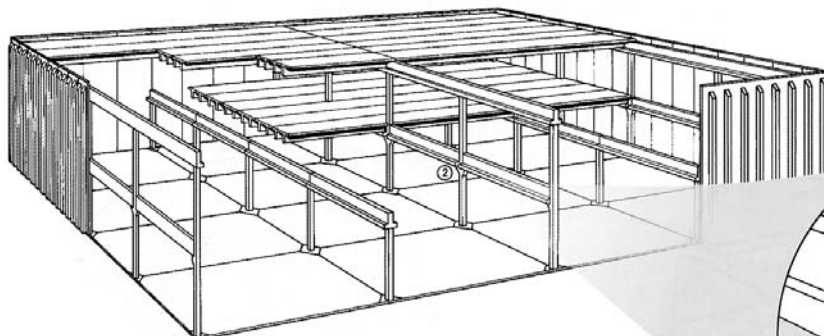
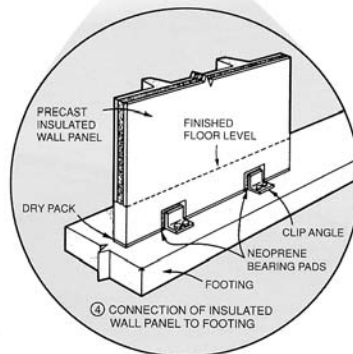
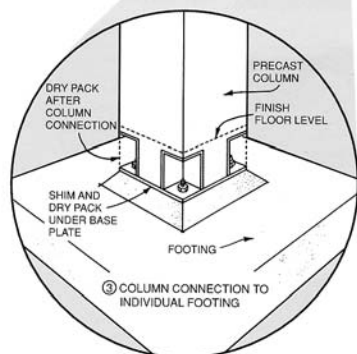
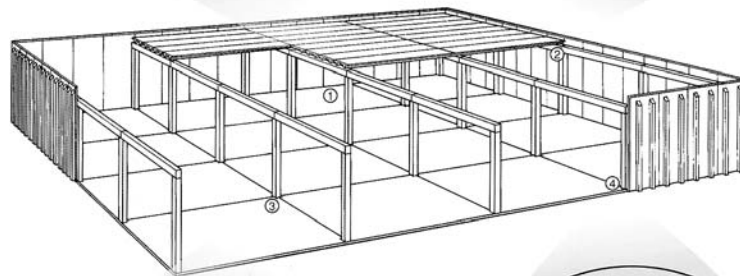
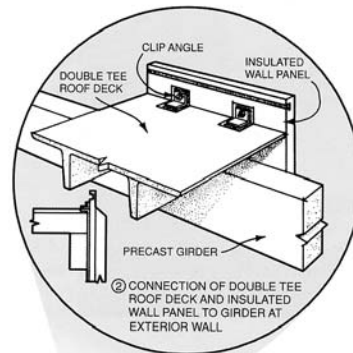
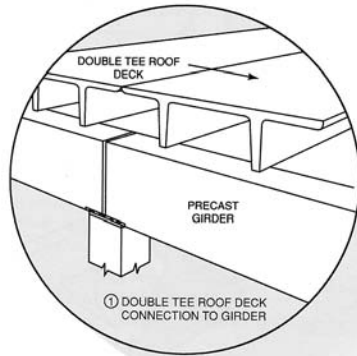


Precast floor and roof framing can be designed to accommodate a variety of mechanical systems and support heavy industrial uses such as hanging loads and bridge cranes.

Insulated sandwich panels can be readily used for load bearing exterior walls. Roof and floor elements can bear directly on pockets or haunches provided on the inside faces of wall panels. Exterior walls can be formed using standard shapes efficiently prestressed in long line production facilities. Custom shapes can be produced in architectural molds with smooth, sandblasted or exposed aggregate surfaces. Sandwich insulation can be incorporated to provide the required RSI-values.



Precast components require little maintenance. Precast concrete resists abrasion, weathering and many harsh chemicals. Precast can withstand washdown, thermal shock and high-pressure hose streams.





Pulp & Paper Mill

Pulp mills require clean non-corrosive interior surfaces. Precast structures can accommodate most equipment, cranes, monorails, mechanical systems and electrical systems. Often a modular grid of openings and sleeves or inserts is provided for flexibility and to allow for ongoing changes during construction and for future modifications to the building/processes.

Precast Panel Systems

Precast sandwich wall panels are ideal for industrial applications. Panels can be provided with insulation values to suit project requirements. Exterior and interior finishes can be smooth, coloured or textured. Panels can be relocated later on to accommodate building expansions (see CPCI publication, "Precast Concrete Insulated Wall Panels, Technical Guide" for more information).



Commercial Buildings

The combination of high quality architectural load bearing exterior walls with mass produced structural precast floor and roof members and precast concrete framing members can produce open, attractive, fire resistant, economical buildings. The quality finishes and fast schedules result in early occupancy, tenant satisfaction and reduced financing costs that makes precast and prestressed concrete buildings very suitable for office buildings.



Significant time savings usually result from the choice of a totally precast concrete structure. The superstructure is prefabricated while the on-site foundations are being built. Potential delays are reduced with the complete building system being supplied under one contract.

Erection of large precast concrete components can proceed even during adverse weather conditions to quickly enclose the structure. Load bearing architectural precast panels provide a finished exterior at the same time that the superstructure is erected. The prestressed floors provide an immediate working platform to allow the interior tradesmen an early start on the mechanical, electrical and interior finishing work.

Long span double tee or hollow core floors reduce interior framing and provide large column free areas. Architectural finishes can be used in the interior of a building for columns, atrium framing, entrance and elevator shaft walls. Interior or exterior shear wall systems and rigid frame column beam jointing have all been successfully used to resist lateral forces.



Stadiums and Arenas

Large stadiums and arenas are impressive structures. Often these projects are built on tight schedules to accommodate some important sporting event. Precast prestressed concrete has been the overwhelming choice for many of these projects. The technique of post-tensioning



precast segments together has allowed this versatile material to form complex cantilever arm and ring beam construction to support the roofs of these structures. Post-tensioning is also commonly employed to reinforce precast concrete cantilevered raker beams that carry the seating and provide unobstructed viewing of the playing surface.

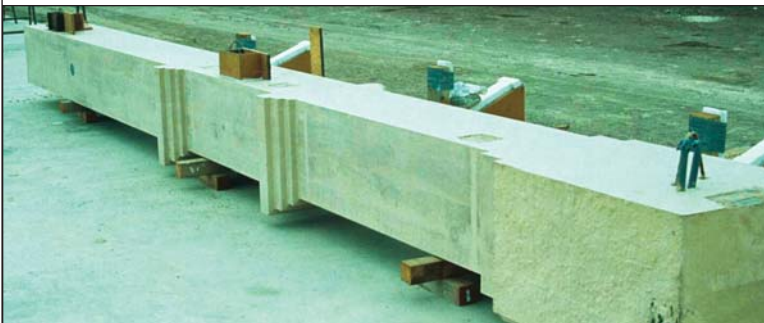
Long-spans and the ability to eliminate costly field formwork makes precast and prestressed concrete the best choice for many components of stadium construction, specially seating that can be standardized to take advantage of repeated form utilization. Mass produced seating units have been



manufactured in a variety of configurations and spans to provide for quick installation and long lasting service.

Pedestrian ramps, concession, toilet, and dressing room areas can all be framed and constructed using precast prestressed concrete elements.

Construction of stadium components that are difficult to cast-in-place, such as raker beams and ring beams can be simplified by precasting these units in a precast plant, delivering them to the site and lifting them into place. Consult CPCI members for available riser sections.





CPCI Members

Institute:

The Canadian Precast/Prestressed Concrete Institute (CPCI) is a non-profit corporation founded in 1961 for the purpose of advancing the design, manufacture and use of structural and architectural precast/prestressed concrete in Canada.

- CPCI is unique: a combination of a trade and professional association, with a representative mix of companies and individuals.
- Membership includes precast producers (Active Members), industry suppliers (Associate and Supporting Members), engineers and architects (Professional Members), plus affiliate and student members.
- These members receive technical information from CPCI and PCI (US).
- Consult the CPCI website (www.cpci.ca) for more information and application forms.

Technology:

CPCI members are committed to developing innovative solutions to meet the demands of the construction industry. CPCI is a source for knowledge, statistics, ideas and information relating to the design, manufacture, and use of precast/prestressed concrete. Through investigations and research, new engineering processes are established to ensure quality and new product design. CPCI's aim is to improve the efficiency and effectiveness of the industry as a whole.

CPCI Members:

CPCI member companies are precast professionals; capable and willing to help you successfully complete your next project. Involve your CPCI partner at the early stages of project planning. Whether the challenges are structural, aesthetic, timing or economic, CPCI members can provide invaluable input. You will find CPCI members are dedicated, committed and competent to contribute to the realization of the standards you have set for your projects. They will be there to advise and assist you from concept to completion. Consult the CPCI website: www.cpci.ca for the members near you.



CPCI Resources

CPCI Guide Specifications

Download these specifications at: www.cpci.ca - click on: Specifications

- Section 03410 - Hollow Core Precast/Prestressed Concrete
- Section 03410 - Structural Precast / Prestressed Concrete
- Section 03450 - Architectural Precast Concrete
- Section 03450 - Insulated Precast Concrete Wall Panels

These online specifications are updated to reflect changes in codes, standards and industry practices.

Detailed Design Information:

CPCI Design Manual

Manual contains comprehensive design and construction information in accordance with industry practice and Canadian design and construction codes and standards.

Order from: www.cpci.ca

Architectural Precast Concrete Walls

Best Practice Guide

Guide contains details and information covering precast walls as both cladding and load bearing assemblies.

Order from: www.cmhc.ca

Designer's Knowledge Bank

The Designer's Knowledge Bank is a site created to assist design and construction professionals to understand precast, prestressed concrete products and structures. The material here is free-of-charge and downloadable. Other material such as comprehensive hardcover design manuals may be purchased through this site.

To access the Designer's Knowledge Bank, go to: www.cpci.ca

CPCI Members Near You / Your Project

To contact CPCI members, go to:
www.precastsearch.com



CPCI Certification

How Precast Certification is a Requirement of the National Building Code

CSA A23.3 – Design of concrete structures:

A23.3-04 Clause 16.1.3 – For elements produced in manufacturing plants certified in accordance with Clause 16.2, the concrete material resistance factor, ϕ_c , specified in Clause 8.4.2 may be taken as 0.70.

A23.3 allows an increased material resistance factor, $\phi_c = 0.70$ for precast concrete members that are certified in accordance with A23.4 in recognition of the quality control and accurate placement of forms and reinforcement. The material resistance factor, $\phi_c = 0.65$ applies to cast-in-place and non-certified precast concrete members

CSA-A23.3-04 - Clause 16.2.1 – All precast concrete elements covered by this standard shall be manufactured and erected in accordance with CSA A23.4.

CSA A23.4 – Precast concrete – Materials and construction:

CSA-A23.4-05 - Clause 4.2.1 – Precast concrete elements produced and erected in accordance with this standard shall be produced by certified manufacturers, with certification demonstrating the capability of a manufacturer to fabricate precast concrete elements to the requirements of this Standard.

CPCI Precast Concrete Certification Program for Architectural and Structural Precast Concrete Products and Systems

The CPCI Certification Program qualifies precast concrete manufacturers who fabricate architectural and structural precast concrete and meet CPCI certification requirements.

Manufacturers are evaluated on their quality system, documentation, production and erection procedures, management, engineering, personnel, equipment, finished products and assemblies. Independent professional engineers conduct audits twice annually.

Certification confirms a manufacturer's capability to produce quality products and systems.

The CPCI Certification Program assures project specifiers and owners of a manufacturer's comprehensive in-house quality assurance program and acceptable production methods.

Manufacturers are required to:

- Establish and maintain the highest standard of integrity, skill and practice in the design and fabrication of their products and systems.
- Undertake the performance of only those services and produce only those products for which they are qualified.
- Be in compliance with current governing codes and regulations, and
- Supply products only from a manufacturer that is certified under the CPCI Certification Program.

Audits are performed to:

- Determine the conformity or nonconformity of the manufacturer's quality system and finished products with the specified requirements,
- Determine the effectiveness of the implemented quality system in meeting specified quality objectives,
- Provide the manufacturer with an opportunity to improve their quality system,
- Confirm that the manufacturer meets the regulatory requirements.

Program Requirements

The manufacturing of precast concrete must be in accordance with the requirements of the latest editions of CSA Standard A23.4 and the PCI Quality Control Manuals MNL-116 and 117 (US equivalent), with the more stringent requirements being the governing criteria.

*F*or More Information:

*CPCI Design Manual,
Fourth Edition
order from www.cpci.ca*



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DISCLAIMER: Substantial effort has been made to ensure that all data and information in this publication is accurate. CPCI cannot accept responsibility of any errors or oversights in the use of material or in the preparation of engineering plans. The designer must recognize that no design guide can substitute for experienced engineering judgment. 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 the material it contains. Users are encouraged to offer comments to CPCI on the content and suggestions for improvement. Questions concerning the source and derivation of any material in the design guide should be directed to CPCI.