

DM Berg Consultants, P.C.

570 Hillside Avenue, Needham, MA 02494

P (781) 444-5156 F (781) 444-5157 WWW.DMBERG.COM

Cast-in-Place Concrete Construction

Concrete Construction is Creeping into Massachusetts

If you've peered into some of the construction sites in and around Massachusetts lately, you may be seeing something above grade that you may not see too often; CAST-IN-PLACE CONCRETE. Slowly, cast-in-place concrete construction is making inroads into the New England construction industry. This may be a time for your firm to consider the advantages of concrete construction in upcoming projects. Cast-in-place concrete construction comes in multiple forms, each with its own benefits. (see reverse)



*Rosecliff Apartments (Six-stories) (aka CJ Willard Street Apartments)
Post-tensioned Floor System*

DMBC recently performed a complete re-design of the framing system for a six-story residential building (featured above). The original design consisted of masonry bearing/shear walls and precast, prestressed concrete plank framing. Pricing review by the General Contractor indicated that a post-tensioned concrete system may be more cost effective. DMBC completed the re-design and detailing and created a more cost-effective superstructure.

DM Berg Consultants, P.C. recently completed Cast-in-Place Post-Tensioned Framing Designs, Two-Way Reinforced Concrete Slab System Designs, and "Filigree" Wide Slab System Designs

This nine story residential building (featured below) was developed architecturally as a masonry bearing/shear wall and precast, prestressed concrete plank framing system. As the plans were developed and our office became involved with the structural framing, other options had to be considered. The floor plates did not lend themselves to the proposed framing systems. Initial analyses by this office indicated a concrete framed structure would make more sense. We provided designs and details for a two-way, cast-in-place, reinforced concrete flat plate with a combined moment frame and shear wall lateral system. This provided the architect with greater plan flexibility while keeping the same depth of construction in comparison to the precast plank system.



*Tufts University Parking Garage and Offices (Seven-stories)
Filigree Wide Slab Floor System*

After detailed studies, the Filigree wide slab system was chosen for its reduced cost and comparable structural depth to other framing options. Filigree is a composite system in which reinforced precast prestressed panels are placed as permanent formwork. Additional mild reinforcing is placed in these forms and then concrete is cast to complete the composite slab construction.

This design-build project (featured left) was initiated by considering three structural framing systems (one steel frame and two concrete). Both cost and floor-to-floor height were the driving considerations. Floor-to-floor height was critical because of zoning height limitations. At the rear of the building, a 150 foot long steel truss bridge was designed for pedestrian access.



*B'Nai B'Rith Covenant House (Nine-stories)
Two-way Reinforced Concrete Flat Plate*

What is Bringing Concrete to New England?

In many cases, the larger concrete framed buildings and structures being built in and around Massachusetts are being managed by construction firms from outside of the New England area with experience in concrete construction. Additionally, many of the large construction firms based in New England have grown into other regions of the country where concrete construction is more prevalent and are bringing their concrete experience back to New England. Lastly, the Big Dig has numerous buildings and structures constructed of cast-in-place concrete providing experience to local sub-contractors, suppliers, and laborers.

All of the above-listed experiences have made forming, reinforcing installation, shoring and re-shoring, and the curing process more cost competitive with steel framed structures. For Owners, Architects, and Structural Engineers, this allows us to expand the possibilities of building framing options in New England.

Types of Cast-in-Place Concrete Floor Constructions and Their Benefits

1. Post-tensioned concrete slabs.
 - 1.1. Reduced depth.
 - 1.2. Reduced dead load.
 - 1.3. Reduced cracking limits intrusion of deleterious materials, which may cause corrosion.
 - 1.4. Less mild reinforcement (conventional rebar).
2. Flat-slab systems. These come in many forms depending on span and loading criteria and may include drop panels and/or column capitals.
 - 2.1. Reduced depth.
 - 2.2. Reduced dead load.
3. Beam and slab system.
 - 3.1. Beams can be used as part of the lateral force resisting system.
 - 3.2. Longer span capabilities compared to the flat slab.
4. Waffle slab system. This is essentially a hybrid of the flat slab and beam/slab system.
 - 4.1. Longer span capability than flat slab system.
 - 4.2. Higher live load capacities than flat-slab system.
5. Filigree wide slab system. This is a composite system combining precast prestressed concrete planks that act as permanent formwork with cast-in-place reinforced concrete cast over.
 - 5.1. Cost savings associated with a permanent formwork system.
 - 5.2. Can be used with a cast-in-place concrete frame or a conventional steel framed structure.



*Tufts University Parking Garage and Offices
Filigree Wide Slab Floor System*

Advantages of Concrete Construction

1. Concrete can take on many shapes and forms thus enabling architectural expression.
2. Repetitive floor plans allow for re-use of forms and shores, reducing construction costs.
3. Concrete has a natural fire rating.
4. Concrete can provide low floor-to-floor heights.
5. Concrete can provide a semi-finished ceiling system.

Disadvantages of Concrete Construction

1. Dead loads are generally higher than similar steel framed structures.
2. Certain concrete systems may not be as advantageous with very low capacity foundation systems.
3. Columns are generally larger than steel columns of similar capacity.
4. Construction can be complicated by extremes in ambient temperature.
5. Initial erection times may be longer than comparable steel framed structures.