PRECAST CONCRETE

Hollow Core Plank

Design, integration, and specification guidance for Girder-Slab® projects.

The Girder-Slab® system uses precast, prestressed hollow core plank as its floor and ceiling deck — the same material specified on hundreds of thousands of residential, hospitality, and student housing projects across North America. This guide covers how hollow core plank integrates with the D-Beam® girder, key specification parameters, camber management, MEP coordination, topping options, and finished floor compatibility.

1. System Integration with the D-Beam® Girder

Hollow core plank bears directly on the bottom flange of the D-Beam® girder. The D-Beam® is a proprietary wide-flange steel girder with a vertical web slot that allows the plank ends to project into the beam depth — eliminating the conventional plank ledger and reducing overall floor-to-floor height by 8 to 14 inches compared to conventional precast-on-steel or flat-plate concrete systems.

Key integration features:

- Plank seats on the D-Beam® bottom flange — no separate bearing ledge required.
- Plank ends project through the web slot; the slot is grouted solid after erection.
- Grout keying at the plank-to-beam interface transfers diaphragm shear to the lateral system.
- The structural steel package (D-Beam® + columns + connections) and the hollow core plank are procured and erected as two separate subcontracts — standard competitive bidding for both.
- Plank is typically installed after the steel frame is erected and braced.

Note: The D-Beam® bottom flange requires spray-applied fireproofing (SFRM) or a gypsum board soffit to achieve the UL K912 fire rating. The hollow core plank itself provides inherent fire resistance through concrete cover over prestressing strands.

2. Plank Depths and Span Ranges

The Girder-Slab® system is compatible with standard precast hollow core plank in 6-inch, 8-inch, and 10-inch depths. Plank selection is driven by required span, superimposed dead load (SDL), and live load. The D-Beam® Calculator provides span/load tables specific to the system.

Depth	Typical Span Range	Residential LL (40 psf)	Common SDL (15–30 psf)	Notes
6"	16–26 ft	✓	✓	Most common for mid-rise residential
8"	22–32 ft	✓	✓	Wider bays; hospitality & student housing
10"	28–40 ft	✓	✓	Long-span mixed-use, parking podium

Span ranges are general guidelines. The engineer of record must confirm plank selection using manufacturer section property tables and project-specific load combinations. CS3 provides D-Beam® span tables and can assist with plank coordination.

3. Section Properties

Hollow core plank section properties vary by manufacturer and region. The values below represent typical industry averages for 4-foot-wide units; the engineer of record should obtain certified shop drawings from the specified precast producer.

Property	6" Plank	8" Plank	10" Plank
Unit width	4 ft (48 in)	4 ft (48 in)	4 ft (48 in)
Self weight (bare)	~55 psf	~65 psf	~75 psf
Concrete strength (f'c)	5,000 psi	5,000 psi	5,000 psi
Strand	½" dia., 270 ksi	½" dia., 270 ksi	½" dia., 270 ksi
Moment of inertia (Ix)	~1,100 in^4/ft	~2,100 in^4/ft	~3,500 in^4/ft
Section modulus (St / Sb)	~365 / ~400 in^3/ft	~525 / ~590 in^3/ft	~700 / ~800 in^3/ft

4. Camber — Understanding and Managing Plank Deflection

Prestressed hollow core plank naturally cambers upward at release — the prestressing force causes the plank to arch slightly. Camber is a function of prestress level, plank depth, span length, and concrete age. Managing camber is an important design and construction coordination issue on all hollow core projects.

4.1 Typical Camber Values

At time of erection, camber typically ranges from ¼ inch to ¾ inch for residential spans (16–30 ft). Longer-span or more heavily prestressed planks may exhibit 1 inch or more. Manufacturers provide predicted camber in their shop drawings; the EOR should coordinate floor finish requirements accordingly.

4.2 Camber Differential

Adjacent planks may camber differently due to manufacturing variation, strand eccentricity, and differential creep. Camber differential between adjacent units is common and should be anticipated in the floor finish design.

- Structural topping concrete (see Section 6) is the primary tool for equalizing camber differential.
- Non-structural leveling toppings (see Section 7) can address minor residual differential after the structural topping is placed.
- For finish-critical applications (large-format tile, polished concrete), specify a structural topping and engage the precast producer early.

4.3 Long-Term Creep

Camber increases over time as concrete creeps under sustained prestress. Long-term camber growth (months to years after erection) is a secondary effect that is typically managed by the structural topping. The EOR should review the precast producer's time-dependent camber predictions for long-span or lightly loaded conditions.

5. MEP Coordination and Core Penetrations

The hollow cores running longitudinally through the plank provide dedicated zones for mechanical, electrical, and plumbing penetrations. This is one of the system's primary coordination advantages over poured-in-place concrete flat plate construction.

5.1 Permissible Core Penetrations

- Round penetrations (pipes, conduit, sleeves) may pass through hollow cores without cutting prestressing strands.
- Core access openings can be field-cut at plank ends where the web is thickest and cores are widest.
- Electrical conduit run longitudinally within hollow cores is a common and efficient MEP routing strategy.

5.2 Restrictions

- Do not cut or notch prestressing strands — any strand damage significantly reduces plank capacity.
- Penetrations must avoid the grout zone at plank ends (typically 12–18 inches from the end).
- Large floor openings (stairwells, shafts) should be framed with header beams and plank trimmer units — coordinate with the structural engineer.
- Coring through the plank web (transverse penetrations) is not permitted without engineering review.

5.3 D-Beam® Grout Zone Coordination

The web slot of the D-Beam® is grouted solid after plank installation. MEP runs must be planned and sleeved prior to grouting. CS3 provides MEP coordination guidance as part of the free engineering consultation service.

6. Structural Concrete Topping

A structural concrete topping is a cast-in-place concrete overlay placed over the hollow core plank to create a composite structural diaphragm, equalize camber differential, and provide a uniform structural surface for finish application.

6.1 Structural Topping Parameters

Parameter	Typical Value / Requirement
Thickness	2½" – 3½" (minimum per ACI and project requirements)
Concrete strength (f'c)	3,000 – 4,000 psi (match or exceed plank)
Reinforcing	WWF 6×6-W2.9×W2.9 (minimum) or deformed rebar per EOR
Shrinkage control	Synthetic fiber reinforcement or per EOR specification
Surface prep	Plank top surface intentionally roughened at plant; clean and dampen before pour
Shear keys	Plank edges grouted; topping bonds into longitudinal keyways
Composite action	Yes — topping + plank act together for superimposed loads

6.2 When a Structural Topping Is Required

- When the building's lateral system requires a fully composite, reinforced concrete diaphragm.
- When camber differential exceeds the tolerance of the intended floor finish.

- For podium structures with demanding flatness requirements (large-format tile, hardwood, accessible routes).
- When the plank spans approach the upper end of the system's range and composite action is needed to satisfy deflection limits.

6.3 When a Structural Topping May Be Omitted

In many residential and hospitality applications, a structural topping is not required if the diaphragm can rely on grouted keyways alone and camber differential is within acceptable limits for the specified floor finish. This decision is the EOR's and should be made early in design — it significantly affects the construction schedule and budget.

7. Non-Structural Toppings and Leveling Systems

Where a structural topping is not specified, non-structural leveling systems compensate for camber differential and surface irregularity to prepare the plank surface for finish application.

7.1 Self-Leveling Underlayment (SLU)

- Gypsum-based or cement-based SLU products are the most common leveling approach on hollow core projects.
- Typical application depth: ■ inch to 1½ inches, depending on differential to correct.
- SLU is not a structural element — it does not contribute to diaphragm action.
- Verify SLU compatibility with the plank surface and with the finish adhesive system.
- For gypsum SLU: confirm suitability for wet or humid environments (bathrooms, laundry, pool decks).

7.2 Gypcrete and Lightweight Toppings

- Gypsum concrete (Gypcrete) is widely used in residential construction for leveling and as a sound-deadening layer.
- Typical density: 100–115 pcf (lighter than normal-weight concrete). Add to dead load calculation.
- Gypcrete requires primer on the plank surface; follow manufacturer's instructions.
- Not suitable for wet areas without an appropriate waterproofing membrane.

7.3 Portland Cement Leveling Fill

A thin (■"–1") sand-cement leveling fill may be used where SLU is not practical. This approach is heavier and less self-leveling, but it is compatible with all floor finish types and is familiar to most concrete subcontractors. Reinforce with fiber if thickness exceeds ¾ inch.

8. Finished Floor Compatibility

Hollow core plank is compatible with all common residential and hospitality finish systems. The key variable is flatness tolerance — more demanding finishes require either a structural topping or a leveling underlayment to achieve the required FF/FL.

Finish Type	Flatness Req.	Leveling Needed?	Notes
Carpet / pad	Low	Typically no	Most tolerant; minor camber differential hidden by pad
Luxury vinyl plank (LVP)	Moderate	Often SLU	3/16" in 10 ft per most manufacturers

Engineered wood / floating	Moderate	Often SLU	Floating system absorbs minor irregularity
Ceramic / porcelain tile	High	SLU or structural topping	1/8" in 10 ft; large format is more demanding
Polished / exposed concrete	High	Structural topping	Topping must be ground and polished
Hardwood (glue-down)	High	SLU or structural topping	Requires very flat, dry, absorbent surface
Stone / marble	Very high	Structural topping required	No flex; rigid structural base essential

9. Acoustic Performance

Hollow core plank provides inherently good airborne sound isolation (STC) due to its mass and density. Impact noise (IIC) requires additional treatment at the floor finish layer.

9.1 Tested Assembly Performance

The following values are based on tested Girder-Slab® assemblies. Full test data is available in the Acoustic Performance Data Sheet (separate document).

Assembly	Topping	Floor Finish	STC	IIC
6" plank + suspended ceiling	None	Carpet	54	72
6" plank + suspended ceiling	None	Vinyl / LVP	54	48
8" plank + suspended ceiling	None	Carpet	56	74
8" plank + suspended ceiling	None	Vinyl / LVP	56	50
10" plank + suspended ceiling	None	Carpet	58	76
10" plank + suspended ceiling	None	Vinyl / LVP	58	52

IBC requirements for STC (≥50) and IIC (≥50) between dwelling units are typically met by the 8" and 10" assemblies with carpet or with appropriate resilient mat underlayment beneath hard surface finishes. Specifiers should verify requirements with the AHJ.

10. Specification Guidance

The following notes are intended to assist the engineer of record and specification writer in setting clear requirements for hollow core plank on Girder-Slab® projects. Full plug-in specification language is available in the CS3 Specification Language Guide (separate download).

10.1 Division 03 — Precast Concrete

- Specify hollow core plank per PCI MNL 116 (Standard Specifications for Precast Concrete).
- Require shop drawings indicating strand pattern, camber prediction (erection and long-term), section properties, bearing details at D-Beam® flanges, and keyway dimensions.

- Require minimum 3,500-psi concrete at 28 days (5,000 psi recommended).
- Specify bearing pads: ¼" elastomeric or plastic bearing strip at D-Beam® bottom flange.
- Grout: non-shrink, flowable, minimum 4,000-psi grout at keyways and D-Beam® web slots.

10.2 Division 05 — Structural Steel (D-Beam®)

- The D-Beam® girder is fabricated by the project's licensed structural steel fabricator under competitive bid — specify as part of the complete steel package.
- Reference CS3 standard connection details (available in the Standard CAD Details package) in Division 05 specification.
- Require AISC Quality Certification, Category STD or better.

10.3 Coordination Notes for the EOR

- Confirm hollow core plank manufacturer early — contact CS3 for a list of precast producers experienced with the Girder-Slab® system.
- Coordinate bearing length at D-Beam® flange: minimum 3 inches per PCI; confirm available bearing width with CS3.
- Identify all floor penetrations (MEP, stairs, shafts) on structural drawings before plank layout is finalized.
- Specify allowable camber differential on the structural drawings (e.g., "¼-inch maximum between adjacent plank units at time of finish application").
- Confirm topping decision (structural or non-structural) with the architect — affects dead load, floor-to-floor height, and finish specification.

11. Additional CS3 Resources

Resource	Description	Access
D-Beam® Calculator v3.5	Live structural design tool — enter span, loading, ASD or LRFD	app.girder-slab.com
Standard CAD Details	Structural & architectural section drawings for specification	girder-slab.com/for-engineers
Specification Language Guide	Plug-in spec text with AISC references and UL K912 notes	girder-slab.com/for-engineers
Fire Resistance Data Sheet	UL K912 assembly data: 2-hr and 3-hr restrained/unrestrained ratings	girder-slab.com/for-engineers
Acoustic Performance Data Sheet	Tested STC and IIC values for 6", 8", 10" assemblies	girder-slab.com/for-engineers
Structural System Matrix	30+ criteria comparison vs. flat plate, post-tensioned, Filigree	girder-slab.com/for-engineers
Design Guide v3.5	Complete reference: performance, assembly, design parameters	girder-slab.com/for-engineers
Free Engineering Consultation	CS3 works directly with the EOR — no fee, no retainer	girder-slab.com/evaluate

CS3 / Girder-Slab® provides engineering consultation to the structural engineer of record at no cost. To request a consultation or download additional resources, visit **girder-slab.com/evaluate** or contact us directly.

All section property values and acoustic data are representative typical values. The engineer of record is responsible for verifying all data with the specified precast producer and for all structural design decisions. This document does not constitute a structural engineering opinion or recommendation.