

Basis of Design

This section applies to the design and installation of structured floors.

Design Criteria

Laboratory Buildings

- Design all floors in new laboratory buildings to support a live load of 100 PSF. In addition, use 30 PSF for equipment load plus 20 PSF uniformly distributed partition load. Do not reduce the live load in the design of the floor slabs, floor beams and floor girders. Consider the equipment load as a live load.
- Design the columns and footings to carry the 100 PSF floor live load reduced in accordance with the current building code. Do not reduce the equipment or partition loads.
- Limit the shrinkage to 0.00030 inches per inch (including all admixtures) in the concrete in the floor framing. The contractor shall submit shrinkage test results of mix, conducted per ASTM C-157, a minimum of 4 weeks prior to use.

Vibration

- Some buildings on campus contain research instrumentation that is extremely sensitive to vibration. Stiff floors with high resonance frequencies vibrate less than more flexible floors with low resonance frequencies. Short-span floors vibrate less than long-span floors. The structural engineer shall select a framing scheme as well as the size and spacing of columns to keep the floor vibrations within the criteria established in the Technical Programming Phase.
- Basic design is 2000 micro-inches/sec. maximum for lab areas. Refer to building program for more restrictive vibration criteria. Areas of some buildings may require 1000 micro-inches/sec. maximum.

All Buildings

- Design penthouse floors to support a live load of 75 PSF or the actual equipment weights, whichever is greater.
- Design platforms for equipment to provide adequate access for maintenance personnel. This may include the design of catwalks and ladders at or above the main platform level.
- Design and specify floors that are engineered and constructed to achieve the following minimum degree of flatness when measured in accordance with ASTM E 1155: Overall $F_F = 35$, Localized $F_F = 25$.
- Design and specify floors that are engineered and constructed to achieve the following minimum degree of levelness when measured in accordance with ASTM E 1155: Overall $F_L = 25$, Localized $F_L = 17$. Note that the use of F_L on structured floors is limited to when the slab is still supported in its original as-cast position (still shored) and when the slab has no camber.
- The Localized F-Numbers indicated are the minimum quality acceptable in any one floor section. This allows the contractor sufficient margin for the normal variations that occur within a pour.

- Specify the top of concrete elevation at each column or wall to be within $\frac{1}{4}$ inch of the elevations shown on the drawings.
- Design camber of formwork and steel framing with the goal of keeping the final (after shore removal) deflected slab or beam at, or just below a horizontal position. Engineer of Record shall specify the required cambers on the drawings in order to achieve the tolerances stated above.
- Provide sleeve and/or curb at all floor slab penetrations.
- If a floor is designed for a future load, indicate clearly on the plan (or a key plan) the location, footprint, operating weight and move-in pathway as applicable. This may typically apply to future medical or lab equipment.

Garage Structures

- Limit the shrinkage to 0.00030 inches per inch (including all admixtures) in the concrete in garage floor framing. The contractor shall submit shrinkage test results of mix, conducted per ASTM C-157, a minimum of 4 weeks prior to use.
- Garage floors may be Overall $F_F = 25$, Localized $F_F = 20$, and Overall $F_L = 17$, Localized $F_L = 13$.

Pedestrian Bridges

- Design pedestrian bridges to support a minimum live load of 100 PSF. Also coordinate with Project Manager for any equipment loads that may be used on the bridge.

Slabs over Electrical Rooms

- Design slabs over electrical rooms with micro silica concrete mix or limit shrinkage to 0.00030 inches per inch and add polypropylene fibers. Treat all cracks with Methylmethacrylate.

Post-Tensioned Slabs

- Use of post-tensioned slabs is discouraged because of inflexibility of the structure for remodeling. The tendons are difficult to locate in the field for future remodeling and penetrations are restricted. Post-tensioned slabs are acceptable for parking garages. All other proposed uses shall be discussed with Project Manager and Campus Engineering.
- All post-tensioning shall be a grouted duct type system.
- Provide for a method of permanently identifying each tendon's location on the soffit of the structure for future remodels. Identification shall be a maximum of 10 feet oc. Possible method is by use of $\frac{3}{4}$ " chamfer strips on soffit of forms. Discuss with Project Manager and Campus Engineering.

"Floating" slabs for mechanical equipment

- Avoid using "Floating Slabs" i.e., slabs that are acoustically isolated from the structural slab with insulation between the two slabs. These slabs are usually constructed before the building is "closed in" or protected from rain. Consequentially they are exposed to rain which saturates the insulation, making the acoustical performance ineffective and providing a breeding place for mold and mildew. Consult with Campus Engineering if floating slabs are considered.

Design Evaluation

The following information is required to evaluate the design:

- Schematic Design Phase: Plans showing structural scheme.
- Design Development Phase: Typical floor framing plan and typical sections. Draft specifications.
- Contract Document Phase: All information required for the installation of the structured floors. Final specifications.

Construction Submittals

- Product data for each type of material utilized

Related Sections

- Facilities Services Design Guide - General Requirements - Structural
- Facilities Services Design Guide - Concrete
- Facilities Services Design Guide - Structural Steel
- Facilities Services Design Guide - Timber
- Facilities Services Design Guide - Finishes

Products, Material and Equipment

- See Related Sections

Installation, Fabrication and Construction

- See Related Sections

END OF DESIGN GUIDE SECTION