

Caltech

Design Guidelines

Caltech

Design Guidelines /

A document to provide durable, maintainable and sustainable solutions for the various standards and buildings systems, infrastructures, and renovation projects.

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Section Titles

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v.1: July 15, 2011

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C10 Interior Construction
C20 Stairs
C30 Interior Finishes

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Section Title

C10 Interior Construction

C1010 Partitions

1. Interior Fixed Partitions:

a. General:

1) Extend room partitions through ceiling and anchor to structure above. Do not terminate partitions at ceiling grid without prior approval. If approved, trim top edge of gypsum board partition with L-bead metal trim.

2) Extend all corridor partitions to structure. Enclose all mechanical and electrical rooms with at least one-hour-rated partitions or more, as required by applicable building code.

3) Arrange layout of rooms, corridors, and facilities for functional and logical design, complying with current building code and accessibility.

4) Provide acoustical treatment in appropriate areas for comfort, presentations, and privacy. Provide for sound control around office, conference rooms, toilet rooms, mechanical rooms, and other sensitive areas.

5) Provide corner guards of appropriate design and material in high traffic areas and utility corridors to protect walls.

b. Metal Framing:

1) Metal Stud Framing: Comply with ASTM C 754; and ASTM C 1063 for portland cement plaster assemblies, and ASTM C 840 for gypsum board assemblies.

2) Sheet Metal Components: Comply with ASTM C 645.

3) Protective Coating: Comply with ASTM A 653/A 653M, minimum G40 (Z120), hot-dip galvanized.

4) Thickness: As required to comply with performance requirements.

5) Provide minimum 6-inch- (152-mm-) high by 0.053-inch- (1.34-mm-) thick (16 gage) metal backing plate, as necessary, to support wall-mounted products and additional live loads, if any. Additional metal backing plates may be required for future wall-mounted products.

c. Gypsum Board:

1) Thickness: Minimum 5/8-inch- (16-mm-) thick, except two layers of 1/4 inch- (6-mm-) thick flexible gypsum board may be used for curved applications.

2) Typical Gypsum Board for Interior Partitions, Soffits, Ceilings, and Shaftliner: ASTM C 1396/C 1396M.

3) Abuse-Resistant Gypsum Board: ASTM C 629/C 1629M, for areas where greater resistance to abrasion, surface indentation, and impact is required. Level classification to be determined by the design professional.

4) Tile Backing Panels: Glass-mat, water-resistant backing board complying with ASTM C 1178/C1178M or cementitious backer units complying with ANSI A118.9 and ASTM C 1288 or 1325.

5) Gypsum board surfaces to be painted shall have no measurable variation in any 2-foot (61 cm) direction and a maximum variation of 1/8 inch (3 mm) in 10 feet (3 m) when a straightedge is laid on the surface in any direction. Shim work, if necessary, to comply.

Callouts

Arrange layout of rooms, corridors, and facilities for functional and logical design

Secondary Callouts

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Introduction

California Institute of Technology (henceforth, referred to as Caltech) is an independent, privately-supported university that offers instruction at both undergraduate and graduate levels and is at the same time recognized as a leading research center.

This document, *Design Guideline*, was prepared by Caltech Facilities Department with assistance from architectural and engineering consultants. Caltech Facilities Design and Construction is in charge of developing and maintaining the *Design Standards*:

Facilities Design & Construction
(626) 395-4771

This document shall apply to new construction and retrofit/remodeling projects on campus or satellite sites.

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10 PROJECT DESCRIPTION

The purpose of this document is to identify the items that are typically applicable to Caltech facilities and the Caltech campus, in order to better communicate Caltech's standards, needs, desires, and expectations with the Design and Construction Professional

The Design Professional should comply with this design standard, unless otherwise agreed by the Caltech Project Manager on the project.

1010 Project Summary

1. Purpose: The purpose of this document is to identify the items that are typically applicable to Caltech facilities and the Caltech campus, in order to better communicate Caltech's standards, needs, desires, and expectations with the Design and Construction Professional (architects, engineers, landscape architects, and other design specialists) at the beginning of a project. Typically, Caltech architects, engineers, and maintenance staff are asked the same questions about standards and products on every project. This document is intended to improve that process and make the design team meetings with Caltech architects, engineers, and maintenance staff more productive.

This document does not contain all requirements specific to any project. Only those items where Caltech has a common preference or specific direction were included in this document. For example, Caltech has specific standards for laboratory casework because these are common facility requirements; and, because Caltech prefers specific features and specific manufacturers. The Design Professional should comply with this design standard, unless otherwise agreed by the Caltech Project Manager on the project.

Where no design standard exists, the Design Professional shall select the product at their discretion and recommendation, subject to review and comment by the Caltech Project Manager.

2. Design Standards Kickoff Meeting: Prior to beginning programming and design for a project, the Caltech Project Manager will schedule a project kick-off meeting with the Design Professional and Caltech Facilities Management. The Caltech Project Manager will distribute the *Design Guideline* to the Design Professional. The meeting will include a review of the *Design Standards* document with the Design Professional and provide an opportunity for the Design Professional to ask questions about Caltech preferences and requirements.

- a. When a General Contractor has been selected, an orientation meeting will be scheduled with the Caltech Project Manager, Caltech EHS and Caltech's in-house inspection team.

3. Comments and input by the Design Professional are encouraged. To be effective, the *Design Standards* is a "living" document that is frequently edited based on new products and Caltech experience. In the event the Design Professional believes that a design standard is not recommended for a specific Caltech facility/project, the Design Professional should discuss specific recommendations with the Caltech Project Manager. When the Design Professional believes it cannot, or should not comply with the *Design Standards*, they shall submit those items in writing or a marked-up copy to the Caltech Project Manager.

1020 Existing Conditions

1. Location: Caltech's main campus is located in south central Pasadena, south

and east of the Lake Avenue and Colorado Boulevard commercial corridors. The campus is bordered on the north and west by two- to three-story apartments and condominiums along the Mentor Avenue-Catalina Avenue and Cordova Street-Del Mar Boulevard corridors.

2. Neighborhood: To the south and east of the campus are established and well-maintained single-family neighborhoods that date from the early 1900s. The predominant one- and two-story housing stock in these areas range from more modest dwellings on smaller lots near Del Mar Boulevard to much larger homes on estate-sized lots in southern areas of the City.

The “Historic Zone” is an area of Caltech’s main campus bounded by California Boulevard on the south, and San Pasqual on the north, Hill Avenue on the east and Wilson Avenue on the west.

3. Main Campus: Presently, the Caltech main campus located on 1200 East California Blvd. in Pasadena, California, encompasses approximately 124 acres. Boundaries for the campus are:

- a. Catalina Avenue on the west;
- b. Del Mar Boulevard on the north;
- c. Hill Avenue on the east;
- d. California Boulevard from Hill Avenue to Arden Road on the southeast; and,
- e. Arden Road, Tournament Park, and Wilson Avenue on the south.

4. Historic Zone: The “Historic Zone” is an area of Caltech’s main campus bounded by California Boulevard on the south, and San Pasqual on the north, Hill Avenue on the east and Wilson Avenue on the west.

5. Satellite Facilities: Caltech owns or operates satellite facilities elsewhere in Pasadena and southern California, which include:

- a. Jet Propulsion Laboratory – Pasadena;
- b. Palomar Observatory – San Diego County;
- c. Owens Valley Radio Observatory – Big Pine;
- d. CARMA (Combined Array for Research in Millimeter Astronomy) – Cedar Flats;
- e. William G. Kerckhoff Marine Biology Laboratory – Corona del Mar; and,
- f. Kresge Building (Seismological Laboratory) and other satellite facilities outside the campus boundary, but within the City of Pasadena

1030 Program

...most current and applicable codes and regulations...

1. Codes and Regulations: The Design Professional shall design the project to conform to the most current applicable codes and regulations including, but not limited to the following:

- a. California Code of Regulation Title 24 Part 1-12.
- b. California Building Code Chapters 1-35 and Appendix Chapters C, H, I, and J.
- c. California Residential Code.
- d. California Green Building Standards Code.

Caltech will retain and pay expenses of a Geotechnical Engineer for performing certain inspection, testing and observation functions required for the project.

All new building projects and major renovations will be designed to achieve LEED Gold certification at a minimum while identifying the incremental improvements on that design to achieve LEED Platinum certification.

- e. California Electrical Code.
- f. California Mechanical Code.
- g. California Plumbing Code.
- h. California Fire Code.
- i. Americans with Disabilities Act

2. Ordinances: The Design Professional shall design the project to conform to all applicable and current County of Los Angeles and City of Pasadena ordinances including, but not limited to the following:

- a. Pasadena Municipal Code, Title 12 - *Streets and Sidewalks*.
- b. Pasadena Municipal Code, Title 13 - *Utilities and Sewers*.
- c. Pasadena Municipal Code, Title 14 - *Buildings and Construction*.
- d. Pasadena Municipal Code, Title 17 - *Zoning*.

1040 Owner's Work

1. Geotechnical Reports and Conditions: Caltech will retain and pay expenses of a Geotechnical Engineer for performing certain inspection, testing and observation functions required for the project. Geotechnical Engineer will communicate only with Caltech, who will, in turn, relay any appropriate instructions to the Contractor, with a copy to the Design Professional, within the provisions of the Contract Documents.

2. Project Survey:

- a. All project specific surveys shall provide benchmarks and monuments that will be compatible and coordinated with the most up to date campus wide survey.
- b. Consult Caltech PM to request a copy of the most up to date campus wide survey to incorporate the project survey. Once incorporated, provide Caltech with the revised survey maintaining layer standards and format as originally provided by Caltech.

1050 Project Criteria

1. Sustainable Design: Caltech is committed to ensuring the existing and future facilities on campus meet and maintain a high level of energy, water and resource efficiency. That goal shall be achieved by using the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) guidelines to inform the design and construction process. Caltech firmly believes that LEED certification in and of itself is not the goal, rather a process for building the most durable, efficient and sustainable building possible.

- a. All new building projects and major renovations will be designed to achieve LEED Gold certification at a minimum while identifying the incremental improvements on that design to achieve LEED Platinum certification.

Additionally, project design should take into consideration the full life-cycle cost

Use of products and materials extracted, harvested or recovered, and manufactured within a 500-mile radius of the project site should be pursued when practical.

Arrange layout of rooms, corridors, and facilities for functional and logical design, complying with current building code and accessibility.

Emergency eyewash and shower equipment shall be located on the same level as the hazard, have un-obstructed access [a door is interpreted to be an obstruction], and require not more than 10 seconds to reach.

of operating and maintaining this type of high performance building and how the building will operate as efficiently as possible within the existing campus infrastructure.

b. All other renovation projects will be designed to maximize energy and water efficiency and reduce project waste to the greatest extent possible. These projects should also be designed in concert with other renovation or retro-commissioning projects planned or under-way in the subject building in an effort to maximize building system efficiency and minimize interference with ongoing building operation.

c. Use of products and materials extracted, harvested or recovered, and manufactured within a 500-mile radius of the project site should be pursued when practical.

d. LEED for Existing Buildings shall be considered and reviewed with Caltech Project Manager and Director of Sustainability for existing buildings seeking LEED certification for the first time and projects previously certified under LEED for New Construction.

1060 Facility Program

1. General:

a. Arrange layout of rooms, corridors, and facilities for functional and logical design, complying with current building code and accessibility.

b. Provide acoustical treatment in appropriate areas for comfort, presentations, and privacy. Provide for sound control around offices, conference rooms, toilet rooms, mechanical rooms, and other sensitive areas.

c. The descriptions included below are the standards of a select number of facilities on the Caltech campus and not limited to these listed facilities. As the program is developed for the specific project, there will be other facilities where a standard will need to be developed working with the Caltech Project Manager.

2. Standard Laboratories: Provide the following:

a. Solid-pattern type premium floor tile (12 inch by 12 inch) equivalent to Armstrong Premium Excelon.

b. Rubber cove base at walls.

c. Stainless steel receptacle and switch plates, with color-coded devices.

d. Caltech's current standard communications outlets.

e. Emergency eyewash showers and floor drains. (See Section D20 for model information)

1) Emergency eyewash and shower equipment shall be located on the same level as the hazard, have un-obstructed access [a door is interpreted to be an obstruction], and require not more than 10 seconds to reach.

f. White marker boards and telephones, at entrances to laboratory areas.

Provide Lab Coat hooks/racks in every lab work area.

- g.** Tackable cork wall surface with aluminum perimeter frame, at desk areas.
- h.** Tempered Glass or Polycarbonate splash guard, 3/8-inch-thick, in aluminum channel, between wet benches and desk areas.
- i.** Provide Lab Coat hooks/racks in every lab work area. Specific locations of coat hooks/racks shall be coordinated with Caltech Project Manager.
- j.** Provide Polycarbonate mats under all manifolds. Coordinate with Caltech Project Manager.
- k.** Air, Gas, and Vacuum services in Labs should be set left to right.
- l.** There should be no occupancy sensors in the labs.
- m.** When laboratory casework is set against a wall, data ports should be located on the walls.
- n.** Vacuum breakers for Deionized Water will be used on a case by case basis. Coordinate with Caltech Project Manager.
- o.** Ductless Fume Hoods will be allowed on a case by case basis. In order to be considered the following conditions must be met:
 - 1) A dedicated purpose and well-defined process to control a chemical hazard.
 - 2) The only ventilation control equipment available within the facility.
- p.** Provide York Elevation Matic Hand Towel Roll Dispenser (551028A, Black) in all Lab Sink and Kitchenette Sink locations.

Traditional Walls: Constructed from metal studs. Studs should go from floor to underside of deck.

3. Clean Room Laboratories:

- a.** Flooring: There are two approaches to floor covers. Use one of the following products:
 - 1) Sheet vinyl with 6-inch-high coved base. This will give the floor a clean monolithic surface with coved floors keeps air from vortexing in the corners, also keeps floor cleaner.
 - 2) Epoxy coating. Consider coving floor to wall intersection.
- b.** Walls: There are two approaches to walls as follows:
 - 1) Traditional Walls: Constructed from metal studs. Studs should go from floor to underside of deck. Provide minimum 5/8-inch-thick moisture-resistant gypsum board screwed to studs. Apply silicon sealant at all butt joints and metal stud intersections. Apply surface plaster. (Regular mud and tape should be avoided, the particulate count is too high, and is always dusting). Cove the intersection of the ceiling and the wall planes, and the vertical wall-to-wall corners with a 6-inch premolded cove flush to wall. Provide an epoxy wall sealer and epoxy smooth coat final finish.
 - 2) Modular Wall System: Factory-fabricated panels configured in modular sizes in various styles and finishes, including tempered glass panels, plastic panels with steel frames, powder-coated steel with foam insulation core, and stainless steel with foam insulation core.
- c.** Ceilings: Should be clean and free from any dust edges. Traditionally, they will have the light fixtures and ceiling pipes concealed.

...ensure that the room interior is a contiguous surface, known in the industry as "bathtub construction."

Keep clean room laboratories on positive pressure and HEPA filtered at all air supply grilles,...

1) Gypsum Board Ceiling: Use with gypsum board wall system. Suspend below structural framing just enough to recess the lighting fixtures and mechanical duct work. Use moisture-resistant gypsum board with a plaster finish and epoxy paint system. Also, use the 6-inch-high, premolded wall/ceiling cove and corners to ensure that the room interior is a contiguous surface, known in the industry as "bathtub construction."

2) Modular Panel System: If modular walls are used, consider a modular ceiling which will coordinate with the wall connection.

d. Doors:

1) Aluminum Profile Clean Room Doors: Custom aluminum extrusions with double perimeter seals and optional door bottom drop seal, and features a flush jamb and leaf assembly. Available with upper and optional lower flush glazing, and finished with an epoxy powder coat for maximum durability and chemical resistance. Preferred manufacturer:

Plascore Pharma (www.plascore.com).

e. Lighting: Clean room lights need to be sealed and can be surface mounted, (not recommended for 10,000 sq. ft. laboratories), or recessed; conforming to the latest ISO 14000 series cleanliness standards.

f. Mechanical: Keep clean room laboratories on positive pressure and HEPA filtered at all air supply grilles, which should be top down even air distribution system. The returns should be along the perimeter of the room, just above the coved base at the perimeter walls (known as a laminar flow); required for laboratories with an area of 10,000 sq. ft. or more. This classification usually requires an ante-room before getting into this space. This is crucial to keeping the particulate count to the specified level.

4. Laser Laboratory: Environmental Health and Safety (EHS) should be consulted in the design stage of a laser laboratory. In general, the following design elements are required for Class 3b and Class 4 lasers:

a. Laser Warning Light:

- 1) Type: A flashing light box with the appropriate class 3b or class 4 laser warning sign. It shall display the laser class, laser symbol and appropriate hazard in accordance with ANCI Z136.1 - 2007 standard. It is recommended that the warning sign be of an insert type.
- 2) Location: Should be above the outside entrances to the lab.
- 3) Activation Mechanism: Shall be activated when the laser power is activated.

b. Laser Curtain Barrier

1) Laser beam blocking curtain, area barriers or windows must be made of a material suitable to block or attenuate the primary or scattered beams of laser or laser system. The protective device must be appropriate for laser type, temporal mode of operation and wavelength(s). They must be rated in Watts per square centimeter (W/cm^2) for a minimum of 100 seconds, in accordance with ANSI Z136.1 - 2007, Z136.7 - 2008 or EN 12254 - 2010.

Typically, the EHS Office will provide the evaluation for the laser barrier rating.

Laser curtain and barriers shall not be of flammable material and they should meet NFPA-701:2010 TM2 standards. They must also display the Optical Density (OD) or barrier threshold level as identified by the manufacturer in a visible location.

A janitor's closet is required on each floor.

5. Janitor's Closets: A janitor's closet is required on each floor.

- a.** One 8- by 12-foot closet shall be located in the basement or ground floor. (Ideally near a service elevator). This closet shall store custodial carts utilized in the area and store paper goods for the building.
- b.** The remaining closets shall be a minimum of 6 feet by 6-feet in size and shall be located on each floor. The space shall be usable space for daily janitorial operations.
- c.** All closets shall include hot and cold water, a floor sink with a splashguard, and include a minimum of one electrical outlet.
- d.** Shelving: Each closet shall have overhead storage with a minimum of three shelves and two wall hooks for ladder safety. Closets shall have seismic wire along the entire shelving.

6. IT/Communication Room:

- a.** During the programming phase, the Design Professional shall provide square footage information and location of Information Technology (IT) COMM rooms and server rooms for review.

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40 PRO-CUREMENT REQUIREMENTS

Design and construction documents shall be organized according to the Construction Specifications Institute (CSI) Masterformat

The Design Professional shall endeavor to find three products of similar quality to specify,

4010 Project Delivery

1. General:

a. Consult Caltech Project Manager regarding information specific to project construction delivery methods (design-bid build, design-negotiate build, construction management, design-build, etc.), number of construction contracts, and methods of payment to the contractor (stipulated sum, unit price, cost plus a fee, cost plus a fee with a guaranteed maximum price, etc.).

2. Design Deliverables:

a. Design and construction documents shall be organized according to the Construction Specifications Institute (CSI) Masterformat, latest edition. See Appendix III for Unifomat to Masterspec translation.

b. Caltech logo shall be placed on all construction documents. The authorized logo can be downloaded from the following website:

<http://styleguide.caltech.edu/logo>.

c. Recommended Maximum Full Size Standard Sheets:

1) Arch D Size: 24 inches x 36 inches

2) All text shall be set at 1/8" minimum on full size sheets.

d. Use of the phrase "or equal" in project specifications should be avoided. The Design Professional shall endeavor to find three products of similar quality to specify, unless otherwise noted in this document. The Design Professional shall notify Caltech if three equivalent manufacturers and products are not available, or if any standards items are not appropriate for the project.

END OF
INTRODUCTION

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