

Z

General Require- ments

This Element states the contractor's administrative requirements, procedural requirements, temporary facilities and controls, and performance requirements to be included in the Contract Documents. The Design Professional should incorporate applicable requirements into appropriate Division 00 and Division 01 documents.

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Z10 GENERAL PROJECT RE- QUIREMENTS

Substitutions will not be allowed in the event that Contractor fails to plan ahead.

Coordinate space requirements and installation of mechanical and electrical work which are indicated in diagrammatic style on the Drawings.

In finish areas, conceal pipes and wiring within the construction.

Z1020 Administrative Requirements

1. Project Management:

a. E-Builder

2. Ordering of Long Lead Materials: Certain materials are considered custom or long-lead items and must be expedited through submittals and ordering. Verify delivery times for all materials and schedule submittals and orders accordingly. Substitutions will not be allowed in the event that Contractor fails to plan ahead.

3. Project Coordination: Coordination by Contractor:

a. Coordinate scheduling, submittals, and Work of the various drawings and sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items scheduled to be installed later.

b. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.

c. Coordinate space requirements and installation of mechanical and electrical work which are indicated in diagrammatic style on the Drawings. Where conflict with the building components is caused by placement of this work, notify the Design Professional in advance of any action. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

d. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Caltech's partial occupancy.

e. Coordination Drawings of Ceiling Systems: Submit ceiling coordination drawings and related mechanical, plumbing, and electrical work and any structural penetrations. Any conflict which occurs with these trades shall be brought to the attention of the Design Professional prior to issuance of the Drawings.

f. Mechanical and Electrical Work:

1) Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

2) In finish areas, conceal pipes and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

3) Work out conditions involving Work of various Sections in advance of



installation. Prepare supplementary Drawings for review showing all equipment, piping, ducts, electrical work, dampers, etc.

4) Provide coordinated drawings for access doors as required by mechanical, plumbing, and electrical work.

Z1020.30 Construction Progress Documentation

1. Construction Schedule: Prepare and submit a CPM Construction Schedule for the Work. Relate the schedule to the entire Project to the extent required by the Contract Documents, to provide for expeditious and practicable execution of the Work. Within 30 days of signing contract, provide schedules for review by Design Professional and Caltech.

a. Base the schedule format upon accepted construction procedures. Show times for the preparation and submission of Shop Drawings, Product Data and Samples, Contractor's and Design Professional's review time, ordering, fabricating, manufacturing and delivery times, and installation time at the site for each item of Work to be furnished and installed by the Contractor. Ascertain from Caltech delivery dates for items that are Caltech-furnished and Contractor-installed, and the work of separate contractors, and include such work in the schedule. Update and reissue the entire schedule at the frequencies as may be required to properly reflect a reasonably accurate status of the Work.

b. Submit a separate schedule for submission of Shop Drawings, Product Data, Samples, and product delivery dates which shall be directly related to the Construction Progress Schedule. Include product delivery dates for those items to be furnished by Caltech.

c. Accelerated Work if Required to Meet Schedule: If the Contractor's performance falls behind schedule, the Contractor shall accelerate the Work as required to get back on schedule at no additional cost to Caltech. Accelerated work shall include air or express delivery of materials and equipment, increasing the number of workers, working overtime, working Saturdays, Sundays, and holidays, and working additional shifts.

2. Progress Meetings:

a. Contractor shall prepare agenda and schedule and hold meetings as required by the progress of the Work. Progress meetings shall be as often as weekly or more frequently as required by the progress of the Work.

b. Contractor shall record notes of meeting.

c. Contractor shall prepare Pending Issue Report which shall include RFI Log, Submittal Log, Construction Schedule, Change Order Log and Field Order Log.

d. Contractor shall distribute minutes of meeting within 3 days.

If the Contractor's performance falls behind schedule, the Contractor shall accelerate the Work as required to get back on schedule at no additional cost to Caltech.



Caltech shall retain and pay the expense of a testing agency... to perform and report on work specified in the Contract Documents.

Caltech will retain and pay the expense of a testing agency for Special Inspection as required by the California Building Code

Nothing in any prior acceptance or satisfactory test result shall govern if at any subsequent time the Work, or portion thereof, is found not to conform to Contract Documents.

Z1040 Quality Requirements

1. Quality Control: Contractor shall maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality. Comply with manufacturers' instructions, including each step in sequence. Should manufacturers' instructions conflict with Contract Documents, request clarification from Design Professional before proceeding with the Work.

2. Testing and Inspection.

a. Caltech shall retain and pay the expense of a testing agency acceptable to the Design Professional, to perform and report on work specified in the Contract Documents. The testing agency, with prior acceptance of the Design Professional, may be a commercial testing organization, the testing laboratory of a trade association, the certified laboratory of a supplier, or other organization. The testing agency shall have been in business for five years.

b. Caltech will retain and pay the expense of a testing agency for Special Inspection as required by the California Building Code, and as specified in other Sections:

1) The Special Inspector shall be a registered Deputy Building Inspector approved by the Design Professional and Caltech. Special inspections will not be required when the work is done on the premises of a fabricator approved by the regulatory agency. The Contractor shall reimburse shop inspection costs to Caltech when the work is done in a shop not approved by the regulatory agency.

c. Qualifications of Testing Agency:

- 1) Meet *Recommended Requirements for Independent Laboratory Qualifications*, published by American Council of Independent Laboratories.
- 2) Meet basic requirements of ASTM E 329, *Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction*.
- 3) Authorized to operate in the State of California.

d. Test Reports: Testing agency shall distribute copies of all reports as follows:

- 1) Design Professional: One copy.
- 2) Structural Engineer: One copy.
- 3) Caltech: One copy.
- 4) City of Pasadena: One copy.
- 5) Number of copies for Contractor and supplier being tested will be determined upon commencement of Contract.

e. Multiple Tests and Inspections: Certain portions of the Work will be tested or inspected at various stages, sometimes off site, between their inception and final positioning in the completed Work. Nothing in any prior acceptance or satisfactory test result shall govern if at any subsequent time the Work, or portion thereof, is found not to conform to Contract Documents.



f. Additional Testing and Inspection:

- 1) If initial tests or inspections made by the testing agency reveal that materials do not comply with Contract Documents, or if Design Professional has reasonable doubt that materials comply with Contract Documents, additional tests and inspections shall be made as directed.
- 2) If additional tests and inspections establish that materials comply with Contract Documents, all costs for such tests and inspections shall be paid by Caltech.
- 3) If additional tests and inspections establish that materials do not comply with Contract Documents, all costs of such tests and inspections shall be deducted from Contract Sum.

3. General Mockup Requirements:

- a.** Intent of mockup is to ascertain elements designed to fit into space provided and provide Contractor with opportunity to coordinate subcontractor work, and to show finish and workmanship expected for finished work.
- b.** Approved work can be included as part of final construction.
- c.** Mockups include, but are not necessarily limited to, the following:
 - 1) Major handrails.
 - 2) Firestopping.
 - 3) Laboratory casework and hoods.
- d.** Maintain quality control over work of various Sections of Specification, manufacturers, products, services, workmanship, and site conditions, to produce mockups in accordance with Contract Documents.
- e.** Provide qualified personnel to produce mockup of specified quality.
- f.** Provide finish to match approved samples.
- g.** Assemble and erect complete, with specified attachment and anchorage devices, flashings, seals, and finishes.
- h.** Remove unacceptable mockups.
- i.** Mockups will be approved by Design Professional in writing, prior to commencement of the Work.

4. Laboratory Mockup: Provide a full-scale cosmetic mockup of typical laboratory spaces for a two stage (rough-in and complete) Caltech review. Include all materials and utility lines, but actual utilities and equipment does not need to be functional. Include basic peninsula, basic wall units, and fume hood. Location of mockup room will be indicated by Caltech.

- a.** If specifically requested by Caltech, construct mockup laboratory “out of sequence” and not located in-place, and available for review before beginning the remaining rough-ins (rough-in stage) and finishes (complete stage).
- b.** Order the materials and equipment for the mockup room immediately after Notice to Proceed.
- c.** Construct rough-in stage of the mockup laboratory “out of sequence” and obtain approval of Caltech before beginning remaining rough-ins in other laboratory



spaces.

d. Construct the “complete stage” of the mockup laboratory space “out of sequence” and obtain approval of Caltech before beginning the finishes (complete stage) in other laboratory rooms.

e. Approval will not be given for any parts of the mockup until all the Work of the entire stage (rough-in or complete) of the mockup is in place.

f. In the event that problems with coordination of Work of different trades becomes apparent during the construction and review of the mockup and results in design changes, Caltech shall be responsible only for replacement of Work in the actual mockup construction that satisfies the original design and quality requirements as indicated in the Contract Documents. The Contractor shall be responsible for replacing, without alteration of the Contract Sum or the Contract Time, any such Work outside the extent of the mockup that is provided before approval of the mockup construction, and which must be replaced due to design changes resulting from the mockup review.

g. Rough-in stage of laboratory spaces shall be complete with metal stud walls and the following:

- 1) Plumbing rough-in.
- 2) Electrical conduit.
- 3) Sprinkler piping installed with head locations indicated.
- 4) Mechanical supply and exhaust.

h. The complete stage mockup shall include all painting and installation of the following items:

- 1) Flooring.
- 2) Finish ceiling.
- 3) Doors and hardware.
- 4) Laboratory casework, countertops, sinks with faucets, lab gas outlets, and markerboard, tech desks, and splash shields.
- 5) Window covering.
- 6) Light switches, electrical outlets, thermostat thermometer.
- 7) Partition closure and window on exterior wall.
- 8) Ceiling light fixtures and under-cabinet light fixtures. Light fixtures shall light up.
- 9) Sprinkler heads, fire alarm horn/strobe, and smoke detector.
- 10) Ceiling air diffuser.
- 11) Equipment; except Caltech-furnished equipment.
- 12) Acoustic insulation.
- 13) Epoxy flooring, wall coating, and ceiling coating, as specified.
- 14) Door and hardware, including view windows and covers.
- 15) Stainless steel countertops, sinks with faucets, gas outlets.
- 16) Light switches, electrical outlets, temporary and humidity sensors and controls, telephone and data outlets, intercom speakers, and all weather-resistant covers.



Provide covered walkways where required to protect adjacent pedestrian walkways.

- 17) Light fixtures, with lamps and power for operation.
- 18) Sprinkler heads and all fire or smoke detection or alarm devices.
- 19) All access panels, diffusers, and grilles,
- 20) Equipment, including Caltech-furnished equipment.
- 21) All finishes.
- 22) Fume hoods.

Z1050.40 Temporary Barriers and Enclosures

Exercise extreme care to preserve and protect all existing trees from damage of any kind.

1. Temporary Fencing: If specifically instructed by Caltech, Contractor shall provide barriers to prevent unauthorized entry to construction areas. Provide minimum 6 foot minimum height chain-link fencing with green privacy fabric. Provide covered walkways where required to protect adjacent pedestrian walkways.

2. Temporary Security Barriers:

a. Guard machinery, equipment, and all hazards in accordance with the safety provisions of the authorities having jurisdiction. Protect all hazards with adequately constructed guardrails or barricades and provide lanterns, warning lights, and the like, as necessary. To this end, dispose, store, guard, and protect the premises and all Work, materials, equipment, and both permanent and temporary construction so as to preclude the unauthorized use thereof, and particularly to eliminate possible consequent injury to all persons.

3. Temporary Tree and Plant Protection:

a. Exercise extreme care to preserve and protect all existing trees from damage of any kind.

b. Notify Caltech in advance of any conditions which require vehicles or equipment to operate within the spread of trees.

c. Protect tree roots from damage as directed.

1) Do not place materials, debris, earth, vehicles or temporary structures under spread of trees.

2) Do not dump excess concrete, chemicals, or other liquid wastes within 10 feet of drip line of trees.

3) Do not operate vehicles or equipment within the spread of any trees.

d. The Design Professional will advise the Contractor of protective measures such as planking, which must be followed to avoid damage to root, trunk, and branch structures where Contract work must be performed in the vicinity of trees. Necessary protective measures may include some or all of the following:

1) The Contractor may build fences around the trees to be protected. These fences should be built at the drip line, or as close to the drip line as the construction activity will allow, and should remain in place throughout construction.

2) Any required branch or root pruning should be performed under the direction of Caltech's Project Manager and other Caltech representatives.

The Design Professional will advise the Contractor of protective measures such as planking, which must be followed to avoid damage to root, trunk, and branch structures where Contract work must be performed in the vicinity of trees.



The Contractor shall be responsible for replacing any existing trees which are damaged as a result of Work under the Contract.

No other signs are allowed without Caltech permission except those required by law.

Design/Builder including Consultant(s) shall provide 1 set of Closeout Deliverables as outline below.

Final Payment shall not be approved until all required data, documents and drawings are received and are verified to meet contract requirements.

3) When trenching occurs around trees to remain, the roots should be carefully exposed by hand-digging to reveal the nature of branching and then either tunneled under or carefully and precisely cut under the direction of the Design Professional.

4) When excavating, digging, or setting pilings within a tree drip line, the Contractor shall carefully dig pilot holes a minimum of 3 feet deep prior to driving the piles.

5) Trees marked for preservation that are located more than 6 inches above proposed grades should stand on broad rounded mounds and be graded smoothly into the lower level. Exposed or broken roots should be cut cleanly and covered with topsoil.

6) Existing trees in areas where the new finished grade is to be lowered, should have regarding work done by hand to the elevation as indicated. Roots shall be cleanly cut as required 3 inches below finish grade and covered with topsoil.

7) The Contractor shall take care when working around the head of a tree. If any pruning is necessary, the pruning procedure must be supervised by the Design Professional.

8) The Contractor shall be responsible for replacing any existing trees which are damaged as a result of Work under the Contract.

9) In the case that it is deemed by the Design Professional that irreparable damage is done to any tree or trees, their value shall be determined in accordance with the International Society of Arboriculture *Guide for Paint Appraisal*, current edition.

Z1050.70 Project Identification

1. Signage: Contractor shall provide signs as follows:

- a. Painted, 5-foot wide by 3-foot high project sign of 3/4-inch-thick, exterior grade, A-C plywood with die-cut vinyl, self-adhesive letters to Design Professional's design and colors, and wood frame construction.
- b. Graphic image will be furnished by Design Professional. List title of Project, names of Caltech, Design Professionals, Mechanical Consultant, Plumbing Consultant, Electrical Consultant, Structural Consultant, and Contractor.
- c. Erect on site at location to be determined by Caltech.
- d. No other signs are allowed without Caltech permission except those required by law.

Z1070.70 Closeout Deliverables

1. **General:** The Design/Builder including Consultant(s) shall provide 1 set of Closeout Deliverables as outline below. Final Payment shall not be approved until all required data, documents and drawings are received and are verified to meet contract requirements.



2. Closeout Data – Maintainable Assets List: As part of their closeout deliverables, the Design/Builder shall furnish CALTECH data in electronic formats for all building components and equipment assets requiring periodic maintenance by the CALTECH Maintenance and Operations department. These building components and equipment assets include, but are not limited to the following categories:

Air Compressor	Fuel Oil Tank
Air Handling unit	Fume Hood
Air Separator	Garbage Disposal
Automatic Transfer Switch	Gas Cabinet
Backflow Preventer	Grease Trap
Battery Charger	Heat Exchanger
Boiler	Hot Counter
Building Automation System	Hot Water Pump
Cabinet Heater	Ice Machine
Chemical Feed Pump	Jockey Pump
Chilled Water Pump	Kitchen Appliances
Chiller	Tanks
Cold Counter	Main Switchboard
Condensate Pump	Make Up Air Unit
Condensing Unit	Panel board
Convection Oven	Pumps
Cooling Tower	Pressure Vessels
De-aerator	Range
Dehumidifier	Refrigerator, Reach-in
Disinfection Unit	Refrigerator, Walk-in
Dishwasher	Rolling Door
Distribution Panel board	Roof Ventilator
Dock Leveler	RO System
Domestic Water Pump	Sewage Ejector Pump
Domestic Water Storage Tank	Sprinkler System
Elevator Equipment	Substation
Emergency Generator	Sump Pump
Emergency Shower	Transformer
Eye Wash Station	Unit Heater
Evaporator	UPS
Exhaust Fan	Variable Air Volume Box
Expansion Tank	Water Cooler
Fan Coil Unit	Water Heater
Fire Suppression System	Water Softener Tank
Fire Pump	Well Pump
Freezer, Reach-in	Mechanical Door
Freezer, Walk-in	Indoor Lighting
Fryer	



At the beginning of each project, CALTECH will work with the Design/Builder to fully specify the list of “maintainable assets” where the enhanced electronic turnover data will be required for acceptable closeout.

3. Closeout Data – Data Fields and Format: The data provided by the Design/Builder shall include the following data fields provided in a formatted MS Excel worksheet provided by CALTECH:

Data Field	Provided by D/B	Field Type	Length	List Field	Description of Data Field
Equipment Number		A/N	15		Assigned CALTECH Asset Number
Asset Number	Yes	A/N	10		Tagged Asset ID (example AHU-1)
Description	Yes	A/N	64		Short Equipment Description
Long Description (Spec)	Yes	A/N	250		Long Equipment Description
Equip Type	Yes	A/N	10	yes	Equipment Type classification
Equip Group	Yes	A/N	15	yes	Equipment Group classification
PM Group		A/N	10	yes	Preventive Maintenance Group classification
Building	Yes	A/N		yes	Building Number
Floor	Yes	A/N		yes	Floor Number
Room	Yes	A/N		yes	Room Number
Keyword		A/N		yes	Equipment Category
Manufacturer	Yes	A/N	10		Manufacturer or Supplier Name
MFR Part No	Yes	A/N	30		Manufacturer Part Number (where applicable)
Model	Yes	A/N	15		Equipment Model Number
Model Year	Yes	Integer	4		Equipment Model Year (or Year Installed)
Serial No	Yes	A/N	20		Equipment Serial Number (where applicable)
Project		A/N		yes	Project Number
Task		A/N		yes	Task Number
Award		A/N		yes	Award Number

4. Closeout Data – Document Submittal Process: As The completed data worksheet shall be provided to CALTECH after installation of the asset and prior to project closeout. This formatted MS Excel worksheet shall be submitted to CALTECH using the provided eBuilder application. The submittal of this closeout document will notify the responsible Facilities Maintenance and Operations person, who will review and validate the completeness and accuracy of this data submittal. After review the document submittal will either be approved, or rejected with an explanation of changes required to this submittal document.

5. Closeout Deliverables Format: Design/Builder shall furnish CALTECH a copy of all closeout deliverables which they or their Subs and/or Consultants produced in each of the following formats:

- a. Electronic copy in the original software application from which each document was created;
- b. Electronic copy in a recent version of Adobe Acrobat (i.e. PDF);
- c. Paper copies in original document size , or smaller if requested by CALTECH PM;
- d. All drawings shall be delivered in the current release of AutoCAD used by CALTECH and shall have all external reference files bound within each drawing file; this shall include all referenced files, even those not originated within the AutoCAD application (e.g. image files).



- e.** File content and naming of the each individual document shall be identical (or significantly similar) to the same document delivered in a different file formats (e.g. ACAD Drawing vs. PDF document vs. Word document, etc.) to allow easy retrieval and cross reference of each document;
- f.** All AutoCAD documents shall have layer names and file names that are based upon AIA standard recommendations;
- g.** File names shall produce a properly sorted set of electronic documents (e.g. MEP drawings 01~23, O&M manual sections A~Z, etc),
- h.** All electronic closeout deliverables shall be provided on CD or DVD with appropriate labeling (e.g. vendor/consultant name, CIT project name and number, content of disk, release date of disk, etc.),
- i.** All PDF deliverables shall be provided as separate documents segmented by trade and equipment/product type (e.g. light fixtures, lighting controls, air balance report, individual equipment manuals, BMS control systems, etc.) Where possible and practical, individual documents shall be delivered separating Operations documents from Maintenance documents (e.g. end user operating information vs. maintenance crew repair information). Each PDF shall not exceed 15Mb unless provided written approval by the CALTECH PM.

6. Closeout Deliverables Documents: The Design/Builder including any Subs and/or Consultants shall provide a copy of all documents and drawings customarily required or expressly required herein, as a part of (or prior to) Project Closeout. Deliverables shall include the following documents:

- a.** detailed and comprehensive as-built drawings depicting actual field conditions, and when applicable;
- b.** operations and maintenance manuals,
- c.** air balance reports;
- d.** warranties;
- e.** specifications/guidelines,
- f.** commissioning reports/logs including equipment calibration details and set points,
- g.** structural calculations,
- h.** shop drawings,
- i.** site/soil surveys
- j.** other specialty documents or drawings included in scope.
- k.** Provide an Excel Spreadsheet indicating a schedule list of equipments servicing multiple rooms throughout a project indicating the specific rooms that each equipment serves. This may include, but not limited to equipment such as air handling units, lighting controls, central vac., etc. Consult Caltech Project Manager regarding the lists of equipment to be included on the list.
- l.** Provide a list of sustainable design features in TI projects.

7. Spare Parts: Provide Caltech products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections. Deliver to Proj-



***Provide list of
sub-contractor
contact
list to Caltech
Project Man-
ager.***

ect site and place in location as directed by Facilities Design and Construction Project Manager; provide transmittal listing the products provided prior to final payment.

a. Materials and items requiring spare parts and extra quantities:

- 1) Door hardware.
- 2) Ceramic, stone, and porcelain tile (1 percent of quantity installed).
- 3) Wood Flooring: 1 percent of quantity installed.
- 4) Resilient Flooring (including Linoleum): 10 linear feet for every 500 linear feet or fraction thereof of quantity installed; in roll form and in full roll width for sheet flooring.
- 5) Acoustical Ceiling Panels and Suspension System: 2 percent of quantity installed.
- 6) Paint: Provide Specifications only.
- 7) Carpet (including Carpet Tile): 2 percent of quantity installed, but not less than 5 sq. yd. Provide full-size units of carpet tile; full-width rolls for broadloom carpet.
- 8) Access Flooring (including Panels, Pedestals, and Stringers): 1 percent of quantity installed. Provide full-size panels.
- 9) Resilient Base and Accessories: 10 linear feet for every 500 linear feet or fraction thereof, of quantity installed.
- 10) Wallcoverings: 5 linear yards of quantity installed, in full roll width.

b. Provide list of sub-contractor contact list to Caltech Project Manager.

c. Provide list of finishes and vendors of the following items listed below to the Caltech Project Manager.

- 1) Paints, Carpets, Wall Base, Ceiling Tiles, Resilient Flooring.

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ELEMENT Z***



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