1

**TECHNICAL PERFORMANCE CRITERIA**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>298</td>
</tr>
<tr>
<td>A Substructure</td>
<td>324</td>
</tr>
<tr>
<td>B Shell</td>
<td>332</td>
</tr>
<tr>
<td>C Interiors</td>
<td>351</td>
</tr>
<tr>
<td>D Services</td>
<td>377</td>
</tr>
<tr>
<td>E Equipment &amp; Furnishings</td>
<td>506</td>
</tr>
<tr>
<td>F Special Construction</td>
<td>521</td>
</tr>
<tr>
<td>G Sitework</td>
<td>540</td>
</tr>
<tr>
<td>Z General</td>
<td>580</td>
</tr>
<tr>
<td>Appendix</td>
<td>594</td>
</tr>
</tbody>
</table>
The following section, *Technical Performance Criteria*, focuses on how to achieve the essential building and site systems and elements as well as construction details in accordance with the principles of the project’s overarching *Holistic Design Intent, Planning and Design Criteria*, and University standards.
## Technical Performance Goals

Consistent with UCSF’s desire to create a working and learning environment of the highest order as envisioned through the *Holistic Design Intent* and the *Planning and Design Criteria*, the Technical Performance Criteria identifies technical principles and goals for the project in detail, in a framework of progressively higher performance levels around which the evaluation of building and interior designs will be analyzed.

The Technical Performance Criteria are organized using Uniformat to reflect the University’s systems-based approach to design thinking. This approach is intended to be compatible with the University’s desire for an innovative approach to design and construction, a holistic and integrated design and engineering approach that fuses the aesthetic and the technical quality.

Due to the site location, soils, and the Marine environment, particular emphasis has been placed on criteria that assure a facility that is Durable and easily Maintained, Energy & Resource Efficient, Structurally Sound, and promotes Occupant Safety, Productivity and Comfort. Respondents are encouraged to pay particular attention to:

- The significant advantages that the micro climate provides to promote energy efficiency and occupant comfort.
- The need for minimal maintenance over the life of the building.
- The problems associated with long term soil movements.

### Technical Performance Criteria

<table>
<thead>
<tr>
<th>Whole Building</th>
<th>A  Substructure</th>
<th>B  Shell</th>
<th>C  Interiors</th>
<th>D  Services</th>
<th>E  Equipment &amp; Furnishings</th>
<th>F  Special Construction</th>
<th>G  Site Works</th>
<th>H  General</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Quality Work &amp; Learning Environment</td>
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<td>A Model of Architectural &amp; Urban Design</td>
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<tr>
<td>Durable &amp; Long Lasting</td>
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<td>Environmentally Sustainable</td>
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<td>Efficiently Serviced &amp; Maintained</td>
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</table>

*The Project Goals, identified in Chapter 01, Holistic Design Intent, apply to the Uniformat sections within which the Technical Performance Criteria are structured.*
INTRODUCTION

Technical Performance Goals

- The caustic nature of the subsurface soils.
- The long term effects of the corrosive Marine environment.
- Proximity to active faults and the desire for resilience of campus buildings and infrastructure.

And, finally, providing a program of certification that provides assurance to UCSF that the building will perform in an acceptable and predictable manner.
Criteria Structure

In general, each Technical Criteria section is structured into three sub-sections (Verification and Validation are combined into one section):

**INTENT**

This section communicates the University’s expectations for how the Integrated Delivery Team (IDT) performs to create a comprehensive solution, with appropriate choices made for different conditions throughout the project.

**DESCRIPTION & PERFORMANCE**

Base Requirements are expected to be satisfied throughout the project. TIER 2 or 3 Criteria shall bat their discretion. Proposing on the higher Tiers will result in enhanced building value and higher team evaluation by the University. If an Integrated Delivery Team chooses to pursue a higher Tier, their design must describe the strategies to achieve that Tier, along with any associated cost and other impacts to the project beyond the associated base criteria. Acceptance of Tiers is at the prerogative of UCSF.

TIER 2 or 3 Criteria set higher performance goals. The IDT shall provide the University with Life Cycle work collaboratively with the University using Target Value Design to make choices that in some cases satisfy these higher goals.

**VERIFICATION**

VERIFICATION is the evidence Integrated Delivery Teams provide throughout the project that a system or component will meet measurable performance criteria. If specific verification methods are not identified, the Team shall provide their proposed verification methods and schedule for each component in their proposals during each design phase.

**VALIDATION**

This section describes the content to be submitted by the Integrated Delivery Teams for University review of progress and criteria compliance. Unless otherwise noted, the submissions are to occur as follows:

- **SD, DD, & CD:** Documentation at the completion of each phase.
- **Construction:** During building construction; specific milestones to be determined with UCSF per criteria.
- **Completion:** After completion of building construction – may vary from pre-occupancy to two years after move-in. To be
During the construction and completion phases, submissions are to be delivered with enough lead time for UCSF to review and provide feedback without effecting cost or schedule. The Integrated Delivery Teams shall coordinate their deliverables so that all aspects of the project are developed to a similar level of completeness and delivered together. This is important:

- To confirm the design is being developed holistically and coordinated across disciplines.
- So the University can review the design effectively and efficiently.
- To understand the comprehensive cost of the project at all times.

Note: There may be exceptions where early submittals are dictated by the delivery schedule or otherwise have a benefit to the project. However, these exceptions need to occur with University approval.

Integrated Delivery Team deliverables shall include the greater of: 1) the submission requirements listed in the Contract; and 2) the Verification requirements listed in the Technical Performance Criteria. Any VALIDATION required in previous phases shall be updated and resubmitted in later phases unless agreed to by the University. For components not specifically identified in the criteria, but necessary to comply with the Intent of the project, the Integrated Delivery Team shall submit VALIDATION that meets the same VALIDATION intent as components that are identified.
**INTRODUCTION**

Document Structure

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### Services

**D 4010 Fire Suppression**

**A. Intent**

Fire Suppression System shall be provided as required for the building's safety and protection of people and goods as required by code and all applicable NFPA guidelines for each of the occupancies and program areas included in the project. The project shall also meet all the requirements of NFPA, City of San Francisco code (including its Bullets and Ordinances), and the requirements of the UCSF Fire Marshal.

**B. Description & Performance**

**D 4010.00 General**

- a. Description: Provides automatic fire protection system for full project coverage and protection in accordance with all requirements by UCSF Fire Marshal. System type (i.e., pre-action, dry-pipe, or gaseous) shall be selected as appropriate for each program space and specialty areas.
- b. Performance Requirements: 1. FM Global compliant design (FM 25040.30)

**D 4010.10 Water Based Fire Suppression (LE 45yrs)**

- a. Description: Provide complete automatic fire sprinkler system with proper system, joints, and sprinkler head layout.
- b. Performance: 1. Provide fire hydrant flow test to determine fire service supply water flow and pressure available at the project site. This information shall be used as the basis for hydraulic calculations and pump design.

**D 4010.13 (TIER 2) Dry-Pipe Fire Suppression (LE 30yrs)**

- a. Application: Discuss with University when the type of system is to be used for specialty spaces.
- b. Description: Provide complete automatic dry-pipe fire sprinkler system appropriate for the location, dry-pipe valve, and sprinkler head layout.
- c. Performance: Provide a fire protection system that will prevent accidental water discharge due to sprinkler head failure or accidental activation.

**C. Verification & Validation (all tiers)**

- See Introduction.
- 2. Complete hydraulic flow test results to be provided. Tests shall not be later than 6 months from the date of meeting with the Fire Marshal.
- 3. Meeting with Fire Marshal and Fire Department to identify specific project code requirements within 3 months of SD phase start date.
- 4. Basis of Design narrative highlighting building Fire Protection system design and any special systems are recommended.
- 5. Schematic Fire Protection system user diagram showing fire water point of connection.
- 6. Site plan showing utility point of connection in relation to the site.
- 7. Site plan showing coordinated FDC's, fire hydrants, and other major site and

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**Uniformat Section**

**Heading**

**Unformat Element**

**Heading**

**Uniformat Element Title**

**Intent Section**

**Performance Requirements**

**Cross-Reference**

**Life Expectancy**

**Tiered Requirement (Tier 2)**
INTRODUCTION

Document Structure

Verification & Validation

Requirements
INTRODUCTION

DOCUMENT STRUCTURE

CROSS-REFERENCING

Rather than repeating criteria, this document contains cross-references for brevity, clarity and consistency. Cross-references use the designation CR and the section code, such as (CR D6020), to identify the portion of the document being referenced. Cross-references are not intended to identify all locations where criteria apply. The Integrated Delivery Team shall:

• Understand all criteria in the Contract and this document.
• Understand and map where criteria from one section impacts another.
• Communicate multi-disciplinary criteria and impacts to all sub-designers and contractors.
• Notify, and gain concurrence from, the University where mutually exclusive criteria cannot be met.

LIFE EXPECTANCIES

The University expects the criteria for each building component or system to be met over the expected lifetime of the component or system. The Integrated Delivery Team is also expected to understand the University’s intention for planned renewal. Consequently, the team shall consider the short- (typically interior finishes), medium- (typically mechanically active equipment), and long-range (full systems including distribution) renewal projects and how the initial project design and component lifetimes enhance future construction efficiency.

The Integrated Delivery Team shall understand the interrelationships between the life expectancies of different building components. Component replacement that requires particularly difficult or expensive relocations of other components should have life expectancies at least as long as those other components. For example, vibration isolation springs should not have a lesser life expectancy than the air handlers they support.

Life Expectancies are identified in the criteria with the notation (LE X (Z yrs)), where ‘X’ represents the Life Expectancy level and ‘Z’ represents the Base Tier. Where omitted, life expectancies of components shall match the life expectancy of the next higher component, or system, in the hierarchy. Where undeterminable, the Integrated Delivery Team shall propose alternate Life Expectancies for University approval.

Life Expectancies shall be tiered as follows:

<table>
<thead>
<tr>
<th>LE</th>
<th>Base</th>
<th>TIER 2</th>
<th>TIER3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8yrs</td>
<td>9yrs</td>
<td>10yrs</td>
</tr>
<tr>
<td>B</td>
<td>10yrs</td>
<td>12yrs</td>
<td>15yrs</td>
</tr>
<tr>
<td>C</td>
<td>15yrs</td>
<td>18yrs</td>
<td>20yrs</td>
</tr>
<tr>
<td>D</td>
<td>20yrs</td>
<td>25yrs</td>
<td>30yrs</td>
</tr>
<tr>
<td>E</td>
<td>30yrs</td>
<td>37yrs</td>
<td>45yrs</td>
</tr>
</tbody>
</table>
The Integrated Delivery Team shall notify, and gain concurrence from, the University where mutually exclusive criteria cannot be met.

**FACILITIES DESIGN GUIDELINES**

This document’s criteria are intentionally performance-based, not prescriptive, in order to allow the Integrated Delivery Team the flexibility to deliver solutions with the best value. The University also has a knowledgebase (known as UCSF Mission Bay Facilities Design Guidelines (FDG)) of systems, components and methods that have met the University’s expectations for quality and durability on past projects, and this knowledgebase can be a valuable resource for the Integrated Delivery Team. However, the Team is discouraged from using these prescriptive answers to past problems without thorough analysis for a number of reasons that include:

- There may be more economical alternatives to achieve this project’s performance criteria.
- Project situations may be more demanding than the solutions found in the Guidelines are attempting to achieve.

The Team is expected to become familiar with the FDG excerpts (CR Table Z1040.30-A), and provide a description for how the Team’s solution meets or exceeds project criteria, and compares to the corresponding FDG solutions.
Introduction

1030 Project Criteria 308
1030.40 Design Loads 317
1030.50 Sustainable Design 320
1030.51 Energy 321
1030.56 Water Efficiency 329
1030.57 USGBC LEED 332
1030.58 Toxic Materials 334
1030.59 Stormwater Management 335
1040 Existing Conditions 336
A. Intent

1030.01 Spare Capacity

The University would like its buildings to be selectively adaptable over its lifetime with spare space built in to easily accommodate routing of additional systems. This includes adequate space in Mechanical, Electrical and Plumbing Equipment rooms to accommodate additional equipment for the potential expansion of each system (space for an additional pump next to the initial ones, for instance). Vertical utility shafts should also be oversized to accommodate routing for the same expansion.

The program elements that require more consideration for potential expansion than typical office space are:

a. The Clinic and Laboratories.

The equipment elements that require spare capacity are:

a. Emergency Generator (kW) & Incoming Service (Amps): 20% spare capacity (accounts for core & shell loads being fixed).
c. Transformers (kVA): 20% spare capacity.
d. TIER2: Heating Plant (BTU): 10% spare capacity.
e. TIER2: Cooling Plant (Tons): 10% spare capacity.

1030.02 Durability/Robustness

The Team shall understand all the factors that diminished durability and robustness, as well as the 8 Wastes of Lean Management Theory:

a. Transport – Moving people, products & information
b. Inventory – Storing parts, pieces, documentation ahead of requirements
c. Motion – Bending, turning, reaching, lifting
d. Waiting – For parts, information, instructions, equipment
e. Over production – Making more than is IMMEDIATELY required
f. Over processing – Tighter tolerances or higher grade materials than are necessary
g. Defects – Rework, scrap, incorrect documentation
h. Skills – Underutilizing capabilities, delegating tasks with inadequate training
In order for the building, in whole or part, to perform as expected over its lifetime the Integrated Delivery Team shall generally prefer more durable and robust solutions over solutions dependent upon the following:

i. Frequent, complex, costly or expert maintenance and training.

j. Active (controlled) components.

k. Moving (whether active or passive) components.

l. Single-points-of-failure (vs. redundant solutions such as multi-bulb lighting).

m. Unproven technologies.

n. Un-stocked replacement items (e.g., doors that need to be custom ordered if broken).

o. Other systems to perform flawlessly (actual UCSF example: not locating exterior patio over electrical vault (leaks shut down the building)).

p. Unreasonably low assumptions of wear and tear.

Another contributor to robustness is beauty. Beautiful Buildings are considered treasured asset, and consequently will be appropriately funded to match service level requirements and better cared for. Better maintenance results in longer lifetimes.

Particularly critical subjects for this Project’s durability/robustness are:

q. Resistance to the caustic nature of sub-surface soils.

r. Resistance to the corrosive nature of the local marine environment.

s. Protection of adjacent systems and finishes during and adequate space for, repair and replacement of equipment without damage to those adjacent systems and finishes (in particular roofing).

t. The maintenance and janitorial methods identified in the UCSF Facilities Services Preventative Maintenance system (Maximo), or as proposed by the Integrated Delivery Team and accepted by the University. (CR 1030.04, Project Criteria, Janitorial, Maintenance & Training).

u. Single-Point-of-Failure Components and long-lead ordering components, both of which require the project to provide a single spare part.

v. A lasting, beautiful appearance.

When the Integrated Delivery Team recommends less durable/robust solutions over more durable/robust solutions, the Team shall fully inform the University of the implications, such as higher failure risks and operating burden/costs upon the University.

The Integrated Delivery Team shall hire a corrosion expert to prepare a report with
recommendations/requirements for designing to achieve the lifetimes for the following systems:

w. Foundation: 50yrs, 100yrs, 150yrs and any other lifetimes stated in (CR A10.00, Foundations – General)
x. Slabs-On-Grade: 50yrs, 100yrs, 150yrs and any other lifetimes stated in (CR A40.00, Slabs-On-Grade, General)
y. Exterior Vertical Enclosures: Lifetime stated in (CR B2010.01, Exterior Vertical Enclosures – Performance)
z. Roofing: Lifetime stated in (CR B3010.01, Roofing – Performance)

aa. HVAC Distribution (including Incoming Air Streams): Lifetimes stated in (CR 3050.50 HVAC Air Distribution).
bb. Liquid & Gas Site Utilities: Lifetime stated in (G30.00 Liquid & Gas Site Utilities – General)

The Integrated Delivery Team shall also hire a reliability engineer with experience analyzing building equipment and systems life. The reliability engineer shall prepare and maintain a Life Expectancy Schedule of all systems and components in the project with the following information. See (CR1030.B, Project Criteria, Verification & Validation) and (CR Appendix: 1030.02-A Sample Life Expectancy Table (TO BE DEVELOPED)):

cc. Original Life Expectancy identified or inferred in the Technical Performance Criteria, along with proposed Life Expectancies for significant components not identified in the Technical Performance Criteria.

dd. Current, modified Life Expectancy approved by the University, if applicable.

e. Proposed method (engineering or manufacturing data, reports, papers, tests, etc.) for verifying each Life Expectancy.

ff. Whether the component represents a single point of failure and the consequent operations that cannot be maintained during replacement.

gg. Spare parts (including recommended quantity) required to be provided by the project to minimize disruption of programs.

hh. Ordering lead time.

ii. Comments that address issues particular to the component or system, such as whether replacement parts require custom fabrication, whether they are likely even to be available over the long term, or whether some form of recertification is required before replaced parts can be put back into service.
1030 Project Criteria

1030.03 Resiliency

The University expects its buildings to be resilient to certain foreseeable events, either by maintaining functionality, or regaining functionality within a specified period of time. This requires that all disciplines select building components and design systems that support the stated resiliency criteria, both independently and interdependently with other systems. It is critical that the Integrated Delivery Team understand how failures can cascade to reduce the recovery time, and even the lifetimes, of other systems.

A good example of the interdependent nature of resiliency concerns water damage. An interior water piping leak (or sprinkler head failure) can be triggered by many different foreseen and unforeseen events (accident, lack of maintenance, user error, seismic event, etc.). The water damage from this event can ruin materials, grow mold, or even get into the cracks of unsealed concrete and corrode its steel reinforcing (the latter reducing the lifetime of the entire building). The duration of the leak will dramatically impact the magnitude of the damage and the time it takes for a portion, or the entirety, of the building to regain its full functionality. As an example, a partial list of potential solutions to enhance resiliency against water leaks could include:

a. Provide enhanced sealing of structural concrete members.

b. Provide flexible sprinkler head connections.

c. Provide an engineered bracing system designed to limit pipe and electrical system movement and protect joints.

d. Increase the quantity of, and strategically locate, shut-off valves so problems are localized to the smallest portion of users.

e. Create exemplary shut-off valve wayfinding and accessibility.

f. Provide leak detection and alerting.

g. Train maintenance personnel in shut-off locations and procedures (reduces duration of leak).

h. Curb floors and add floor drains to historical leak locations, such as labs with process cooling water.

i. Provide building materials that can get wet and dry out without needing replacement.

j. Provide components that meet their life expectancies and therefore get renewed before failure.

Each one of the partial solutions above can also have other trade-offs, such as lab drains increasing the risk that hazardous lab liquids accidentally make it to the sewer system, and hence the need for a holistic design process with extensive stakeholder involvement and review.
The Integrated Delivery Team shall identify the anticipated potential resiliency issues affecting the project over its Superstructure lifetime (CR B10.B, Superstructure, Description & Requirements), along with the Team’s assumed importance of impact and frequency of occurrence for University review and approval. The following are some, but not all, of the resiliency issues the University believes could be important for projects within or near the Mission Bay Campus:

- Structural Damage
- Envelope Integrity
- Water Damage (internal and external sources)
- Building Systems Failure/Power Outage
- Sea Level Rise
- Extreme Weather
- Terrorism
- Tidal Waves
- Pest Infestation (see CR C1090.90 Pest Control Devices and CR Z1040.31 International Code Council, SF Department of the Environment, Pest Prevention by Design.)

### 1030.04 Janitorial, Maintenance, and Training

For resiliency, operational and safety concerns, the University would like its buildings and sites to require only safe, infrequent, convenient and relatively unskilled maintenance. This is expected to be achieved both through component quality, simplicity and elegance of design, and intentionally designing for minimal maintenance (eg. minimizing Fire/Smoke dampers which require regular testing, larger trash receptacles that require less frequent collection).

Additionally, the University would like to be able to conduct maintenance concurrent with building operation. Where the Integrated Delivery Team proposes solutions that cannot be maintained, repaired or replaced concurrent with building operations, the Team shall:

- Fully inform the University (during the design process with adequate lead time to consider viable alternatives without impacting the project schedule) as to the extent of building non-operability.

The highest facilities operational cost for a UCSF office building is janitorial, higher than even its energy cost. Consequently, particular attention should be paid to materials choices that:

- Are easy to clean and do not show dirt easily
- Reject dirt and staining
- Are recommended to be cleaned with non-toxic cleaning agents
The University’s anticipated intensity of maintenance is described in the UCSF Facilities Services Preventative Maintenance system (Maximo). Where the Integrated Delivery Team proposes design solutions that are dependent upon University maintenance beyond what is described in the Maximo system, or knowledge/training beyond staff’s present knowledge-base to meet performance criteria over its components expected lifetimes, the Team shall:

- Fully inform the University (during the design process with adequate lead time to consider viable alternatives without impacting the project schedule) of those dependencies.
- Create a maintenance schedule that, if followed by the University, will be required for the solution to meet its expected lifetime.
- Create a list of training courses and/or certifications expected to be mastered by University staff in order to be qualified to operate and maintain the solution.
- Create an electronic user manual for the solution that can be printed and combined into a more comprehensive Project User Manual, and be utilized electronically in the field.
- Incorporate maintenance requirements and documentation into the University’s BIM model for the project per the University’s BIM Standards Guidelines (CR Z1040.35, References, UCSF).

The Block 33 project will have only transient onsite maintenance staff. As a result, the Integrated Delivery Team should incorporate remote monitoring of systems and potential failures into the campus monitoring system so that maintenance personnel can be dispatched to the event as soon as possible.

The Integrated Delivery Team shall propose methods for safe upper story exterior maintenance. The University currently washes its windows infrequently. As a result, the University’s preferred infrastructure provisions for exterior vertical enclosure maintenance are davits on the roof for 3rd party contractors to securely fasten all of the maintenance equipment (eg. scaffolding) they would provide to perform the work. The Team shall create and procure the Operating Procedures Outline Sheet (OPOS) per CCR Title 8, Subchapter 7, Group 1, Article 5. (See CR E1030.40, Window Washing Equipment).

### 1030.05 Extended Warranties

See the Contract for Baseline Warranties. Extended Warranties shall include the same Owner requirements as the Baseline Warranties.

Provide 3-year (TIER 2) or 5-year (TIER3) extended warranties for the following:

- Motors
- Variable Frequency Drives (VFDs)
Technical Criteria

1030 Project Criteria

c. Pumps
d. Meters
e. Chillers
f. Cooling Towers
g. Air Handlers
h. Exhaust Fans
i. Boilers
j. Emergency Generator
k. Exterior (Perimeter) Doors
l. Loading Dock Doors

1030.06 Ergonomics & Human Factors

The UC Ergo Work Group establishes UC ergonomics requirements, design guidelines, and best practices for ergonomics system-wide. These initiatives serve as a foundation for local UC campus efforts to reduce or eliminate the number and severity of musculoskeletal disorders (MSDs), thus increasing employee productivity, quality, and efficiency – while decreasing workers’ compensation claims.

The UCSF Ergonomics & Human Factors Program manages ergonomics initiatives at UCSF and represents UCSF on the UC Ergo Work Group. The purpose of the UCSF Ergonomics & Human Factors Program is to improve safety, health and productivity at UCSF through the use of ergonomics principles and proactive ergonomics planning and design.

Ergonomics principles and requirements apply in all work environments and focus on the interface between humans and their work environment. This includes furniture, equipment and tools; work processes; work flow; environmental factors including lighting; and software. Ergonomics design goals are to create environments that are inclusive of the needs and capabilities of at least 90 percent of the population.

Universally-adjustable sit-to-stand work surfaces and furniture adjustability and flexibility are targeted goals along with cost savings related to reduced lifecycle costs.

The Integrated Delivery Team (IDT) shall become familiar, and design the project to comply, with the available principles and requirements of both the UC Ergo Work Group and UCSF Ergonomics & Human Factors Program. Additionally, it is expected that the IDT shall work with University Ergonomics staff collaboratively throughout each design phase to ensure ergonomics are an integral part of the project’s design criteria.
1030 Project Criteria

1030.07 Accessibility

The University would like their buildings to be as accessible to as diverse a population as possible. Consequently, all aspects of the project should consider the following design principals of accessibility:

a. Americans with Disabilities Act Accessibilities Guidelines (ADAAG), current version
c. Low Vision Design Committee (LVDC), Design Guidelines for the Visual Environment
d. Gallaudet University, DeafSpace Guidelines, current version
e. UCSF Gender Inclusive Facilities Presentation (November 4, 2015).
1030.08  Shelled Space

Any spaces identified in the Program as Shelled Space shall include:

a. Anything required for the shelled space to be unoccupied, but comply with Code.
b. Anything required for the non-shelled portions of the building to be occupied and comply with Code.
c. Unfinished, concrete floor.
d. Partitions without interior gypsum wallboard and finishes except as required for (a) and (b) above.
e. Exterior wall partitions, vapor barriers, insulation and wallboard as required to achieve the project’s infiltration and energy goals.

B. Verification & Validation

<table>
<thead>
<tr>
<th>SD, DD, CD &amp; Construction</th>
<th>1. Updated Narrative describing how the design achieves the strategies laid out in the Proposal stage.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Resiliency Engineer’s updated Life Expectancy Schedule of all building systems and components, including proposed method for verifying the life expectancy for each item. The schedule should be organized to align with the criteria numbering in this document.</td>
</tr>
<tr>
<td></td>
<td>3. Updated Spare Capacity Schedule.</td>
</tr>
<tr>
<td></td>
<td>4. Updated Corrosivity Report describing how the design achieves the longevity required.</td>
</tr>
<tr>
<td></td>
<td>5. Updated Resiliency Issues narrative including description for how the design addresses each issue successfully.</td>
</tr>
<tr>
<td></td>
<td>6. Drawings, Narratives and Basis of Designs shall include calculated systems capacities, the spare capacities, and whether capacity is initial or space available.</td>
</tr>
<tr>
<td></td>
<td>7. Schedule of critical maintenance access points, with locations identified in the BIM model; review with UCSF stakeholders.</td>
</tr>
<tr>
<td>Beginning of SD</td>
<td>8. Conduct a workshop soliciting perspectives and suggestions from University Ergonomics Staff.</td>
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<tr>
<td></td>
<td>9. Plan illustrating all movement and clear space requirements for</td>
</tr>
</tbody>
</table>
### 1030.40 Design Loads

**A. Intent (See F1030.30 Seismic Performance for seismic loads)**

The structure shall be designed to support all code-mandated loads and the loads prescribed in this...
section, whichever is more stringent. In addition, the structure shall be designed to accommodate changes that may occur over the life of the building from normal use, renovations and aging. The criteria have been developed with sufficient reserve capacity to accommodate these changes.

### B. Description & Performance (See F1030.30 Seismic Performance for seismic loads)

#### 1030.41 Live Loads (Uniform)

a. Project Applicability: For purposes of this section, the following shall be considered Clinic, and the remainder shall be considered Office:

1. **TIER 1**: 50% of the entire Ophthalmology and Proctor (ASF) program.
2. **TIER 2**: 100% of the entire Ophthalmology and Proctor (ASF) program.

b. Requirements:

<table>
<thead>
<tr>
<th>Area</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobby and ground floor</td>
<td>100 psf nonreducible</td>
</tr>
<tr>
<td>Office, Meeting and other nontechnical space</td>
<td>TIER 1: 50 psf nonreducible, but not less than weight of equipment and Code minimums. TIER 3: 100 psf nonreducible, but not less than weight of equipment.</td>
</tr>
<tr>
<td>Laboratory, Vivariums and Clinic</td>
<td>100 psf nonreducible, but not less than weight of equipment.</td>
</tr>
<tr>
<td>Exit corridors and stairs</td>
<td>100 psf nonreducible</td>
</tr>
<tr>
<td>Public roof terraces</td>
<td>100 psf nonreducible</td>
</tr>
<tr>
<td>Roof</td>
<td>20 psf plus weight of all rainwater that could accumulate if the primary drainage system is blocked in whole or in part. In addition, design</td>
</tr>
</tbody>
</table>
### 1030.40 Design Loads

Block 33

May 28, 2016 Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4603

<table>
<thead>
<tr>
<th>Component / Scenario</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof to accommodate equipment maintenance and equipment replacement without requiring shoring.</td>
<td>50 psf</td>
</tr>
<tr>
<td>Rooftop mechanical and electrical equipment rooms or designated equipment areas</td>
<td>50 psf</td>
</tr>
</tbody>
</table>

#### 1030.42 Live Loads (Concentrated)

<table>
<thead>
<tr>
<th>Area</th>
<th>Live Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>All floors</td>
<td>2,000 pounds over an area 2.5’ x 2.5’ at any location</td>
</tr>
<tr>
<td>Driveways over occupied space</td>
<td>As required for fire trucks.</td>
</tr>
</tbody>
</table>

#### 1030.43 Dead Loads (Minimum superimposed dead loads in addition to code-required dead loads)

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspended Equipment</td>
<td>Equipment Rooms: weight of all suspended piping/conduit/ductwork and equipment or 50 psf uniform, whichever is greater. Typical: weight of all suspended piping and equipment or 10 psf uniform, whichever is greater.</td>
</tr>
<tr>
<td>Floor-Supported Equipment</td>
<td>MEP Equipment Rooms: weight of equipment and pads or 150 psf uniform, whichever is greater. Server Rooms and File Storage Rooms: weight of equipment and storage or 250 psf uniform, whichever is greater. Typical: weight of equipment and pads.</td>
</tr>
<tr>
<td>Allowance for Floor Leveling</td>
<td>As required to satisfy floor leveling and flatness requirements.</td>
</tr>
<tr>
<td>Roofing</td>
<td>10 psf and not less than actual weight.</td>
</tr>
<tr>
<td>Future Photovoltaic Panel System</td>
<td>Weight of photovoltaic array or 5 psf, whichever is</td>
</tr>
</tbody>
</table>
1030.50  Sustainable Design

A. Intent

Design a project that integrates all systems to provide a high-performing building that is appropriately controlled and monitored to minimize energy and resource consumption, and at the same time provide a high degree of human comfort and indoor air quality.

The overarching directive for the project’s sustainability goals is the UC Sustainable Practices Policy, June 22, 2015:

1. Requirements stated in the Policy shall be followed by the Integrated Delivery Team (IDT).
2. Objectives and goals are intended to be met by following the criteria stated in this document. Additionally, the following performance criteria are in line with the intent of the San Francisco Green Building Ordinance AB093.

Verify performance (eg. Energy and Water Efficiency) through the utilization of the Skyspark building software that analyzes the data collected through the Building Management System (BMS).

### 1030.51 Energy

#### A. Intent

Design a project that integrates all systems to provide an energy efficient building that reduces the University’s reliance on fossil fuels, including supporting the UCOP policy of being a carbon neutral University system by 2025.

#### B. Description & Performance

1030.52 Energy Efficiency Objectives

a. The energy performance of the building should be driven by the energy use intensity (EUI), as detailed in item 1030.52 Climate Protection, below. Targeting a lower EUI is seen as more comprehensive and verifiable than a higher Title 24 compliance margin.

b. Outperform 2013 CBC Title 24, Part 6 by 20%.

c. Participate in the PG&E Savings by Design Program.

1030.53 Climate Protection

a. Meet the whole-building energy performance targets listed below before accounting for on-site energy generation. The energy performance target is expressed as an Energy Use Intensity (EUI), which is a sum of the Annual Electricity and Annual Thermal targets (converted to kBTU/gsf-yr) published in Table 2 of the document Benchmark-based, Whole-Building Energy Performance Targets (Sahai et al. March 2014). The whole-building energy performance shall be an area-weighted average of EUIs for Complex (Lab, Acute Care, and similar intensity) and Simple space as described below. Assignments of Complex and Simple space can be found in the Program Space Summary along with their corresponding contributions to the energy performance.
Introduction

Mission Bay East Campus Phase 1 (Block 33)  
University of California, San Francisco, Project No: M4603

Technical Criteria

1030.51 Energy

The IDT shall update the energy performance targets if and when the program changes.

1. Complex* space programmed areas extrapolated to Gross Square Feet (GSF) at 153 kBtu/GSF-year plus,
2. Simple* space programmed areas extrapolated to GSF at 30 kBtu/GSF-year:
   a. TIER 2: 80% of total energy calculated from (1) and (2) above.
   b. TIER 3: 60% of total energy calculated from (1) and (2) above.

Projects are also required to model and report on the following metrics:

1. Annual electricity consumption (kWh/gsf/yr)
2. Annual thermal consumption (therms/gsf/yr)
3. Peak electricity (W/gsf)
4. Peak chilled water (tons/kgsf) (if applicable)
5. Peak thermal (therms/hr/kgsf)

1030.54 Clean Energy

a. Whether required by Code or not, the IDT shall meet the Solar Ready requirements in CEC 2016 Title 24, Part 6, Section 110.10(b)-(e), except the Solar Zone area shall be maximized to the extent possible, but not less than 15% of the roof area. Exceptions 1 and 2 to Section 110.10(b)1B do not apply to this project. Additionally provide:
   1. Space for PV disconnect within the main electrical room.
   2. Conduit from roof to main electrical room.

b. Design the roof structure to support 3rd-party, self-ballasted, photovoltaic arrays placed directly on top of, but not penetrating, the roofing system. (CR B1020, Roof Construction).

c. The building design shall ensure that any shifting of solar panels, due to wind, seismic activity, or other forces, shall not be able to fall from the roof of the building.

d. TIER 2: Identify and install an alternative on-site renewable energy generation solution, while reserving as much future photovoltaic array space as possible.

1030.55 Greenhouse Gases

a. Throughout the design the IDT shall project the project’s annual emissions of greenhouse gases and consequent contribution to global warming expressed in CO2e Emissions. Individual contributions shall be identified for alternatives with different
greenhouse gas consequences, and shall be presented to the University alongside other costs and benefits when making design choices. For example, total global warming contribution data can inform the choice between more efficient HVAC systems and less efficient ones that utilize different or no refrigerants.
C. Verification & Validation

**Predicted Energy Performance**

Predicted energy performance is dependent upon the demands of weather, occupant use profiles, and occupant equipment. Everything else is a building response and will result in a total predicted Energy Use and Energy Use Intensity (EUI), the latter of which is divided by the area served.

**Actual Energy Performance**

Actual energy performance is measured by the utility company at the building scale, and sub-metering at the system scale.

Inputs must be measured in order to recalibrate the building model and determine if changes in actual Energy Use are a measurement of performance or changes in inputs.
INTRODUCTION

Block 33

1030.51 Energy

May 28, 2016
Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4603

Technical Criteria
Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4603

**Technical Criteria**

**INTRODUCTION**

**1030.51 Energy**

**Energy Performance Verification**

Systems are metered to inform the Integrated Delivery Team during performance optimization (tuning) while maintaining criteria for occupant comfort.

If actual building performance is less than predicted, predicted demand inputs should be replaced with actuals and the energy model run again.

If actual building performance is still less than predicted, occupants should be engaged to understand if their use profile can be modified, and the building systems should be tuned until performance can be achieved.
## 1030.51 Energy

**Beginning of SD**

1. Identify all spaces that are to be considered “Complex” for the purpose of developing Climate Protection EUI targets. Submit to University for review and approval.

2. Establish expectations for the energy verification process, including energy model assumptions, in coordination with UCSF through the following process:
   a. Draft an Energy Savings Performance Risk and Responsibility Matrix, based on FEMP Measurement and Verification v4 Table 3.1.
   b. Discuss these risks and responsibilities with UCSF, identifying which parties will provide which information and the level of detail required.
   c. List the energy model assumptions that will be used in detail. For an example of the level of detail expected, occupancy schedules would be described with a daily and weekly fractional schedule, combined with a peak value and would make note of other factors such as accounting for holidays.
   d. Provide a copy of the energy model files (once developed), along with the list of assumptions and results reports, for UCSF review.

3. Develop an energy model of the proposed building and compare with 1030.53 Climate Protection target EUI. Adjust the building design accordingly, utilizing the model to inform design strategies.

4. Provide NRCC-PRF-01 forms from a CEC approved compliance software and version to demonstrate that the building meets the 2013 CBC Title 24, Part 6 requirement stated in 1030.52(b).

**SD, DD, CD & Construction**

6. Update energy model, including updates to EUI target based on updated spaces in program considered “Complex”, and compare predicted EUI with 1030.53 Climate Protection target EUI. Adjust the building design accordingly, utilizing the model to inform design strategies. Provide updated list of assumptions, results report and energy model files.

7. Provide NRCC-PRF-01 forms from a CEC approved compliance...
software and version to demonstrate performance compliance with
2013 CBC Title 24, Part 6 requirement stated in 1030.52(b).

8. Work with the Savings by Design program and incorporate
recommendations as appropriate.

9. Plans showing all proposed or alternative on-site renewable
generation solutions and/or proposed or future photovoltaic arrays,
including conduit from roof to main electric room, and space for
future solar disconnect equipment.

10. Updates of anticipated output of clean energy generation.

11. Locations of meters supporting energy performance verification
strategy.

Startup

12. The following process shall continue for 24 months after substantial
completion or until the building has consistently conformed to the
performance requirements for six months, whichever comes first. The
process shall follow the International Performance Measurement and
Verification, specifically Volume III, Option 3, Method 2, and ASHRAE
Guideline 14-2014. The following steps outline the process as it
relates to this project.

13. Report quarterly during this period on: predicted energy performance,
actual energy performance, discrepancies between the two, and
potential causes and solutions. Include, as available, other
opportunities for improved performance.

These solutions will be implemented and the results, along with the
above information, will be clearly documented.

Predictive model calibration shall take actual input data, such as
weather data, occupant schedules, and occupant equipment, and
transfer this information to the predictive model. The predicted EUI
from the calibrated model shall be used as the new target EUI against
which building performance is compared. The primary purpose of this
is to account for factors outside of the control of the Integrated
Delivery Team. Factors controlled by the Integrated Delivery Team,
such as incorrect equipment installed during construction, shall not allow an increased overall EUI target. The impact of these occupant-controlled factors on the EUI target shall be calculated and disaggregated.

Potential solutions and performance opportunities should cover the following areas:

a. Model Calibration: transferring actual input data to predictive model
b. Building Tuning: adjustment of equipment and controls
c. Occupant Engagement: training of occupants and facility management

14. Meter, monitor and trend building variables to the extent necessary to successfully demonstrate that building energy performance meets the project targets. This could include:

a. Sub-metering of lighting load, central plant and HVAC systems, major equipment, and plug loads. Sub-metering could include electrical circuit metering (separate circuits required), thermal energy metering and natural gas metering.

b. Occupancy profiles could be estimated using demand controlled ventilation sensors (CO2 sensors), occupancy sensors for lighting systems, HVAC availability schedules and/or occupant or facility management surveys.

c. HVAC systems managed by the BAS could trend variables such as (if applicable) chilled water supply temperature, chilled water flow in gpm, AHU cfm, chilled water temperature reset, supply air temperature, supply air reset temperature, room air temperature and humidity.

1030.56 Water Efficiency

A. Intent
Support the UC policy and UCSF campus-wide water consumption reduction goals.
Consider measures identified in the UC Drought Response Report to the Office of the Governor, April 15, 2014.

B. Description & Performance

a. Water Analysis: Each new Construction Project or Renovation shall have a Water Analysis Report that:

1. Describes the applicable water uses and types, including but not limited to potable water, non-potable water, industrial water, sterilized water, purified water, reclaimed water, stormwater, and wastewater. Identifies potential water uses that could use reclaimed water.
2. Outlines location-specific strategies for achieving reduced potable water consumption.
3. Analyzes the identified water use reduction strategies using a total cost of ownership approach by considering:
   a. Projected costs and savings of the identified water use strategies,
   b. Indirect costs and savings associated with reduced energy consumption due to the energy use embodied in water use,
   c. Savings associated with reduced or avoided infrastructure costs, and other avoided costs.
4. Estimates water consumption in Gallons Per Day (GPD) by programmatic space type and Gross Square Footage (GSF).

b. Performance:

1. Dual-Plumbing: At Mission Bay campus, systems in which California Plumbing Code allows for recycled water use shall be dual plumbed to use recycled water from a future external source. As a result, no Gray Water or Black Water Treatment will be required. Examples of these systems include:
   a. Irrigation
   b. Cooling towers
   c. Flushing of Toilets
   d. Flushing of Urinals
2. Landscape design criteria shall include efficient irrigation systems and drought tolerant plant selection. Turf shall only be used if it serves a programmatic function.

3. Installed fixtures shall be of the highest efficiency possible (with exception of discouraged waterless urinals) and Water Sense certified (if available) for a given application.

c. Water Efficient Equipment Installation:

1. Per UCOP policy, new equipment requiring liquid cooling shall be connected to an existing recirculated building cooling water system, new local chiller vented to building exhaust or outdoors, or to the campus chilled water system through an intervening heat exchange system, if available.

   a. Once through or single pass cooling systems shall not be allowed for soft-plumbed systems using flexible tubing and quick connect fittings for short term research settings.

   b. If no alternative to single pass cooling exists, water flow must be automated and controlled to avoid water waste.

2. Cold Rooms and Sterilizers shall be connected to the UCSF Controls System.

d. Water Efficient Utilities:

1. Per new UCOP policy mandating connection of equipment requiring cooling to recirculating building cooling water system, new facilities should be designed with a cooling system which can provide dedicated recirculating cooling water to equipment.

2. The equipment cooling system should be divided into systems that service equipment with similar schedules. The Integrated Delivery Team shall identify equipment schedules for UCSF review and confirmation. In particular cooling for 24-hour operating equipment needs to be separated from other cooling.

3. The central cooling system at the facility may be used as a back-up.

e. Water Metering

1. See (CR D.05 Services – Metering)
**1030.57 USGBC LEED**

### A. Intent

Support the UC policy for attaining USGBC Leadership in Energy and Environmental Design (LEED) Certification for this project, as well as use additional LEED credits for verification of particular sustainable design features.

### B. Description & Performance

- **Version:** 4.
- **Achieve New Construction (NC) Certification:**
  1. Silver (minimum)
  2. TIER 2: Gold
  3. TIER 3: Platinum
- **The following credits must be achieved:**
  1. At least two points within the Water Efficiency category (UCOP SPP)
  2. Rainwater Management (2-3 points depending on the project)
  3. Enhanced Commissioning

**Beginning of SD**

1. Water Analysis Report, as described in 1030.55.B(a).


3. Table of equipment cooling water use schedules mapped to circuits dedicated to different schedules.

4. Include Water Sense certificates with submittals for all Water Sense certified fixtures.

**Startup**

5. Monitor water end for a period of at least a year and compare to the Water Analysis Report updated at the end of construction. Prepare a Report that includes all sections and metrics described in 1030.55B(a) and includes a comparison to predicted performance. Identify discrepancies between predicted and actual water usage.
INTRODUCTION

Block 33

May 28, 2016 Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4603

1030.57 USGBC LEED

Technical Criteria

4. Construction and Demolition Waste Management (1 point)
6. Thermal Comfort (1 point)
7. Construction Indoor Air Quality Management Plan (1 point)
8. PBT Source Reduction (Healthcare 2 points, pursue regardless of project type)
9. Enhanced Indoor Air Quality Strategies - Entryway Systems portion of this credit.
10. Public Education Innovation Credit
11. Cooling Tower Water Use (2 points).

4. Construction and Demolition Waste Management (2 points)
5. Building Product Disclosure and Optimization - Sourcing of Raw Materials
6. Building Product Disclosure and Optimization - Environmental Product Declarations
8. Water Metering.
9. Indoor Air Quality Assessment.

6. Thermal Comfort (1 point)
7. Construction Indoor Air Quality Management Plan (1 point)
8. PBT Source Reduction (Healthcare 2 points, pursue regardless of project type)
9. Enhanced Indoor Air Quality Strategies - Entryway Systems portion of this credit.
10. Public Education Innovation Credit
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8. PBT Source Reduction (Healthcare 2 points, pursue regardless of project type)
9. Enhanced Indoor Air Quality Strategies - Entryway Systems portion of this credit.
10. Public Education Innovation Credit
11. Cooling Tower Water Use (2 points).

d. The following credits are strongly preferred:

1. Bicycle facilities
2. Reduced parking footprint
3. Green vehicles
4. Construction and Demolition Waste Management (2 points)
5. Building Product Disclosure and Optimization - Sourcing of Raw Materials
6. Building Product Disclosure and Optimization - Environmental Product Declarations
8. Water Metering.
9. Indoor Air Quality Assessment.

6. Thermal Comfort (1 point)
7. Construction Indoor Air Quality Management Plan (1 point)
8. PBT Source Reduction (Healthcare 2 points, pursue regardless of project type)
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6. Building Product Disclosure and Optimization - Environmental Product Declarations
8. Water Metering.
9. Indoor Air Quality Assessment.

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7. Construction Indoor Air Quality Management Plan (1 point)
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6. Building Product Disclosure and Optimization - Environmental Product Declarations
8. Water Metering.
9. Indoor Air Quality Assessment.

6. Thermal Comfort (1 point)
7. Construction Indoor Air Quality Management Plan (1 point)
8. PBT Source Reduction (Healthcare 2 points, pursue regardless of project type)
9. Enhanced Indoor Air Quality Strategies - Entryway Systems portion of this credit.
10. Public Education Innovation Credit
11. Cooling Tower Water Use (2 points).

d. The following credits are strongly preferred:

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6. Building Product Disclosure and Optimization - Environmental Product Declarations
8. Water Metering.
9. Indoor Air Quality Assessment.

6. Thermal Comfort (1 point)
7. Construction Indoor Air Quality Management Plan (1 point)
8. PBT Source Reduction (Healthcare 2 points, pursue regardless of project type)
9. Enhanced Indoor Air Quality Strategies - Entryway Systems portion of this credit.
10. Public Education Innovation Credit
11. Cooling Tower Water Use (2 points).

e. Performance:

1. Outdoor Water Use Reduction:
   a. Prerequisite: In addition to the two LEED options, meet UCOP policy on irrigation, drought tolerant landscape design and turf.
   b. Credit: The higher efficiency of this credit should be a project objective.

2. Indoor Water Use Reduction:
   a. Prerequisite: To go beyond reducing fixture consumption from a baseline, UCSF should specify high fixture efficiency standards with future room for improvement. Toilets shall be 1.28gpf, urinals shall be 0.125gpf, etc.
   b. Credit: Achieving these LEED credits are not mandatory, but the
1030.58 Toxic Materials

A. Intent

Support the UC policy for providing a healthy interior building environment.

B. Description & Performance

1. Goals:
   - Eliminate all Living Building Challenge Red List materials that are exposed to the building’s interior environment.
b. Eliminate Healthier Hospitals Safer Chemicals Challenge Anti-Microbial Finishes from the building’s interior environment.

c. Eliminate copper, formaldehyde, asbestos, cyanide compounds, lead and mercury from the building’s exterior envelope.


C. Validation & Verification

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Utilize the team’s Choice-Making process (see this document’s Preface) in A3 format to identify less-toxic alternatives and their consequences wherever the design includes the use of materials the University prefers eliminated from the project (see Goals above).</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD, CD &amp; Construction</td>
<td>2. Update A3’s described above.</td>
</tr>
</tbody>
</table>

1030.59 Stormwater Management

A. Intent

Address stormwater management from a watershed perspective in a location-wide, comprehensive way that recognizes stormwater as a resource and aims to protect and restore the integrity of the local watershed(s).

These sustainability criteria are in addition to minimum criteria described in CR G3030, Storm Drainage Utilities.

B. Description & Performance

a. Requirements:

1. Civil Engineering: (See CR G3030, Storm Drainage Utilities for minimum requirements)

2. Landscape Design: (See CR G2080.01, Stormwater Management)

3. Stormwater Management Plan: Produce a stormwater management plan with the following criteria:
INTRODUCTION

Mission Bay East Campus Phase 1 (Block 33)
May 28, 2016
University of California, San Francisco, Project No: M4603

1040 Existing Conditions

a. Implementation of the intent of this section.
b. References the location’s best management practices for preventing stormwater pollution from activities that have the potential to pollute the watershed (e.g., construction; trenching; storage of outdoor equipment, materials, and waste; landscape maintenance; outdoor cleaning practices; vehicle parking).
c. If feasible, cites relevant and current location of stormwater-related plans and permits in an appendix or reference list accompanying the project.
d. Includes, to the extent feasible, full cost evaluation of stormwater management initiatives.

4. TIER 2: Implement a stormwater management plan that captures and reuses 25% of the calculated volume of stormwater runoff from the two-year, 24-hour storm.

5. TIER 3: Implement a stormwater management plan that captures and reuses 100% of the calculated volume of stormwater runoff from the 95th-percentile rain event.

C. Verification & Validation

| SD   | 1. Outline of Stormwater Management Plan described above. |
|      | 2. Stormwater hydrology calculations with projected runoff both with and without stormwater capture and reuse for required volume. |
|      | 3. Schematic drawing presenting stormwater capture and reuse system including identifying storage tank. |
|      | 5. Update drawing presenting stormwater capture and reuse system. |
|      | 7. Update drawing presenting stormwater capture and reuse system. |
INTRODUCTION

1040 Existing Conditions

A. Intent

Design a project that addresses the challenges, and exploits the opportunities, present on the Project site.

B. Description & Performance

1040.01 The Mission Bay Campus has particular conditions which must be addressed:

a. Long-term effects of the corrosive marine environment
b. Caustic nature of the sub-surface soils
c. Significant advantages that the micro climate provides to promote energy efficiency and occupant comfort.
d. Significant long-term soil movements.
e. Proximity to active faults and the expectation that the building will be subjected to one or more damaging earthquakes during its life.
f. Need to prevent or contain hazardous spills from entering the ground and, relatively rapidly, the SF Bay.
g. Significant quantities of local and migratory birds.

1040.02 Site-specific conditions which must be addressed:

a. Location is remote from, and across 3rd street from, the majority of the Mission Bay Campus. The building will require many stand-alone features.
b. Location is adjacent to Block 34 to be developed in the future. Anticipation of the future project, including connected or shared aspects, could have long-term benefits to the University.
c. Location is adjacent to the proposed Golden Gate Warriors development. As a consequence, the project shall consider:
   1. Opportunities for street level marketing of UCSF.
   2. Increased traffic pressure
   3. Increased parking pressure
   4. Increased pedestrian traffic
   5. Increased quantity and intensity of vandalism.
d. Vibration and Electromagnetic Interference from 3rd Street Muni Streetcars
e. Electromagnetic Interference from 115KV transmission lines under 16th and Illinois
f. The following utility services are provided to the back of curb at Illinois Street (unless otherwise noted) by the Mission Bay Development Group, Utility Owner or others. The Integrated Delivery Team is responsible for connecting to these utilities and coordinating with the provider.

1. Potable Water: San Francisco Water Department
2. Fire Water: San Francisco Water Department
3. Recycled Water for all non-potable demands: San Francisco Water Department
4. Chilled Water: None
5. Hot Water: None
6. Separated Stormwater: San Francisco Public Utilities Commission
7. Separated Sanitary Sewer: San Francisco Public Utilities Commission
8. Combined Sanitary Sewer and Stormwater: None
9. Steam: None
10. Natural Gas: Pacific Gas and Electric
11. Electricity: Pacific Gas and Electric
12. Non-UCSF Communications: AT&T

g. UCSF Communications: See (CR G5010 Site Communications)

C. Verification & Validation

SD, DD, CD & Construction

9.1. Updated Existing Conditions Narrative.
A Substructure

Guiding Principles 340
A 10 Foundations 341
A 1020 Special Foundations 342
A 40 Slabs-on-Grade 343
A 90 Substructure-related activities 347
Guiding Principles

Design a substructure that provides support for the superstructure without settlement over the life of the building. The substructure must resist the corrosive nature of local subsoils and help mitigate negative environmental contaminants.
A 10 Foundations

A. Intent

Foundations shall transfer dead loads, live loads, wind loads, seismic loads and other environmental loads of the completed building to the earth in such a way that the building is supported evenly and without movement and will remain serviceable, without requiring repairs, over the life of the building.

B. Description & Performance

A 10.00 General:

a. Life Expectancy: Match that of B10 Superstructure.

b. Foundation construction shall not impact patients, animals, and ongoing operations in surrounding buildings. As a consequence driven piles are discouraged.

c. A Preliminary Geotechnical Investigation Report (CR Z1040.30) for the site will be provided to the Integrated Delivery Team (IDT) and will provide an evaluation and characterization of the site subsurface conditions, with preliminary geotechnical recommendations for design and construction, to serve as a basis for design during the Proposal Phase.

d. Foundation design shall be based on a Design Geotechnical Report prepared by the IDT’s Geotechnical Engineer and Peer Reviewed by UCSF.

e. Report from the IDT’s Corrosivity Expert/Consultant providing recommendations and requirements for achieving expected lifetimes of the Foundation System as it concerns corrosion from environmental agents. Updated report to analyze and verify the expected lifetimes of the final, proposed foundation design.

C. Verification & Validation (All Tiers)

SD 1. Report from the IDT’s Corrosivity Expert/Consultant proposing recommendations and requirements for achieving expected lifetime of the foundations as it concerns corrosion from environmental agents.

DD 2. Updated report from the IDT’s Corrosivity Expert/Consultant analyzing and verifying the expected lifetime of the proposed foundation design as it concerns corrosion from environmental agents.
A 1020 Special Foundations

A 1020.00 General:

a. Driven piles or other foundation systems that could generate excessive noise or vibrations are not permitted.

A 1020.01 Deep Foundation System

a. Description: A deep foundation system designed to transfer the building loads to the weathered bedrock below artificial fill and Bay Mud deposits. …to the very dense sand layer and weathered bedrock below the artificial fill and Bay Mud deposits.

b. Performance Requirements: Prior to construction, the Integrated Delivery Team shall perform an indicator pile installation and pile load testing program for the deep foundation system selected. During construction a pile proof testing program shall be conducted.

C. Verification

SD 1. Design Geotechnical Report prepared by the Integrated Delivery Team’s Geotechnical Engineer and Peer Reviewed by UCSF. SD foundation design shall include proposed foundation system types, capacities (tension and compression), lengths and diameter, and the

Commented [RF1]: Don’t use the term “Bored Piles”. Deep pile or drilled shaft foundations are not typically designed for a 150 year LE – this could raise many questions and issues, particularly in regards to corrosion.
## Technical Criteria

### Slabs-on-Grade

<table>
<thead>
<tr>
<th>A 40 Slabs-on-Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Intent</strong></td>
</tr>
<tr>
<td>Slabs on grade shall provide flat, level, durable, maintenance-free wearing surfaces for the life of the structure. Slabs shall be designed to control cracking and deformations, to ensure long-term durability of applied finishes and to facilitate installation of interior partitions and other components. Slabs shall control vibrations for occupant comfort and for optimal serviceability of programmed technical equipment, such as that for laboratories and clinics.</td>
</tr>
<tr>
<td><strong>B. Description &amp; Performance</strong></td>
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</tbody>
</table>

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**Commented [RF2]:** Consider timing of the indicator pile program further, and if it should be done during completion of DD.
A 40.00 General

a. Life Expectancy: Match that of B10 Superstructure.

b. Design slabs in accordance with ACI 301 Specifications for Structural Concrete and ACI 302.1R Guide for Concrete Floor and Slab Construction (latest editions) unless otherwise indicated. Any deviations shall be brought to the attention of UCSF.

c. Design slabs to accommodate soil settlement. Slab shall be free of vertical offsets that could impair serviceability. Slabs shall be designed to satisfy current ADA requirements for the life of the building.

d. Design slabs to accommodate thermal changes.

e. Slabs shall be free of cracks that telescope through or otherwise damage floor coverings or permit moisture or gas transmission.

f. Slabs shall be designed to support required loads. (CR 1030.40 Design Loads).

g. Slab vibration criteria: See (CR F1030.17 Floor Vibration Design).

h. Where subgrade pipes or conduit are run below slab, design pipe/conduit supports for the weight of the pipe/conduit and contents, vertical component of seismic force and soil loading in accordance with the Geotechnical Report. Use stainless steel threaded rod hangers positively clamped or otherwise positively fastened to the pipe with hardware matching the pipe size. Use stainless steel inserts, anchors and/or connection for subgrade utility support with maximum support spacing of 4’ and first support within one foot of building entry. Satisfy requirements of ASTM F2536-06b Standard Guide for Installing Plastic Piping Suspended from Slabs on Grade for fill or foam installation around suspended piping/conduit. These requirements shall apply to all suspended piping.

i. Floor Flatness and Levelness: Finish troweled slab surfaces to the following Specified Overall Value (SOV) and Minimum Local Value (MLV) tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

1. General Use Floors Receiving Carpet: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

2. Polished Concrete Floors: Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.

3. Floors Receiving Thinset Tile or Resilient Flooring: Specified overall values of
flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17.

4. **Noncritical Floors (Mechanical Rooms, Parking Structures, Below raised floors of Computer Rooms):** Specified overall values of flatness, F(F) 20; and of levelness, F(L) 15; with minimum local values of flatness, F(F) 15; and of levelness, F(L) 10.

5. **Other Floors:** Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15.

j. Flatness of inclined, cambered or shored, elevated construction after shoring has been removed:

1. Finish to a straightedge value at any point not to exceed 3/16 inch in 10 feet.

k. **The Mission Bay Development Group will hire**... The University will hire a consultant to provide environmental tests and reports as required by the City of San Francisco Maher Ordinance (CR Z1040.10). The Integrated Delivery Team (IDT) should assume that the tests will indicated that methane will need to be actively mitigated and monitored across the entire structure-covered portion of the site, and as a result, comply with the following:

1. Permits from the appropriate regulatory authorities having jurisdiction.
2. Construction of the mitigation measures and design documentation sufficient for the IDT to execute the measures.

l. Where the environmental soils tests indicate that contaminating gas barriers are not required, provide an under-slab gas vapor retarder:

1. Sheet Vapor Retarder: 15 mil polyolefin film meeting requirements of ASTM E 1745, Class A, except with maximum perm rating of 0.01. Include manufacturer’s recommended adhesive or pressure-sensitive tape.

m. **Waterproofing for subgrade slabs on grade subject to hydrostatic pressure:**

1. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness sheet.
2. Physical Properties:
   a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
A 40 Slabs-on-Grade

b. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154/E 154M.
c. Hydrostatic-Head Resistance: 200 feet (60 m); ASTM D 5385.

n. Report from the IDT’s Corrosivity Expert/Consultant providing recommendations and requirements for achieving expected lifetimes of the slabs-on-grade as it concerns corrosion from environmental agents. Updated report to analyze and verify the expected lifetimes of the final, proposed slabs-on-design.

A 4020 Structural Slabs-on-Grade

a. Description: Reinforced concrete structural slab designed to support and transfer required loads to foundation
b. Performance Requirements:
   1. Post-tensioned slabs are not permitted.
   2. Limit short term and long term deflections consistent with serviceability requirements for floor coverings, interior walls and exterior cladding. In addition, limit live load deflection to L/360 of span; limit long term total deflection to L/240 of span; limit live load deflection of members supporting exterior wall to 0.5” maximum. Compute initial and time-dependent deflections using ACI 435R.

C. Verification & Validation (All Tiers)

SD  10.1  Plan and sections showing design of slab and subgrade.
    11.2  Report from the IDT’s Corrosivity Expert/Consultant proposing recommendations and requirements for achieving expected lifetime of the slabs-on-grade as it concerns corrosion from environmental agents.

DD  12.3  Plan and section showing design of slab and subgrade, including reinforcement requirements. Provide concept design for interface of exterior and interior slabs at egress locations. For structural slabs on grade, submit calculations demonstrating compliance with strength and deflection requirements.
    13.4  Report from the IDT’s Corrosivity Expert/Consultant analyzing and verifying the expected lifetime of the proposed slabs-on-grade design as it concerns corrosion from environmental agents.
A 90 Substructure-Related Activities

A. Intent

The Integrated Delivery Team (IDT) shall prepare the site for construction of the substructure such that:

1. The performance of the substructure is not compromised over its expected lifetime.
2. On-site life safety is protected.
3. The neighboring built environment and neighboring occupants are not significantly impacted by the work.

B. Description & Performance

A 90 General

a. Design and construction shall be in accordance with criteria defined in the Design Geotechnical Report prepared by the IDT’s Geotechnical Engineer.

b. Existing conditions surrounding the site shall be maintained as-is or improved as a result of the work.

c. Conform to the requirements of the Mission Bay Risk Management Plan (CR Z 1040.36 References - UCSF Mission Bay Campus), such as the requirement that soils must be
tested for contamination and properly disposed of.

A 9010 Substructure Excavation

a. Description: Excavation for structures below grade or for site preparation.

b. Performance Requirements:
   1. All offsite trucking and disposal of spoils from all excavation activities shall comply with G1070.00 Site Earthwork, General.
   2. Temporary and permanent construction excavations must comply with the current requirements of Cal-OSHA. Excavations impacting adjacent construction shall be designed and constructed to provide continuous support for all gravity loads and all design lateral loads from the adjacent construction, and for loads during construction.

A 9010.10 Backfill and Compaction

a. Description: Placing fill for new construction.

b. Performance Requirements:
   1. Meet compaction and material requirements designated in the IDT’s Design Geotechnical Report, contract drawings, and/or specifications.

A 9020 Construction Dewatering

a. Description: Removal of excess water during construction operations.

b. Performance Requirements:
   1. The IDT shall dewater excavations to provide a safe work environment and to create an environment conducive for the subsequent construction operations to result in their expected performance. The Design Geotechnical Report prepared by the IDT shall determine the project design groundwater level.
   2. The IDT shall secure all necessary permits, pay all necessary fees, and provide all necessary treatment (if required). Water collected during construction dewatering should be tested for contamination prior to discharge to the City sanitary sewer system.

A 9030 Excavation Support

a. Description: Permanent or temporary support of excavations.

b. Performance Requirements:
1. Design and construct excavation support systems to protect all existing adjacent construction, including surcharge forces from construction equipment, building materials, excavated soil, and vehicle traffic adjacent to the excavation.

2. Permanent supports that are required to protect adjacent construction under gravity or lateral loads shall be designed for a life expectancy matching that of the substructure.

C. Verification & Validation (All Tiers)

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<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>20.1.</td>
<td>Pre-construction survey plan.</td>
</tr>
<tr>
<td>DD</td>
<td>21.2.</td>
<td>Proposed grading and excavation plans.</td>
</tr>
<tr>
<td>CD</td>
<td>22.3.</td>
<td>Proposed construction dewatering and excavation support plans. Design for earth retention systems over 4’ in height shall be stamped by a licensed California Civil Engineer.</td>
</tr>
</tbody>
</table>

Construction

23.4. Perform pre-construction survey of adjacent construction to document existing conditions. Survey shall include photographic documentation as well as measurements that will provide a 3 dimensional record of movement.

24.5. Soil compaction testing.

25.6. Perform post-construction survey of adjacent construction. Notify the University of deviations from pre-construction conditions that could be attributable to construction activities.
### B  Shell

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guiding Principles</td>
<td>351</td>
</tr>
<tr>
<td>B 10  Superstructure</td>
<td>352</td>
</tr>
<tr>
<td>B 1010  Floor Construction</td>
<td>352</td>
</tr>
<tr>
<td>B 1020  Roof Construction</td>
<td>354</td>
</tr>
<tr>
<td>B 1080  Stairs</td>
<td>355</td>
</tr>
<tr>
<td>B 20  Exterior Vertical Enclosures</td>
<td>356</td>
</tr>
<tr>
<td>B 2010  Exterior Walls</td>
<td>360</td>
</tr>
<tr>
<td>B 2020  Exterior Windows</td>
<td>363</td>
</tr>
<tr>
<td>B 2050  Exterior Doors &amp; Grills</td>
<td>366</td>
</tr>
<tr>
<td>B 2080.80  Bird Control Devices</td>
<td>371</td>
</tr>
<tr>
<td>B 3010  Roofing</td>
<td>371</td>
</tr>
</tbody>
</table>
Guiding Principles

Provide an efficient structural system that is integrated with the proposed spatial and building systems to efficiently adapt to changing uses and technology, while at the same time fulfilling or exceeding codes and performance standards. The building envelope shall be weather-tight, highly durable, resilient to the corrosive environment of Mission Bay, and take maximum advantage of daylighting, views and natural ventilation.
Develop a code-compliant, safe building that can withstand major seismic events and remain operational following expected earthquakes (CR F1030.30 Seismic Control). Provide an efficient structural system that is integrated with the proposed spatial and building systems and that can efficiently adapt to changing uses, while fulfilling or exceeding required performance standards.

B. Description and Requirements

B 10.00 General

a. LE G (100 yrs).
b. Design and construct concrete floors and roofs in accordance with ACI 301 Specifications for Structural Concrete and ACI 302.1R Guide for Concrete Floor and Slab Construction (latest editions) unless otherwise indicated. Any deviations shall be brought to the attention of UCSF.
c. Design and construct steel framing in accordance with the AISC Specification for Structural Steel Buildings and the AISC Code of Standard Practice (latest editions). Any deviations shall be brought to the attention of UCSF.

B 1010 Floor Construction

A. Intent

Floors shall be flat, level, durable, and repair-free under normal service loads for the life of the structure and support all required loads. Floors shall be designed to control cracking and deformations, to ensure long-term durability of applied finishes and to facilitate installation of interior partitions and other components. Floors shall control vibrations for occupant comfort and for optimal serviceability of equipment. Floors shall be capable of restraining nonstructural components using post-installed anchors, except in extraordinary conditions, which may require through-bolting.

B. Description & Performance

B 1010.00 General

a. See (CR B10 Superstructure)
b. Design floors to support required loads (CR 1030.40, Design Loads).
c. Concrete slabs, walls and framing shall be free of cracks that telescope through or otherwise damage floor coverings and architectural finishes. In no cases shall cracks pose a source for long term structural deterioration.
d. Slab vibration criteria: See (CR F1030.17, Floor Vibration Design).
e. Flatness and Levelness: See (CR A40.00.h & A40.00.i).

B 1010.10 Floor Structural Frame

a. Description: Structural elements required for support of floor construction including columns, beams, girders, and bearing walls.
b. Performance Requirements:
   1. Precast, pre-tensioned and post-tensioned systems are not permitted.
   2. Design and construct floor framing with redundancy and ductility so that in the event of damage to a major supporting element or an abnormal loading event, the resulting damage may be confined to a relatively small area and the building will have a better chance of providing overall stability.
   3. Explicitly design connections, reinforcement, components and materials to easily adjust to field tolerances and foreseeable construction conditions.

B 1010.20 Floor Decks, Slabs & Toppings

a. Description: Floor designed to support and transfer required loads to structural frame.
b. Performance Requirements:
   1. Post-tensioned slabs are not permitted.
   2. Slabs shall have a minimum thickness of 5”; fill over metal decking shall not be less than 3.25” thick.
   3. Limit short term and long term deflections consistent with serviceability requirements for floor coverings, interior walls and exterior cladding. In addition, limit live load deflection to L/360 of span; limit long term total deflection to L/240 of span; limit live load deflection of members supporting exterior wall to 0.5” maximum. Compute initial and time-dependent deflections using ACI 435R.
   4. Slab vibration criteria: See (CR F1030.17, Floor Vibration Design)
B 1020 Roof Construction

A. Intent

Roofs shall support all required loads, facilitate drainage, easily accommodate renovations, and support a photovoltaic array system (CR 1030.54, Clean Energy). The roof shall be designed to provide an appropriate substrate for the roofing, and together shall be considered as a system that enables the performance of both over their expected lifetimes.

B. Description and Requirements

B 1020.00 General

a. See (CR B10, Superstructure)
   b. Design roofs to support required loads (CR 1030.40, Design Loads).

B 1020.10 Roof Structural Frame

a. See (CR B1010.10, Floor Structural Frame)

B 1020.20 Roof Decks, Slabs, and Sheathing (See B 1010.20 Floor Decks, Slabs & Toppings and additional performance requirements below)
a. Description: Roof designed to support and transfer required loads to columns, walls or other supports.

b. Performance Requirements:
   1. Roof above top floor shall be a concrete slab with a minimum thickness of 5”, or metal decking and concrete fill with a minimum fill thickness of 3.25”.
   2. Where penthouse or similar roof framing consists of metal decking without concrete fill, provide supplemental steel framing at not less than 4’ on center to facilitate support and seismic restraint of future suspended utilities (does not apply to spaces without equipment or the potential for future equipment).

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Tier</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. See Contract.</td>
</tr>
<tr>
<td>DD</td>
<td>2. See Contract.</td>
</tr>
<tr>
<td>CD</td>
<td>3. Complete plans, sections and details for roof framing components.</td>
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<tr>
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<td>4. Calculations demonstrating compliance with all project requirements.</td>
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<tr>
<td></td>
<td>5. Material submittals (concrete mix design, reinforcing steel, curing compounds, accessories, etc.).</td>
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<tr>
<td></td>
<td>6. Material testing per CBC Chapter 17.</td>
</tr>
<tr>
<td></td>
<td>7. Vibration measurements (by Integrated Delivery Team) demonstrating project criteria have been met.</td>
</tr>
</tbody>
</table>

B. 1080 Stairs

A. Intent

Beyond providing code-required egress, stairs should be used to facilitate access, communication, postural variation and exercise within a department or between departments. As a minimum, stairs should be fully functional in the Design Earthquake and shall satisfy the additional performance objectives selected by the University (CR F1030.30 Seismic Control).

Non-Egress Monumental Stairs should present a highly-finished appearance.

B. Description and Requirements
B 1080.00  General (LE G (100 yrs))

a. Design stairs to support required loads (CR 1030.40 Design Loads).
b. Design stairs to accommodate interstory seismic drift and remain functional (CR F 1030.30).
c. Discouraged Stair Types (even if permitted by code): Winders, Spiral and Circular.
d. Roof access shall be provided using extension of not less than one stair tower to the roof level. Ladders and ship’s ladders to access roof level are not permitted.
e. Stair Comfort:
   1. Stair Steepness: Provide stairs with risers of not more than 7 inches (178 mm) and treads sized so that twice the riser height plus the tread depth totals 24 to 25 inches (610 to 635 mm).
   2. Landings: Provide stairs with maximum rise of not more than 10 ft (3.0 m) between landings.

C. Verification & Validation (All Tiers)

| SD  | 1. See Contract. |
| DD  | 2. See Contract. |
| CD  | 3. Details and calculations for stair design demonstrating compliance with code and project requirements, and/or specifications containing performance requirements for deferred approval design by others. |

Construction 4. Shop Drawings showing design, fabrication details, installation, connections, material, and size of members.

5. Structural calculations demonstrating code compliance under gravity loads, lateral loads and seismic interstory drift.

6. Material testing per CBC Chapter 17.

B 20  Exterior Vertical Enclosures

A. Intent

In addition to being one of the primary elements of the architectural expression, the building envelope
shall be designed as the main barrier between the conditioned spaces and the exterior environment. The vertical exterior enclosures (including cladding, glazing, and doors) horizontal exterior enclosures, particularly the roof system and associated parapets, to form an entire enclosure system. As such, the total enclosure should, over its expected lifetime:

1. Maintain the building science design principles described below.
2. Provide durability against exposure to the elements (rain, temperature, humidity and UV) including the local marine environment, and against biological growth.
3. Require minimum maintenance.
4. Allow for ease of cleaning.
5. Maintain its energy performance.
6. Minimize the exchange of heat, air, moisture to ensure occupant comfort.
7. Accommodate differential movements from seismic and wind loading, structural loading, and moisture cycling.
8. Provide security against unwanted intrusions.
9. Resist abuse and normal wear and tear over its expected lifetime.
10. Resist vandalism and graffiti.

The building science design principles that apply to this project are:

11. Rainwater management principles consisting of an exterior weather seal and a secondary waterproof weather barrier separated by a free draining cavity wept to the exterior at regular intervals.
12. Materials outboard of the waterproof weather barrier shall generally be moisture insusceptible and accommodate repeated wetting and drying cycles.
13. A continuous air barrier maintained above the dew point temperature of the anticipated interior environment at the mean low temperature for the coldest month.
14. Continuous insulation (uninterrupted by structural elements other than fasteners) and/or thermal breaks, to minimize thermal bridging and comply with maximum U-value prescribed by code and prevent condensation on any surface inboard of the air barrier noted above.
15. A vapor barrier to minimize vapor diffusion so as to prevent condensation under the mean low temperature for the coldest month for the anticipated interior environment.
16. Minimize solar heat gain and glare through the glazing while maximizing natural light for the occupants.

Performance shall be demonstrated through a combination of long-term historical field performance.
data, appropriate laboratory testing to industry standards, and analytical computer modeling previously validated by laboratory testing.

### B. Description & Performance

#### B 20.01 Design

- Continuity of the air/water barrier shall be maintained at transitions to windows, doors, roofing, foundations, and all other transitions or penetrations.

#### B 20.02 Performance

- Comply with acoustic performance (CR F1030.10).
- Comply with seismic performance (CR F1030.30).
- Aluminum surfaces shall have fluoropolymer coating complying with AAMA 2605.
- Field performance testing to include the following:
  1. Water penetration field testing in accordance with ASTM E1105.
  2. Qualitative Air leakage testing in accordance with ASTM E1186
  3. Quantitative Air leakage testing in accordance with ASTM E2357 or ASTM E783.
  4. AAMA 501.4 - Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Interstory Drifts. Perform a minimum of three cycles for both lateral and vertical design displacements as determined by seismic criteria located in CR F1030.30, with the exception that the acceptable damage shall be as indicated in CR F1030.35c and as required to satisfy the performance objectives associated with the selected Seismic Performance Tier. This test is to be coordinated with the air and water testing noted above.
- Report from the Integrated Delivery Team’s (IDT) Corrosivity Expert/Consultant providing recommendations and requirements for achieving expected lifetimes of the Exterior Vertical Enclosures as it concerns corrosion from environmental agents. Updated report to analyze and verify the expected lifetimes of the final, proposed Exterior Vertical Enclosure design.

### C. Verification & Validation (All Tiers)

- Wind load study for load distribution on building cladding based on...
representative “to scale” building and surroundings.

2. Report from the IDT’s Corrosivity Expert/Consultant proposing recommendations and requirements for achieving expected lifetime of the Exterior Vertical Enclosure System as it concerns corrosion from environmental agents.

3. Incorporation of Wind Tunnel test data to refine component selections.

4. Drawings showing outline of proposed building on site, and overall drawings showing project intent and scope.

5. Report from the IDT’s Corrosivity Expert/Consultant analyzing and verifying the expected lifetime of the proposed Exterior Vertical Enclosure System design as it concerns corrosion from environmental agents.

6. Project specifications developed based on Rain Screen Principle.

7. Architectural drawings showing all different wall components and their respective locations, elevations, % vision/opaque wall, relevant wall sections and details of wall components and associated interfaces.

8. Define exterior wall performance mock-up configuration and testing requirements.

9. Product data submittals

10. Pre-construction testing (i.e. adhesion and compatibility testing for sealants, membranes, etc.)

11. Shop Drawings submittals review and approval

12. Structural calculations submittals

13. Review of manufacturer(s) quality assurance and quality control during production of mock-up components, and compliance with approved and stamped shop drawings or submittals.

14. Construction Review – Field Review of initial on-site mock-ups and periodic review of work in progress

15. Manufacturer representatives’ site visits as required to review typical
B 2010 Exterior Walls

A. Intent

The exterior wall assemblies include all materials associated with the exterior opaque walls and soffit construction including the cladding/veneer, air barrier assembly, waterproofing membranes, insulation, and vapor barriers.


B. Description & Performance

B 2010.00 Design


b. All exterior walls, with the exception of pre-cast concrete walls with two stage sealant joints at all interface and terminations, shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a continuous air and water-resistive barrier behind the exterior veneer and a means for draining water that enters the assembly to the exterior.

1. TIER 2: All exterior walls shall be designed to rainscreen principles consisting of an exterior weather seal and a secondary waterproof weather barrier separated by a free draining cavity of no less than 3/8” wept to the exterior at regular intervals.

2. TIER 3: All exterior walls to include pressure equalized rainscreen principles which includes compartmentalization of drainage cavities behind the cladding
in order to equalize air pressures within the drainage cavities with those on the exterior face of the cladding.

c. Alternate to compliance with the above requirements for drainage, shall require an exterior wall envelope that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E 331 under the following conditions:

1. Exterior wall envelope test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.
2. Exterior wall envelope test assemblies shall be at least 8 feet by 8 feet in size.
3. Exterior wall envelope assemblies shall be tested at a minimum differential pressure of 12 pounds per square foot (psf) (0.297 kN/m2)
4. Exterior wall envelope assemblies shall be subjected to a minimum test exposure duration of 2 hours.

d. Continuous air/water barrier membrane shall be fully adhered over exterior gypsum sheathing at steel stud framed walls, concrete, CMU or other approved substrate.

e. Thermal insulation shall be installed exterior of the air/water barrier. Insulation shall be continuous except as required for intermittent anchors or support framing to attach cladding systems.

f. Cladding shall be weather sealed at joints, penetrations and transitions with adjacent assemblies to provide a continuous water shedding surface.

g. Through wall flashings shall be provided at regular intervals to direct water behind the cladding back to the exterior.

h. Vapor retarder:

   1. Continuous vapor retarder to be provided at interior side of thermal insulation.
   2. TIER 2: The air/water barrier shall also perform as the vapor barrier, with all thermal insulation installed exterior of the air/water/vapor barrier membrane.

B 2010.01 Performance (LE F (40 yrs))

a. Resist design wind load as determined by wind tunnel testing, with no failure of cladding, attachment, and framing, and with no damage to air barrier, water barrier, vapor barriers, and flashings.
1. Deflection under wind load: When subject to design wind loads, limit live load deflection of cladding to L/240 of span; limit deflection of support framing members to L/360 of span (and L/600 of span at masonry veneer), when tested in accordance with ASTM E330.

b. Resist seismic loads and deformations (CR F1030.32 Seismic Performance Objectives).

c. Air infiltration and Exfiltration:

1. Maximum allowable air leakage through air barrier materials of exterior walls shall not exceed 0.004 cfm/sq.ft. under a pressure differential of 1.57 psf when tested in accordance with ASTM E2178.

2. Maximum allowable air leakage through air barrier assemblies of exterior walls shall not exceed 0.04 cfm/sq.ft. under a pressure differential of 1.57 psf when tested in accordance with ASTM E2357, ASTM E1677, ASTM E1680, or ASTM E283.

d. No water shall penetrate past the plane of the air/water barrier when tested with a differential pressure of 12 psf in accordance with ASTM E331.

e. Thermal Performance/Movement: No buckling; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

1. Temperature range: the greater of 120 F ambient or that which results in a 180 F surface temperature range.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
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<th></th>
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<tbody>
<tr>
<td></td>
<td>3. Defining the exterior wall and soffit assemblies and materials.</td>
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<td>4. Determine thermal performance requirements for each assembly</td>
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<td>based on Energy Code compliance.</td>
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<td>6. Verify thermal performance based on defined assemblies, insulation</td>
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<td></td>
<td>thicknesses and cladding attachment methods. For assemblies not</td>
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<tr>
<td></td>
<td>defined in the Energy code or ASHRAE 90.1, undertake thermal</td>
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</tbody>
</table>
B 2020 Exterior Windows

A. Intent

The exterior windows include all windows, storefronts, curtain walls (including operable units where applicable) located in the exterior walls. The window assemblies include frames, glazing, sealants, finishes and other associated flashings.


B. Description & Performance

B 2020.00 Design


b. Compliance to ASCE 7-10.

c. All exterior windows and systems to be drained, vented, and every opening to be compartmentalized.

d. All exterior windows to be thermally-broken, pre-finished, aluminum frames.

e. Insulating Glass Units (IGU):

   1. Exterior windows and curtain walls: Double pane glass minimum for all vision areas.
   2. Curtain wall at spandrel locations: Insulation/metal backpan with single pane of glass.
   3. Design for 4 edge supports.
   4. TIER 2: Incorporate thermochromic glazing where exposed to sun.
   5. TIER 3: Incorporate electrochromic glazing where exposed to sun.

f. All sealed units to be IGCC and IGMA certified.

g. Design to minimize the use of exterior sealants wherever possible. If exterior sealants are used, only silicone sealant with at least +/- 50% movement capability are acceptable.
h. Exterior windows to be designed to accommodate estimated structural long and short
term movement of the building (vertical and horizontal displacement).

i. Anchorage and Support Framing: Shall be designed to accommodate thermal and
building movements without harmful effect to exterior window system, including glass
and glazing materials, and sealant applications.

1. Design anchoring system to ensure proper embedment can be attained for
each proposed slab thickness.
2. Anchors (bracing, inserts, clips, bolts, etc.) shall be designed for same loads as
exterior windows and checked at 1.5 x “Design Wind Pressure” in addition to
all other forces to ensure that the stresses do not exceed the yield point or
elastic buckling, whichever is lower.

j. TIER 2: Components to be designed for 100 year rain fall and be selected to resist wind-
born debris of 50 year storm.

k. Exterior windows shall have certified and labeled energy performance ratings in
accordance with NFRC.

l. Design for the following environmental conditions:

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100
deg C), material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).

**B2020.01 Performance (LE F (40 yrs))**

a. Structural Wind Performance Test – Window Without Wall: Capable of withstanding full
design wind load as determined by ASCE 7-10, using a 90 mile per hour 3 second wind
speed (Exposure Category C), or wind tunnel analysis.

b. Structural Wind Performance Test – Window in Wall: Test according to ASTM E330 as
follows:

1. When tested at positive and negative wind-load design pressures, assemblies
   (including anchorage) do not evidence deflection exceeding specified limits.
2. When tested at 100% of design wind-load (positive and negative pressures),
   not evidence of material failures, structural distress, and deflections of framing
   members exceeding L/175 of clear span, or ¾” , whichever is less for spans up
to 13’-6” and L/240 + 0.25” for spans greater than 16’-0”. Test
   Durations: As required by design wind velocity, but not less than 10 seconds.
3. When tested at 150% of design wind-load (positive and negative pressures), no evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.1 percent of span. Test Durations: As required by design wind velocity, but not less than 10 seconds.

c. Air infiltration and Exfiltration:
   1. Resistance to air leakage at 6.24 lbf/sq. ft. static-air-pressure difference (ASTM E283):
      a. Fixed Glazing and Framing Areas: not more than 0.06 cfm/sq.ft.
      b. Operable Windows: not more than 0.25 cfm/sq.ft.
      c. TIER 2: Operable Windows: not more than 0.06 cfm/sq.ft.

d. No water shall penetrate the inner water barrier when tested with a differential pressure of 12 psf (as per ASTM E331).

e. No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft.

f. Thermal Performance/Movement: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5, when subject to thermal design conditions specified in section 2020.00 r.

g. Energy Performance:
   1. Solar Heat Gain Coefficient: Exterior windows (Fixed glazing and framing areas) shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.

h. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 55 as determined according to NFRC 500.

i. A Temperature Index resistance based on the design parameters and confirm by carrying out testing under AAMA 1503.

j. Seismic Test: (See CR B20.02.b.4, Exterior Vertical Enclosures – Field Performance Testing).

k. Material selected will not fade more than 2 degrees photopic luminosity in 20 years under typical site sun exposure (per CIE Measurement of Luminosity).
Technical Criteria

B 2050 Exterior Doors & Grills

Verification & Validation

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>3. Define types and locations of all glazing systems.</td>
</tr>
<tr>
<td></td>
<td>5. Pre-qualify exterior window manufacturer/window systems.</td>
</tr>
<tr>
<td></td>
<td>6. Pre-qualify contractors and the use of pre-approved applicators/glazing installers.</td>
</tr>
<tr>
<td></td>
<td>7. Thermal performance analysis, Energy calculations, light transmission and SHGC, etc.</td>
</tr>
<tr>
<td></td>
<td>9. In plant review during manufacturing of project components to confirm compliance with approved shop drawings.</td>
</tr>
</tbody>
</table>

B 2050 Exterior Doors & Grills

A. Intent

The exterior doors and grills include all doors, grills and frames located in the exterior walls. These assemblies include the frames, solid, glazed or revolving doors, and applicable hardware. Door assemblies shall, over its expected lifetime, be fully operational during anticipated seismic deformation. See system intent (CR B20).

Additionally, exterior door hardware shall accommodate over its expected lifetime:

1. Wear and tear from anticipated operation (eg. Sliding doors hold up better than hinged doors per UCSF experience).
2. Required level and control of security.
3. Height, width and weights of the doors they support.
5. Ambiance of the spaces within.
6. Likely contact with pedestrian and material traffic.

### B 2050.00 Design


b. Hollow Metal Doors to be constructed with hot dipped galvanized steel with face welded frame construction. Field finish to be two-coat urethane.

c. Aluminum framed entrances shall be constructed of thermally broken frames.

d. Exterior entrance doors into the building’s public circulation system (as opposed to Bike Storage, for instance) used by visitors and the general building population (as opposed to University staff) shall be sliding. The loading dock doors should be swinging.

### B 2050.01 Performance (LE D (20 yrs))

a. Resist design wind load as determined by wind tunnel testing, with no failure of door frame, hardware, anchorage, gaskets, or joinery seals.

1. Maximum deflection of framing members when subject to design wind load shall not exceed L/175 of the clear span.
2. Maximum permanent deflection of framing members shall not exceed 0.2% of clear span when tested to 150% of the design wind load.

b. Hollow Metal Doors shall meet Duty Level 3, in accordance with ANSI SDI A250.8

c. Thermal Transmittance (U-factor) shall not exceed the following:

1. Aluminum framed entrances: 0.60 BTU/sq.ft.x h x deg F as determined in accordance with NFRC 100.
2. Hollow Metal Doors: 0.37 BTU/sq.ft.x h x deg F as determined in accordance with ASTM C1363

d. Solar Heat Gain Co-efficient (RSHGC) for glazed exterior doors shall not exceed that 0.35, as determined in accordance with NFRC 200.

e. The area-weighted Visible Transmittance (VT) of glazed exterior doors shall be no less that that indicated in Table 140.3-B of 2013 Building Energy Efficiency Standards, Title 24, Chapter 6, as determined in accordance with NFRC 200 or ASTM E972.
f. Air infiltration and Exfiltration:
   1. Maximum allowable air leakage through exterior doors shall not exceed 0.30 cfm/sq.ft., or 1.0 cfm/sq.ft. for double swing doors, under a pressure differential of 1.57 psf when tested in accordance with NFRC-400 or ASTM E283.

g. Water Penetration Resistance:
   1. Compression seal terrace-style swing doors shall prevent water penetration when tested with a differential pressure of 6 psf in accordance with ASTM E331.

h. Thermal Performance/Movement: No buckling; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
   1. Temperature range: the greater of 120 F ambient or that which results in an 180 F surface temperature range.

i. Emergency Power:
   1. Temperature range: the greater of 120 F ambient or that which results in an 180 F surface temperature range.

B 2050.90 Exterior Door Supplementary Components (Door Hardware) (LE D (20 yrs))

a. Follow latest edition of UCSF Door Hardware Standards (Section 08710).

b. Physical Endurance:
   1. Doors, Frames, and Hardware: ANSI A250.4-2001 Level A using hardware specified.

c. Wear Resistance:
   1. Door Surfaces: Scuff-resistant in areas where foot impact is likely; highly scratch-resistant in areas where hand contact is likely.
   2. Door Hardware Materials: All exterior door hardware shall be 316 stainless steel.
   3. Door Handles and Knobs: Highly scratch-resistant and of finish that will
minimize appearance changes due to wear; satin or brushed finish and no
plated or coated finishes.

d. Doors non-removable from outside without use of key.

e. Doors to be operated by accessible push plate.

f. Primary entry doors: These automatic sliding entrance doors shall be equipped with a
   “Fail-Safe Auto-Lock Assembly” , which will lock the doors during non-operation hours;
   however, the door can still be operated by card reader and doors will unlock for
   swinging, emergency operation during an alarm situation.

g. Other exterior door will be secured using a “fail-secure” method that allows entrance
   plus exit from inside using only one motion.

1. Exceptions: The following will not allow entrance:
   
a. Exit doors opening from exit stairways directly to exterior (Exit Only
      function).

2. Keys: Type as required to minimize unauthorized entry.
   
a. Keying: Key to the existing keying system.

3. Lock Functions: Appropriate to the location and function and as follows:
   
a. Entrance Doors: Public Entry/Exit (“nightlatch”).
   c. Exit Doors from Stairwells and Fire Exits: Exit Only.

4. Lock Function Definitions: As described in ANSI/BHMA A156.2-2003 (F36-F48,
   F75-F94, F107-F109), A156.3-2001 (“X” prefix), A156.5-2001 (“E” prefix),
   A156.12-2005 (F95-F106), and A156.13-2005 (F01-F25); type of lock required
   may also be governed by other criteria.
   
   a. Always-Locked: F86.
   b. Classroom: F84.
   c. Exit Only: F13, with no outside trim, no thumbturn or other
      unlocking feature inside, no holdback or dogging.
   d. Office: F82 Grade 1, operation of key unlocks outside handle.
   e. Store Door: F91.

5. Forced Entry: Provide doors capable of resisting forced entry equivalent to:
   

h. Integration of ACAMS (See CR D7010.11, Access Control, General).

C. Verification & Validation (All Tiers) (see system verification CR B20)

|       | 3. Define the exterior door systems and locations.
|       | 4. Determine thermal performance requirements for each entry system based on Energy Code Compliance.

|       | 6. Project specifications developed for each entry door system.

|              | 8. Submission of test reports for each door system. |
B 2080.80  Bird Control Devices

A. Intent

Design building exterior (including interior spaces often open to the exterior such as loading docks) to minimize attractiveness for roosting birds. Additionally, design a bird-safe building that minimizes the likelihood of collisions.

B. Description & Requirements

B 2080.81  References

a. Conform to the following reference documents:


C. Verification & Validation (All Tiers)

SD 1. Narrative identifying locations / areas of concern, and recommended mitigation measures.

B 3010  Roofing

A. Intent

The roofing assembly includes all waterproofing membranes, insulation, vapor barriers, parapets and copings. The assembly is part of an overall system that includes the roof structure (typically slab) and its attachment to the roofing assembly, roof-to-wall interfaces, and must be designed holistically to achieve its performance criteria over its expected lifetime. The assembly should be designed with durability, safety, ease of maintenance, renewals and future changes in mind (such as additions of roof-mounted equipment, solar panels, etc.). Building system penetrations need to be minimized in order to minimize points of higher degree of failure. The Integrated Delivery Team shall select roofing
materials and assemblies appropriate for the:

1. Exposure to the elements (rain, temperature, humidity and UV) including the local marine environment, and against biological growth.
2. Building type.
3. Adjacent rooftop equipment (particularly those requiring maintenance and eventual replacement).
4. Pathways to and from that equipment.
5. Types of tools and replacement parts that might be carried along those pathways and the consequences of them being dropped.
6. Access to window washing operations, equipment and anchorage.
7. Accomplishment of fall protection.


B. Description & Performance

**B 3010.00 Design**

a. All roofing systems to be fully adhered.

b. At no point shall the depth of rigid insulation exceed 8 inches.

c. All roofing assemblies (both built up and IRMA) should be installed on a substrate sloped to drain ¼” per 12”

d. System should be designed with drains and overflow scupper in accordance with NRCA placement guidelines. Coordinate with plumbing specification.

e. Use of pitch pockets is discouraged.

f. All roofs areas that will have either rooftop equipment, window washing system supported from the roof as well as solar ready roof areas to have primary waterproofing membrane protected by a durable, walkable surface in order to protect membrane from incidental damage from building maintenance practices.

g. Integrate fall protection and coordinate with (CR E1030.40 Maintenance Equipment).

**B 3010.01 Performance (LE E (30 yrs))**

a. Capable of withstanding wind load as determined by ASCE 7 or wind tunnel analysis.

b. UL listed Class A for fire performance.

c. Air leakage through assembly is maximum 0.09cfm at 1.157 psf, when tested in accordance with ASTM E2357
d. For IRMA Roofs – Concrete slab pavers or interlocking pavers to create walkable surface. Pavers to be installed on pedestals or have “ribbed” undersurface. Minimum weight of 18lb/ft².

e. Acceptable Membrane Types and Requirements:

<table>
<thead>
<tr>
<th>Membrane Type</th>
<th>Thickness</th>
<th>Puncture resistance</th>
<th>Tear strength</th>
<th>Water absorption</th>
<th>Water vapor permeance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Ply SBS</td>
<td>Base ply – 96 mils</td>
<td>300 lbf when tested to ASTM 5602</td>
<td>120 lbf when tested to ASTM 5147</td>
<td>1% water weight when tested to ASTM 5147</td>
<td>0.03 perms when tested with ASTM E96 procedure B</td>
</tr>
<tr>
<td></td>
<td>Cap ply – 180 mils</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Rubberized Asphalt</td>
<td>215 mils</td>
<td>110 units when cone penetration tested to ASTM D 5329 at 77 Fahrenheit</td>
<td>0.18 percent max. weight gain for 1/8 inch thick membrane after 72 hour immersion.</td>
<td>0.03 perms for 1/8 inch coating at 100 degrees F, ASTM E96, Procedure E.</td>
<td></td>
</tr>
<tr>
<td>TPO Waterproofing</td>
<td>60 mil</td>
<td>300 lbf when tested to FTM 101C, method 2031</td>
<td>55 lbf when tested to ASTM D751</td>
<td>3% water weight when tested to ASTM D471, 166 hours at 158 Fahrenheit water</td>
<td>0.03 perms, when tested to ASTM E96 procedure B</td>
</tr>
<tr>
<td>PVC Waterproofing</td>
<td>60 mil</td>
<td>33 lbf when tested to ASTM 5602</td>
<td>45 lbf when tested to D751</td>
<td>3% water weight when tested to ASTM D570</td>
<td>0.03 perms when tested to ASTM E96 Procedure B</td>
</tr>
<tr>
<td>EPDM Waterproofing</td>
<td>90 mil</td>
<td>250 lbf when tested to Federal Test Method 101B / 2031</td>
<td>150 lbf when tested to ASTM 624 die C</td>
<td>8% when tested to ASTM D471</td>
<td>0.03 perms when tested to ASTM E96 procedure B</td>
</tr>
</tbody>
</table>

f. Insulation:

1. Product: as appropriate for roofing system
2. Insulation to be installed above the structural deck for all flat roof applications.
3. Installation: Stagger seams of insulation; adhere all layers.

g. Vapor Barrier:
Technical Criteria

1. Vapor retarder membrane with maximum permeance rating of 0.02 perm.

   h. Warranty: Provide an all-inclusive warranty, and include removal and replacement of overburden.

      1. TIER 1: 20 years  (Note: this is less than life expectancy for which performance is still expected to be maintained.)
      2. TIER 2: 25 years  (Note: this is less than life expectancy for which performance is still expected to be maintained.)
      3. If required by product manufacturer to achieve warranty, owner to appoint third party inspection to verify field work.

   i. Report from the Integrated Delivery Team’s Corrosivity Expert/Consultant providing recommendations and requirements for achieving expected lifetimes of the Roofing System as it concerns corrosion from environmental agents. Updated report to analyze and verify the expected lifetimes of the final, proposed Roofing System design.

B 3010.50 Vegetated Roof Assembly (LE D (20 yrs))

   a. Applicability: This section is only required if Vegetated Roof Landscaping (CR G2080.02) is provided.

   b. Reference:

      1. See (CR G2080.02 Vegetated Roof Landscaping) for remainder of system.

   c. Description: Advanced Vegetative Roof System (AVRS) with a variety of sedum species as tiles, plugs, or plants, and a maximum of 6” growing medium; or an intensive green roof system with more than 6” depth of growing medium and perennials, shrubs and trees. To be coordinated with landscaping and with potential rain water / grey water design strategy.

   d. Performance: AVRS system shall be capable of:

      1. Detaining and retaining rainwater and irrigation water.
      2. Retaining sufficient water for plant uptake and year round health.
      3. Preventing root rot.
      4. Allowing airflow under multilayer system.
      5. De-energizing wind flow under multilayer system to reduce chance of wind uplift.
      6. Install root barrier under vegetated system and above roof waterproofing.
C. Verification & Validation (all tiers)

| SD         | 1. Roof load calculations. |
|           | 2. Report from the Integrated Delivery Team’s Corrosivity Expert/Consultant proposing recommendations and requirements for achieving expected lifetime of the Roofing System as it concerns corrosion from environmental agents. |
| DD         | 3. Plan highlighting all roofing penetrations. |
|           | 4. Report from the Integrated Delivery Team’s Corrosivity Expert/Consultant analyzing and verifying the expected lifetime of the proposed Roofing System design as it concerns corrosion from environmental agents. |
| CD         | 5. Architectural drawings showing roofing details |
|           | 6. Roof assembly cut sheets |
|           | 7. Drawings showing how slope to drains is achieved |
| Construction | 8. Shop drawings |
|           | 9. Sloped Insulation shop drawings (if applicable) |
|           | 10. Product data submittals |
|           | 11. Portion of roof to be mocked up as part of the project’s vertical wall mock-up. Please refer to section Z1040.40. |
|           | 12. Field quality control: |
|           | a. Include manufacturer’s site visits to review typical installation procedures, termination details, and transition details that are within scope. |
| Startup    | 13. Perform flood tests in accordance with ASTM D5957 for IRMA roofs. |
|           | Electronic Field Vector mapping or thermography as performance testing for built up roofs. |
|           | 14. Roof assembly is also to be tested as part of full-building air leakage test to verify air leakage is less than 0.4cfm when tested in accordance |

Commented [SV3]: Need final decision from UCSF on vegetated roofs. In the workshop they mentioned possibly no tray systems but no final word on allowing vegetated roofs.
Block 33  

Mission Bay East Campus Phase 1 (Block 33)  

University of California, San Francisco, Project No: M4603  

Technical Criteria  

B 3010 Roofing with ASTM E779.
C Interiors

C 10 Interior Construction 379
C 1010 Interior Partitions 380
C 1020 Interior Windows 382
C 1030 Interior Doors 384
C 1060 Raised Floor Construction 388
C 1070 Suspended Ceiling Construction 391
C 1090 Interior Specialties 394
C 20 Interior Finishes 403
C 2010 Wall Finishes 404
C 2030 Stair Finishes 414
C 2050 Ceiling Finishes 414
Building interiors shall complement ergonomic furnishings and building equipment systems to support spatial requirements, easily accommodate changing uses and technology, and create an interior environment that promotes occupant productivity, health, safety, comfort and well-being. All interior systems should be considered potential wayfinding cues to augment signage for an easily navigable environment.
C 10  Interior Construction

A. Intent

Interior construction defines the primary volumes, light, adjacencies, access and circulation that reflect the programmatic criteria and project goals. Interior construction should:

1. Support UCSF’s mission of excellence in academics, healthcare research and clinical care by developing facilities that foster technical excellence, individual productivity and well-being, group collaboration, and community camaraderie.
2. Fosters an interactive environment that fuses academic and translational research, teaching, and patient care.
3. Set a model for the future of UCSF workplace.
4. Achieve optimal efficiencies in the use and organization of space, circulation and core functions.
5. Integrate building functions, technology and systems for high performance, maximizing function, serviceability and durability.
6. Connect the exterior, interior, office and learning program elements to create a rich and full experience for the building users.
7. Design the building interior to be imaginative, contemporary, yet timelessly elegant, cohesive and meaningfully transparent.
8. Enhance employee safety.

Interior construction must also consider:

11. Acoustic control.
12. Environmental control.
13. Hazardous materials control.
14. Likely contact with pedestrian and material traffic.
15. Segregation of traffic to enhance durability.
16. Physical access to technology infrastructure for future adaptability.
17. That they create pathways for plumbing, electrical and communications distribution.

B. Description & Performance
C 10.00 General


C 1010 Interior Partitions

A. Intent

The design of interior separation between spaces needs to be holistic, including all the components that span between structural slabs above and below. These include barriers that continue fire and acoustic ratings beyond the primary partition to their horizontal continuation, and any systems that penetrate the partition system, such as piping and ductwork.

Additionally, partitions are the primary means of supporting wall-hung furnishings and equipment. While it is always the Integrated Delivery Team’s responsibility to design partitions to support identified wall-hung furnishings and equipment, the team should also anticipate likely locations for future wall-supported items. For future flexibility, heavier gauge studs than the minimum are requested throughout.

B. Description & Performance

C 1010.00 General

a. All elements necessary to subdivide and finish space enclosed within the shell, including applied interior surfaces of the exterior enclosure.

b. Non-Structural Metal Stud Framing

1. Provide wall studs at 16” o.c. maximum spacing
2. 0.033-inch thick studs (20 gauge) minimum, except where thinner studs are approved by the University in residential building types.
3. Stud flanges shall not be less than 1.375”.
4. Detail “slip joints” at top of partition, not base.

c. Sound Transmission: (CR F1030.10 Sound & Vibration Control)

d. Wall Protection: (CR C1090.35 Wall & Door Protection)

C 1010.10 Interior Fixed Partitions (LE F (40 yrs))
a. Fixed Partitions: Withstand loading of 5 psf (239 Pa) with maximum deflection for Typical Finishes of L/240, and at Tile, Plaster, Stone or Similar Finishes of L/360 per ASTM C 754.

b. Partial Height Partitions: Withstand concentrated load of 200 lbf (890 N) applied over not more than 10 sq in (6,400 sq mm) anywhere on partition surface.

c. Elevator Shaft Wall Partitions: Maximum deflections per ASTM C 754 to be same as Fixed Partitions under greater of constant 5psf load or intermittent air pressure loads as follows:

<table>
<thead>
<tr>
<th>Elevator Velocity</th>
<th>1 or 2 Elevators/Shaft</th>
<th>3 or more Elevators/Shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 180 fpm</td>
<td>5.0 psf (24 Pa)</td>
<td>5.0 psf (24 Pa)</td>
</tr>
<tr>
<td>180 to 1,000 fpm</td>
<td>7.5 psf (36 Pa)</td>
<td>5.0 psf (24 Pa)</td>
</tr>
<tr>
<td>1,000 to 1,800 fpm</td>
<td>10.0 psf (48 Pa)</td>
<td>7.5 psf (36 Pa)</td>
</tr>
<tr>
<td>1,800 to 3,000 fpm</td>
<td>15.0 psf (72 Pa)</td>
<td>7.5 psf (36 Pa)</td>
</tr>
</tbody>
</table>

d. Air Shaft Partitions: Withstand sustained air pressure loads of 10 psf (479 kPa) with maximum deflection for Typical Finishes of L/240, and at Tile, Plaster, Stone or Similar Finishes of L/360 per ASTM C 754.

**C 1010.20 Interior Glazed Partitions (LE F (40 yrs))**

a. Provide interior glazed partitions between adjacent spaces where required by the program or where proper functioning of adjacent spaces requires limited visual or physical connection between them.

1. Provide aluminum interior frames or aluminum storefront framing.

**C 1010.50 Interior Operable Partitions (LE C (15 yrs))**

a. Acoustically-rated (CR F1030.13, Interior Adjacencies Noise Control), fire-rated and non-rated, electrically operated, vertical partitions supported from structure.

b. Interior operable partitions shall be automatic, acoustic, and vertically-folding.

c. When in the down position (closed) they are:

1. Hard, rigid, flat, plumb walls constructed of a rectangular grid of acoustical
C 1020 Interior Windows

A. Intent

C. Verification & Validation (All Tiers)

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>SD</strong></td>
<td>1. See Contract.</td>
</tr>
<tr>
<td><strong>DD</strong></td>
<td>2. Load charts or calculations for support of all partitions over 14-feet tall.</td>
</tr>
<tr>
<td></td>
<td>3. Product data of Interior Operable Partitions, if used.</td>
</tr>
<tr>
<td><strong>CD</strong></td>
<td>4. See Contract.</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>5. See Contract.</td>
</tr>
<tr>
<td><strong>Startup</strong></td>
<td>6. See Contract.</td>
</tr>
</tbody>
</table>
C 1020 Interior Windows

Interior windows comprise one of the components of the interior partition system. Generally, the University prefers glazed partitions when there is a desire for light and views to traverse spatial separations. However, interior windows are particularly beneficial when only a small amount of the partition is desired to be clear (for instance in particular security situations, conference room occupant checking, and where higher fire and acoustic ratings are required). The life expectancy of interior windows should be no less than the partitions into which they are set. The interior windows should also continue the degree of acoustic, security, and environmental segregation as the partitions into which they are set.

B. Description & Performance

C 1020.00 General

   a. All elements necessary to provide light or vision into different spaces as required by use.
   b. Sound Transmission: (CR F1030.10 Sound & Vibration Control)

C 1020.20 Interior Fixed Windows (LE F (40 yrs))

   a. Interior Windows (Fixed):
      2. One of the following will be used:
      3. Hollow Metal windows at fire rated openings.
      4. Aluminum or hollow metal windows at non-fire rated openings.

C 1020.50 Interior Special-Function Windows (LE C (15 yrs))

   a. Pass, Transaction- and fixed-type service and teller windows, with sound or ballistics resistant properties per programing.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Layer</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. See Contract.</td>
</tr>
<tr>
<td>DD</td>
<td>2. Cut-sheets for any special-function windows.</td>
</tr>
<tr>
<td>Startup</td>
<td>5. See Contract.</td>
</tr>
</tbody>
</table>
C 1030 Interior Doors

A. Intent

Interior doors comprise one of the components of the interior partition system. The selection of doors must consider all of the same criteria as that of partitions, but doors shall also be sized to accommodate:

1. People, vehicles, animals and materials likely to move between adjacent spaces.
2. Egress requirements.
3. Appearance intent.

Additionally, interior door hardware (in particular locksets) shall be standardized across the University and shall accommodate over its expected lifetime:

4. Wear and tear from anticipated operation
5. Required level and control of security.
6. Height, width and weights of the doors they support.
7. Minimum maintenance.
8. Ambiance of the spaces within.
9. Likely contact with pedestrian and material traffic.
10. Integration of existing security technology and adaptability to future systems.

When closed, interior doors should also continue the degree of acoustic, security, and environmental segregation as the partitions into which they are set. Where appropriate (e.g., meeting rooms) vision panels shall be provided so external users can identify activity within the room without opening the door, and where they would enhance safety (e.g., labs).

B. Description & Performance

**C 1030.00 General**

a. Dimensions: Provide interior doors that are sized appropriately for people, vehicles, and goods likely to move between adjacent spaces.

b. Height: Not less than 96 inches in height.

c. Width: Not less than 36 inches in width, except for doors to shallow closets.

d. Sound Transmission: (CR F1030.10 Sound & Vibration Control)
e. Door Protection: (CR C1090.35 Wall & Door Protection)

### C 1030.10 Interior Swinging Doors

a. Hollow steel doors and frames. (LE 50 yrs)
   1. Steel doors shall be manufactured from cold-rolled steel conforming to ASTM specification A 366.
   2. Steel frames shall be 0.053 inch (16-guage) cold rolled. All frames to be back welded at the faces and ground smooth.
   3. Performance: SDI A250.4, Level B.

b. Flush wood doors: (LE D (20 yrs))
   1. Doors shall be 1-3/4” pre-finished solid core, AWI Custom grade or WDMA Premium grade, 5 ply, with FSC Certified fully bonded MDF, SCL, or staved wood cores.

c. Glazed aluminum doors: (LE 25 yrs)
   1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members.

d. Discouraged types: Knock-down hollow metal frames.

### C 1030.20 Interior Entrance Doors (LE D (20 yrs))

a. Automatic entrance door assemblies that include sliding doors, framing, sidelites, door operators, activation and safety devices, and accessories required for a complete installation.

b. Commercial, automatic door operators that are furnished separately from the door and frame; that include only the operator and related controls, which include activation and safety devices; and that can be applied to new and existing swinging doors to automate them.
   1. Auto-Door Operated Standard: BHMA A156.10 or A156.19 depending on use.

### C 1030.25 Interior Sliding Doors (LE C (15 yrs))

a. Manually operated sliding door assemblies, including door leaves, sidelites, framing,
headers, carrier assemblies, roller tracks, and accessories.

**C 1030.40 Interior Coiling Doors (LE B (10 yrs))**

a. Overhead coiling (rolling) service doors, manual or electric, including fire rated assemblies. Overhead coiling doors are fabricated from steel, stainless steel, and aluminum. Fire-rated doors are fabricated from steel and stainless steel.

**C 1030.70 Interior Special Function Doors (LE D (20 yrs))**

a. Hollow-metal security doors and frames, including swinging and sliding doors and door, sidelight, and borrowed-light frames.

1. Security Grade: Assemblies pass testing requirements in ASTM F 1450 for security grades specified.

b. Sound control door assemblies consisting of steel or wood doors, steel frames, and sound control seals.

1. Refer to (CR F1030.10 Sound & Vibration Control).

**C 1030.90 Interior Door Supplementary Components**

a. The following components shall be incorporated into the door sections above where applies.

**C 1030.91 Door Hardware (LE C (15 yrs))**

a. Follow latest edition of UCSF Door Hardware Standards (Section 08710).

b. Locks: Each room door will be secured using a keyed lockset that allows exit from inside using only one motion, with the following exceptions:

1. The following will not have any locking feature at all:

   a. Stairwell doors shall allow free access into stairwells, but should be locked from egress side without a card reader or other security access device.

   b. Stairwell doors should be openable from the egress side upon a signal from the fire command center, if present, or a signal by the building’s emergency personnel.

   c. Doors across corridors (i.e. interrupting the length of corridors for fire, smoke, or privacy reasons).
d. Doors to restrooms, shower rooms, locker rooms, kitchens, and laundry rooms.

2. The following may have privacy lock function (without key):
   a. Doors to bathrooms, water closet compartments, shower compartments, or single person restrooms.

c. Exit Doors Having Occupant Load of 50 or More (Regardless of Occupancy): Exit hardware will be provided that releases the locking/latching mechanism upon the application of a force in the direction of egress travel.

d. Locking Functions: Appropriate to the space location and function and as follows:
   1. Office Work Spaces: Office.
   2. Equipment Utilization Spaces: Store room.
   3. Meeting and Instruction Spaces Intended for One Occupant: Office.
   4. Meeting and Instruction Spaces for More Than One Occupant: Office lock tied to the access control system.
   5. Office Closets for one occupant: Privacy.
   6. Office Closets for more than one occupant: No locking.

e. Lock Function Definitions: As described in ANSI/BHMA A156.2 (F36-F48, F75-F94, F107 F109), A156.3 ("X" prefix), A156.5-2001 ("E" prefix), A156.12 (F95-F106), and A156.13 (F01-F25); type of lock required may also be governed by other criteria.
   1. Always-Locked: F86.
   2. Classroom: F84.
   3. Exit Only: F13, with no outside trim, no thumb turn or other unlocking feature inside, no holdback or dogging.
   4. Office: F82 Grade 1, operation of key unlocks outside handle.
   5. Privacy: F76 Grade 1.

f. Integration of ACAMS (See CR D7010.11, Access Control, General)

g. Restroom Door Operation
1. Multiple-occupant restroom doors shall be sensor-automated and power actuated from the interior side for reasons of hygiene and reduction of paper towel use.

C 1030.92 Door Glazing (Match LE of Door)

a. Color: Provide integral colored glazing as follows:

1. Vivarium Holding Rooms: Rose Chocolate. (GET FROM JACOBS)

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. Present plans of door arrangement meeting programming requirements and review with Users.</td>
</tr>
<tr>
<td>DD</td>
<td>2. Present refine plan from user comments.</td>
</tr>
<tr>
<td>CD</td>
<td>3. Show final plan conforming to Programming requirements.</td>
</tr>
<tr>
<td></td>
<td>4. See Contract.</td>
</tr>
<tr>
<td>Startup</td>
<td>5. None.</td>
</tr>
</tbody>
</table>

C 1060 Raised Floor Construction

A. Intent

The Integrated Delivery Team shall consider the functional, aesthetic and use of intended space before considering access flooring. Access flooring shall be considered as part of an entire system, including: pedestal supports, anchorage to slabs below, lateral restraint, support for, and attachment to, the floor finish above, support and bracing for components supported by the floor, vents and electrical outlets, and any materials required to continue the function of the partition above to the slab below. Select access flooring systems that, over their expected lifetimes, successfully accommodates:

1. A stable and level platform for an appropriate floor finish.
2. Mechanical, electrical, and data systems.
3. Structural dead, live, and seismic loads.
4. Anticipated wear and tear, and material and pedestrian traffic.
5. The intended appearance of the space above.
6. The required quantity of perforations where required, without compromising other aspects.
7. User control of ventilation where appropriate.
8. Changes to the partition configurations above, including easily relocated baffles for the continuation of acoustic separation of spaces.
9. Easily maintainable (including cleaning inside ducts), pest-free, underfloor air distribution so that indoor air quality is not affected.
10. Easily identifiable, labeled, removable and replaceable access panels.
11. Underfloor air distribution registers should allow for easy disassembly for cleaning by custodial staff rather than requiring special engineering staff attention to ensure proper operability once the units are cleaned and put back into service.

The selection of access-flooring systems should begin in the earliest stages of design because of the impact of the system on the overall design, floor-to-floor heights, and interior layout of a building.

B. Description & Performance

C 1060.00 General

a. Access flooring shall conform to Structural Performance: CISCA’s “Recommended Test Procedures for Access Floors” and comply with the following:
   1. Top-Surface Deflection: 0.10 inch.
   2. Stringer Load Test: 225 lbf minimum at center of span with a permanent set not to exceed 0.010 inch.
   3. Pedestal Axial Load Test: 5,000 lbf minimum.

b. Access floors shall conform to requirements for “Special Access Floors” as defined in Chapter 13 of ASCE 7.

c. In general raised floor conditions (as opposed to cleanroom or computer rooms) cementitious material or a lightweight-concrete core shall fill the panel cavity to increase mass at:
   1. Pedestrian pathways near open working areas.
   2. Other areas where noise from traffic on raised floors can be an annoyance.
      See (CR F1030.10, Sound and Vibration Control).

d. For additional Acoustic criteria see (CR F1030.10, Sound and Vibration Control).

e. For Seismic criteria see (CR F1030.30, Seismic Control).
C 1060.10 Access Flooring (LE F (40 yrs) support structure, 30 yrs floor panels)

a. Cleanroom / Laboratory Access Flooring Description: Standard modular access-flooring panels and understructure systems for clean, and control rooms; laboratories and similar critical environments.

b. Cleanroom / Laboratory Access Flooring Performance Requirements:
   1. Die-cast aluminum panels formed from aluminum sheets. Solid or perforated panels.
   2. Concentrated Loads: 1,750 lbf minimum or greater if stated in Section 2, Interior Planning Criteria.

c. Computer Room Access Floor Description: Standard modular access-flooring panels and understructure systems for computer and equipment rooms exposed mainly to static loads within the structural capabilities panel systems.

d. Computer Room Access Performance Requirements:
   1. Hollow panels of flat, steel top sheets welded to bottom steel pans with structural domes or dimples formed into the pans at spaced intervals to provide rigidity.
   2. Concentrated Loads: 1,500 lbf minimum or greater if stated in Section 2, Interior Planning Criteria.

e. General Offices Access Floor Description: Standard modular access-flooring panels and understructure systems for general offices and similar environments subject to heavy-duty static and dynamic loads within the selected panel's structural capabilities.

f. General Offices Access Floor Performance Requirements:
   1. Flat, steel top sheets welded to bottom steel pans with structural domes or dimples formed into the pans at spaced intervals to provide rigidity.
   2. Concentrated Loads: 2,500 lbf minimum or greater if stated in Section 2, Interior Planning Criteria.

g. Ultra-Low Profile Access Floor Description: Ultra-low profile modular access-flooring panels systems with a height between 1.6 and 2.75 inches for general office, conference rooms and other applications where extreme flexibility is required.

h. Ultra-Low Profile Access Floor Performance Requirements:
   1. Removable, interchangeable steel base units, corner plates, channel plates,
C 1070 Suspended Ceiling Construction

A. Intent

Suspended ceilings shall be considered as an entire system, including: their anchorage, lateral restraint, and the ceiling finishes they support, as well as the utilities and ductwork within and their penetrations. As a system, the suspended ceilings must accommodate over their expected lifetimes:

1. The functional intent of the space below.
2. The acoustic criteria of the space below.
3. Minimum maintenance and cleaning.
4. Wear and tear from material and pedestrian traffic below.
5. Wear and tear from access to space above ceiling by maintenance personnel.
6. The intended appearance of the space below.
7. The lighting of the space below.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Task</th>
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<tbody>
<tr>
<td>SD</td>
<td>1. Suggest products that conform to reference standards and programming requirements and review with Users.</td>
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<tr>
<td></td>
<td>2. Submit actual samples with Product Data showing conformance with requirements.</td>
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<tr>
<td>CD</td>
<td>3. Show final conformance to Programming and Performance requirements.</td>
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<tr>
<td></td>
<td>4. Submit shop drawings and structural calculations demonstrating compliance with gravity and lateral load requirements.</td>
</tr>
<tr>
<td>Construction</td>
<td>5. Allow Users to review Mockups of access flooring at least one week prior to ordering materials.</td>
</tr>
<tr>
<td>Startup</td>
<td>6. None.</td>
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</tbody>
</table>

Border units, and accessories.

2. Concentrated Loads: 2,000 lbf minimum or greater if stated in Section 2, Interior Planning Criteria.
8. Anticipated structural loads, including fixtures and other in-ceiling items.
9. Potential support of piping and utilities from below (eg. in laboratories).
10. Where the ceiling does not include easily removable panels, tiles, or adequate clearance, provide easily identifiable access panels (coordinated with maintenance access locations (eg. valves)).
C 10700 General

a. All corridors, offices and classrooms should have acoustic ceilings or equivalent acoustic control. (CR F1030.10)

C 107010 Acoustical Suspended Ceilings

a. Description: Acoustical panels (tiles) (LE D (20 yrs)) and exposed suspension systems (LE D (20 yrs)) for interior ceilings, including special-use types for high-temperature and high-humidity locations and clean rooms, conforming to ASTM E1264.

b. Requirements:

1. Compressed mineral fiber, non-directional deep fissure panels (tiles) tile in manufacturers’ standard, factory applied white color.
2. 3/4” minimum, square edge, 24” x48” or 24” x24” panels (tiles).
3. Minimum height AFF: 8’-0”
   a. Certain spaces require additional height (see below and Program Data Sheets)
   b. The IDT shall confirm that all equipment can be adequately accommodated by each ceiling height.
4. Impact resistant coating in high use, non-assignable areas.
5. Where suspended gypsum board ceilings are not required (see CR C1070.20), spaces requiring washable ceilings (including USDA /FSIS) shall receive ASTM E1264-Type IV, impervious, inorganic, mineral fiber composition, mold and soil-resistant, durable, mylar-wrapped, and chemical fume-resistant panels (tiles) that meets ISO Class 5:
   a. Kitchens
   b. Food Service Areas
   c. Laboratories with plumbed utilities
   d. Clinic Treatment and Procedure Rooms

C 107020 Suspended Gypsum Board Ceilings (LE D (20 yrs))

a. Consider in wet locations, as required for acoustical reasons, and for restricting access above ceilings. Where provided because of wet or washable locations, suspended gypsum board ceilings shall be epoxy painted. These ceilings shall be provided at a minimum for:
1. Vivarium Holding Rooms
2. Locker Rooms and Restrooms
3. Any washing areas: Autoclaves, glass washing, cage washing, etc.

**C 1070.50  Specialty Suspended Ceilings (LE D (20 yrs))**

a. Linear metal and pan metal ceilings having specially designed carriers and accessories. For use where unique appearance and visually integrated services.

b. Wood ceilings having standard or specially designed carriers and accessories. For use where their unique appearance and visually integrated services.

**C 1070.70  Interior Special Function Suspended Ceilings (LE 25 yrs)**

a. Description: Integrated ceilings and security ceilings.

b. Integrated ceilings having specially designed carriers and accessories. For use where plenum accessibility is a low priority, for their unique appearance and visually integrated services, e.g., light fixtures and air diffusers that are almost invisible and do not disrupt the linear appearance of the ceiling.

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**C. Verification & Validation (All Tiers)**

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</table>

**C 1090 Interior Specialties**

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**A. Intent**
Interior specialties shall each be considered a system that includes their support and finishes. As a system, interior specialties must accommodate over their expected lifetimes:

1. The intended functions and appearances of the spaces in which they’re located.
2. Minimum maintenance and cleaning.
3. Wear and tear from adjacent material and pedestrian traffic.

 Appropriately designed, specified and located interior signage shall be one of the methods by which the Integrated Delivery Team shall fulfill the Intent and Requirements of Wayfinding in the Program and Planning Section of this document. The intent is to create an interior environment with enhanced wayfinding that simplifies occupant orientation and navigation through the holistic and integrated application of clear planning organization, interior design cues, signage and technology.

B. Description & Performance

C 1090.10 Interior Railings and Handrails (LE C (15 yrs))

a. Handrails and Guardrails Design:
   1. To enhance usability by the visually impaired, incorporate:
      a. High visual contrast.
      b. Radiused, continuous turns and transitions.
      c. Intermittent brackets and connections with eased or rounded corners and edges.

b. Handrails and Guardrails Requirements:
   1. Provide handrail and guardrail assemblies capable of resisting forces per Code.
   2. TIER 2: Provide handrail and guardrail assemblies capable of resisting forces in EXCESS of those required by Code, as follows:
      a. Uniform Load: Minimum 60 lb/ft (0.88 kN/m) applied in any direction at the top.
      b. Concentrated Load: Minimum 250 pounds (1112 N) applied in any direction at any point along the top.
      c. Normal Load to Intermediate Rails or Guard: Minimum 60 pounds (267 N) horizontally applied to area of not more than 1 foot square (305 mm square).
4. Height: Tops of guardrails shall be located at 48” above finished floor (note: this is a UCSF standard that exceeds Code).
5. Cable rail systems are discouraged.

C 1090.21 Visual Display Units

a. Description: Markerboards/Whiteboards, Glassboards, Tackboards, Smart Boards, Display Rails.

b. Configuration and surface area as indicated in the program:

1. Erasable surfaces, which are identified in the program as markerboards or whiteboards:
   a. Abrasive, toothed surface for marking with markers and erase with and without using water. Low-force cleanability is important for janitorial ergonomics.
   b. Holders for writing materials, below and full length of each area of erasable surface.

2. Tackable surfaces, which are identified in the program as tackboards for standard push pin use.
3. Smart Boards, erasable boards that allow images and text to be captured in electronic format.
4. Display Rails, metal or wood rails with tackable inserts.

c. Convenience of Visual Display Surfaces - Except as otherwise indicated, required surface area will be accomplished within the “usable” areas as follows, although additional area is not bjectionable:

1. Erasable Surfaces: Not less than 30 inches (760 mm) above floor; not more than 72 inches (1830 mm) above floor. Mobile unit optional.
2. Tackable Surfaces: Not less than 36 inches (915 mm) above floor; not more than 72 inches (1830 mm) above floor. Mobile unit optional.
3. Display Rails: Not less than 72 inches (1830 mm) above floor.

d. Product Type Wear Resistance:

1. Markerboards (LE B (10 yrs))
2. Glassboards (LE B (10 yrs))
3. Tackboards (LE 8 yrs)
4. Visual Display Rails (LE B (10 yrs))

e. Surface Type Wear Resistance:
   1. Visual Display (Projection) Surfaces (LE B (10 yrs).): Surfaces will comply with criteria for wall finishes for the spaces in which they are installed.
   2. Erasable Surfaces (LE B (10 yrs).): Designed to withstand marking with the specified materials without permanent damage, imprint, or visibility of erased markings.
   3. Tackable Surfaces (LE 8 yrs.): Tackable material and surface finish durability not less than would be provided by applied wall coverings complying with ASTM F 793-2007 Category II-Decorative with Medium Serviceability.

C 1090.22 Interior Signage (LE B (10 yrs))

- Mounting locations: Avoid backgrounds that are visually inconsistent such as glass or highly reflective surfaces. These backgrounds can create silhouetting and other low contrast conditions that are difficult for individuals with low vision conditions to read.
- Interior Donor Signage:
  1. Signage Content: Solicit content from the University.
  2. Mockups (see CR Z1040.42, Mockups) are required for each sign and shall include solicited content for Donor and University approval.
  4. Locations and Assumed Quantities: See Interior Planning portion of this document quantity of signs, if any. Solicit locations from the University during the design phase.
- Interior Trash, Compost and Recycling signage: Locate University-provided signage at eye level for users to easily pay attention to.
- All other Interior Signage:
  1. Signage Content: Solicit content from the University.
  2. Mockups (see CR Z1040.42, Mockups) are required for one exemplary sign and shall include solicited content for University approval.
  4. Locations and Assumed Quantities: See UCSF Signage Standards Manual and
Ordering Catalog for intended quantities and locations.

**C 1090.25 Compartments and Cubicles (LE B (10 yrs))**

a. Toilet and Shower & Dressing Compartments enclosures for toilets and screens for entrances to toilet room privacy at urinals and other privacy screens. Compartments are also called toilet partitions or enclosures. When selecting compartment enclosure and screen types, material or finish, and mounting styles, consider the requirements for maintenance, vandal and moisture resistance, supporting construction, and repairing damaged units. UCSF prefers keeping the floor as unobstructed as possible (i.e., Ceiling-mounted toilet partitions). When providing multiple HC toilet stalls within a single room, attempt to provide both right- and left-hand approaches.

1. Mounting Types:
   a. TIER 1: Floor-mounted partitions.
   b. TIER 2: Ceiling-mounted partitions.


**C 1090.35 Wall and Door Protection (LE B (10 yrs))**

a. General: In back-of-house corridors, mail rooms, and freight receiving rooms, the Integrated Delivery Team shall anticipate the types of traffic that will cause damage due to items such as:
   1. Liquid Nitrogen Dewars.
   2. Rolling carts
   5. Hand trucks.
   6. Pallet jacks.

b. Wall Protection: Provide appropriate impact-resistant wall bumpers (at appropriate heights), and corner guards, or wall surfaces that are inherently resistant to anticipated impact damage.

c. Walls Protection Standards:
   1. Comply with ASTM D256.
d. Wall Protection Types:
   1. Crash rails: Provide crash rails in areas where considerable amount of abuse from heavy impacts is anticipated. Crash rails shall be nominally 4 to 8 inches high or higher.
   2. Bumper rails: Provide bumper rails in areas subject to limited abuse. Bumper rails shall be nominally between 2 and 4 inches in height.

e. Door Protection Standards:
   1. Comply with BHMA A156.6.

f. Door Protection Types:
   1. Kick plates protect the bottom of the push side of doors subject to foot traffic. Standard heights are 8, 10, and 12 inches.
   2. Mop plates protect the bottom of the pull side of doors that are subject to abuse during floor cleaning. Standard heights are 4 and 6 inches.
   3. Armor plates protect the lower half of doors subject to cart or truck traffic or rough usage and are usually applied to the push side of single-acting doors and to both sides of double-acting doors. Standard heights are 36, 40, and 42 inches.
   4. Stretcher plates protect doors at specific areas where consistent contact is made by stretchers and similar equipment. These plates are not designated in BHMA A156.6. Standard heights are 6 and 8 inches. Mounting height depends on use.

C 1090.40  Toilet, Bath, and Laundry Accessories (LE B (10 yrs))

a. Shall meet universal design principles.

b. Shall be hands-free.

c. Consider providing alcoves (rather than integrated recessing) of these items (particularly Waste Bins and Paper Towel Dispensers typically located directly above Waste Bins) for faster Custodial care, but not creating difficult navigation for users with disabilities.

d. Coordinate accessory requirements with the Owner to ensure that dispensers requiring disposable products are of the appropriate type, especially if the Owner purchases large quantities of supplies.

e. Provide accessory fixtures as required to accomplish the design:
1. Mirrors:
   a. Continuous mirror for each group of lavatories.
   b. Other locations where indicated in project program.

2. Grab Bars: Wherever required for safety and assistance in use of toilet and bath fixtures, and at toilets designed for the disabled and showers.

3. Waste receptacles (provided by University).
   a. Space provisions: Space for two 23-Gallon Compost bins: one near sink, one near door.
   b. Allowed Types: free-standing. (Note: This requires additional planned floor space for CBC and ADA clearances. See University for dimensions of bins to be provided.)
   c. Discouraged Types: built-in, recessed, or under-counter (hole in counter deposit), since these require more Janitorial time to collect.

4. Shower Fixtures:
   a. Closures that prevent water spillage onto floors and walls outside showers.
   b. Shower seats where indicated.

5. Holders and dispensers for toilet, sink, and bath supplies.
   a. Toilet Paper: Confirm make and model with University during design phase.
   b. Towel bars or hooks, in each bathroom, to hold 2 unfolded items to dry, 6 folded items, and 2 hooks.
   c. Hand Soap: Liquid, one dispenser for each lavatory. Shall be above counter height. Through-counter solutions are discouraged.


7. Hooks for temporary storage of occupants’ property; one in each toilet compartment and shower areas.

8. Convenience Shelves:
   a. Provide convenience shelves at all restroom facilities.
b. Shelves (matching countertop construction) shall be a section of built-in countertop, away from the lavatories.

c. Individual stainless steel shelves in stalls may be used in addition to the built-in shelf.

C 1090.41 Custodial Accessories (LE B (10 yrs))

a. Shall meet universal design principles.
b. Provide accessory fixtures as required to accomplish the design.

1. Holders and dispensers for cleaning supplies, utensils, and tools furnished by the University.

   a. Mops and Brooms: 6 items to be hung up in each janitor’s closet, plus shelf for supplies.

C 1090.60 Safety Specialties

a. Fire-protection cabinets (LE E (30 yrs)) are available in steel, aluminum and stainless steel. Provide recessed cabinet boxes unless that won’t fit in wall then provide semi-recessed cabinet boxes. Recommend the use of painted steel boxes unless conditions dictate otherwise.
b. Fire extinguishers (LE A (8 yrs)) should be listed and labeled by an independent testing laboratory, such as FM Global (FMG) or UL that is acceptable to authorities having jurisdiction. Provide size of extinguishers as required by authorities having jurisdiction. The identification mark of the listing and labeling company should be on each fire extinguisher. Locate fire extinguishers per NFPA 10.

C 1090.70 Storage Specialties (LE B (10 yrs))

a. Lockers: Metal, wood plastic and plastic laminated lockers. Locker benches are also included. Recommend the use of metal or plastic lockers for all general or industrial use. Wood and plastic-laminated lockers should be use for higher end uses.
b. Locker Room Benches: Securely fasten pedestals to floor.

c. United States Postal Service (USPS)-approved postal-delivery and collection equipment, including mail receptacles, cluster box units, parcel lockers, and collection boxes. (NOT IN PROJECT FOR BUILDING 33).

C 1090.90 Pest Control Devices (LE C (15 yrs))

**C 1090.91 Unframed Mirrors (LE C (15 yrs))**

a. Unframed, silvered flat glass mirrors: Laminated ultra-clear glass mirrors that qualify as safety glazing. Quality-Q1 glass with a nominal thickness of 6 mm. conforming to ASTM C 1503.

### C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Suggest products that conform to reference standards and programming requirements and review with University.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. C1090.20: Updated wayfinding user type scenario schematics.</td>
</tr>
<tr>
<td></td>
<td>3. C1090.20: Wayfinding Journey Mapping for 4 user types, 1-2 scenarios per user type including:</td>
</tr>
<tr>
<td></td>
<td>4. Map of journey in plan with sign locations and additional wayfinding queues.</td>
</tr>
<tr>
<td></td>
<td>5. Sample designs of key sign types and wayfinding queues.</td>
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<tr>
<td></td>
<td>6. Identify pests to be designed out of the project for University review and approval.</td>
</tr>
<tr>
<td></td>
<td>7. List of conveying devices anticipated to travel through the building’s circulation system.</td>
</tr>
<tr>
<td></td>
<td>8. Submit actual samples with Product Data showing conformance with requirements.</td>
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<tr>
<td></td>
<td>9. Identify proposed methods and locations for designing the identified pests out of the structure. Include on a first floor plan with site information, and additional floor level plans if applicable.</td>
</tr>
<tr>
<td></td>
<td>10. Floor plans of typical travel paths for conveying devices (rolling carts, gas cylinders, LN2 dewars, etc.) superimposed over a plan showing bumpers, corner guards and other wall protection devices.</td>
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<tr>
<td></td>
<td>11. Show final conformance to Programming and Performance requirements.</td>
</tr>
</tbody>
</table>
12. Schedule of signage information gathering, review and approvals, including adequate time for each.
13. Request signage content.
14. Provide signage mockups for approval.
15. Revise signage mockups if requested

C 20  Interior Finishes

A. Intent

The selection of appropriate finishes for the function of each interior space is paramount. The Integrated Delivery Team shall consider the functional, aesthetic and acoustic intent of the space, and then select finishes that, over their expected lifetimes, successfully:

1. Accommodates the programmatic criteria (See the Programming and Planning portion of this document)
2. Resist the wear and tear of anticipated contact due to adjacent traffic.
3. Maintains its intended overall quality appearance, despite minor fading, etc.
4. Resist exposure to moisture and fluctuations in relative humidity.
5. Resist exposure to stains and reagents.
6. Resist UV light (color changes and fading from sunlight through specified glazing).
7. Resist exposure to in-service damage such as scratches, indentations, and gouges.
8. Promote the University’s sustainability goals (CR 1030.50).
9. Promote human health (CR 1030.50).
10. Supports the lighting intent of the room through reflectance and texture.
11. Satisfies the University’s maintainability and reparability goals (CR 1030.02, Durability/Robustness; and CR 1030.04, Janitorial, Maintenance, and Training), including, but not limited to:
   a. Smooth finishes preferred over textured finishes except where functionally required, eg. slip resistant flooring.
   b. Minimizing the quantities of different finish components (eg. ceiling tiles, ...
C 2010 Wall Finishes

A. Intent (see system intent C20.A)

Wall finishes are an integral part of the interior partition system, and must work together to achieve many performance criteria such as a well-lit environment, durability, and acoustics. The selection of appropriate wall finishes for the function of each interior space is paramount. In addition to the intention for all interior finishes, the Integrated Delivery Team shall consider the functional, aesthetic and acoustic intent of the space, and then select wall finishes that, over their expected lifetimes, successfully:

1. Accommodates the eventuality of users wanting, or needing to, mount robust or temporary items to the walls.
2. Resists graffiti.
3. Otherwise provide a low-janitorial (easy to clean and keep clean) and low-maintenance (consider the quantity of paint colors and impact on repainting) finish.

B. Description & Performance

C 2010.00 General

a. Wall Finishes: Provide integral or applied wall surfaces that are appropriate for anticipated usage and traffic, offering durability not less than would be provided by applied wall coverings as follows, classified in accordance with ASTM F 793:

1. Occupant Work: Category IV- Type I Commercial Serviceability.
2. Storage Rooms: Category IV- Type I Commercial Serviceability.
3. Corridors: Category VI- Type III Commercial Serviceability.
4. Lobbies: Category VI- Type III Commercial Serviceability.
5. Stairs: Category V- Type II Commercial Serviceability.
7. Utility Equipment Rooms: Category V- Type II Commercial Serviceability.
C 2010.10  Tile Wall Finishes (LE D (20 yrs))

a. Consider use in areas of abuse or wet conditions.
   2. Thin set mortar only; mastic discouraged. Consider tile use in:
      a. Restrooms.
      b. Shower rooms.
      c. Kitchen
      d. Mop sinks in custodial closets (may be partial height).
   3. Use of thin, glazed, ceramic base discouraged at high traffic areas.

C 2010.20  Wall Paneling  (LE D (20 yrs))

a. Custom-manufactured flush wood paneling. Custom-veneered paneling and paneling fabricated from premanufactured sets of sequence-matched panels are included.

b. Follow the Architectural Woodwork Standards paneling Section, Premium grade.

C 2010.30  Wall Covering  (LE B (10 yrs))

a. Vinyl, wood-veneer, and metal-panel wall coverings.

b. Discouraged Types: Fabric (except for specific acoustic treatments) and heavily textured wall coverings, both of which are hard to clean and keep clean.

c. Conform to ASTM F 793 durability standards.
   1. Category IV, Type I Commercial Serviceability.
   2. Category V, Type II Commercial Serviceability.
   3. Category VI, Type III Commercial Serviceability.

C 2010.50  Stone Facing  (LE D (20 yrs))

a. Dimension stone paneling on interior walls and columns, including units with carving or inscriptions.

b. Elegant appearance of full-height panels that provides the ability to maintain a good color and pattern match.

c. Stone Groups:
   1. Granite.
   2. Limestone.
   3. Marble.
4. Quartz-Based Stone.
5. Slate.
6. Travertine

**C 2010.60 Special Wall Surfacing (LE B (10 yrs))**

- **a.** Maintenance Requirements: This section may only be allowed at the discretion of the University since these are often difficult to clean and keep clean.
- **b.** Stretched-Fabric Wall Systems: Site-assembled and -upholstered fabric systems for covering walls. Systems use manufactured frame components and can be decorative, tackable, acoustical, or any combination of these characteristics.
- **c.** Fabric Wrapped Panels: Shop-fabricated, fabric-wrapped wall panels that are attached to finished wall construction. Panels can be decorative and tackable, but any acoustical benefit is incidental to panel construction and appearance.

**C 2010.70 Painting and Coating (LE B (10 yrs))**

- **a.** Paint materials selected for coating systems for each type of surface shall be the product of a single manufacturer.
- **b.** Paint colors shall be specified to minimize maintenance ordering (ie. Can be specified remotely without color matching.)
- **c.** Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
- **d.** Concrete block should have one coat of filler-sealer and a minimum of two coats of paint. At areas where epoxy paint is to be applied (toilets, kitchen areas), block filler is to be applied with squeegee to insure that all pores are filled before application of epoxy.
- **e.** Drywall, concrete, or plaster should have one coat of suitable primer and a minimum of two coats of semi-gloss or eggshell paint.
- **f.** Kitchen, restroom and locker room areas should be painted with epoxy paint or other approved, maintainable, non-porous finish.

**C 2010.71 Dry-Erase Wall Coating (LE D (20 yrs))**

- **a.** Description: Used for erasable wall surfaces.
- **b.** Performance:
  
  1. **Primer:** Shall be magnetic type, to create a magnetic wall.
2. Dry Erase Coating: 2-part, solvent-based coating providing a surface suitable for use of dry-eraser markers.

C 2010.80 Acoustical Treatment (LE 8 (10 yrs))

a. Acoustic Performance: (See CR F1030.10)

b. Sound-Absorbing Wall Units; Shop-fabricated, acoustical wall panels that are tested for acoustical performance and are attached to finished wall construction. Sound-absorbing, sound-diffusing, and sound-reflecting panels are included. Sound-absorbing panels have high sound-absorption values; sound-diffusing and sound-reflecting panels have low sound-absorption values. Panels can also be decorative and tackable.

c. Sound-Absorbing Ceiling Units; Shop-fabricated, acoustical ceiling panels that are tested for acoustical performance and are applied to ceilings or suspended from overhead construction. Sound-absorbing, sound-diffusing, and sound-reflecting panels are included. Sound-absorbing panels have high sound-absorption values; sound-diffusing and sound-reflecting panels have low sound-absorption values.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Tier</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. Suggest products that conform to reference standards and programming requirements and review with Users.</td>
</tr>
<tr>
<td>DD</td>
<td>2. Submit actual samples with Product Data showing conformance with requirements.</td>
</tr>
<tr>
<td></td>
<td>3. Provide product data for wall finishes showing how wall finish meets the indicated durability requirements.</td>
</tr>
<tr>
<td>CD</td>
<td>4. Show final conformance to Programming and Performance requirements.</td>
</tr>
<tr>
<td></td>
<td>5. Allow Users to review Mockups of wall and ceiling finishes at least one week prior to ordering materials.</td>
</tr>
<tr>
<td>Startup</td>
<td>6. None.</td>
</tr>
</tbody>
</table>

C 2030 Flooring

A. Intent (see system intent C20)
The selection of appropriate flooring material for the function of each interior space is paramount. In addition to the intention for all interior finishes, the Integrated Delivery Team shall consider the functional, aesthetic and acoustic intent of the space, and then select flooring materials that, over their expected lifetimes, successfully:

1. Resist the wear and tear of anticipated vehicular (carts, wheelchairs, etc.) and pedestrian (various footwear types) traffic.
2. Resist abrasiveness of local soils.
3. Maintain appearance and slip resistance with the anticipated type and frequency of maintenance.
4. Support users in long-term seated and standing postures and be designed to support optional anti-fatigue mats and/or chair mats in employee work areas.
5. Allows chair casters to roll smoothly where such chair types are anticipated.
6. Dampens expected traffic to meet the acoustical intent of nearby spaces.
7. Satisfies the University’s janitorial, maintainability and reparability goals (CR 1030.02, Durability/Robustness; and CR 1030.04, Janitorial, Maintenance, and Training), including, but not limited to:
   a. Prefer modularly replaceable components (eg. Carpet tile over Sheet Carpet), and particularly in locations more likely to receive spills and heavy wear and tear.
   b. Flooring colors and patterns that do not show dirt easily, increasing the janitorial cleaning schedule.
   c. Flooring finishes that do not require toxic materials to maintain (eg. toxic wax strippers).
8. Enhance usability for the visually impaired:
   a. Primary circulation areas should have hard surface floor finishes that are not glossy.
   b. Transitions and borders with contrasting color should also have contrasting texture.
9. It should be noted that the University has experienced durability from the following products to be particular appropriate for many of its buildings:
C 2030 Flooring

a. Aesthetically elevated locations: Sealed Slate stone.

B. Description & Performance

C 2030.00 General

a. Requirements:
   1. Moisture Testing: For all Glued Down or Fluid Applied Flooring or Coatings:
   2. Calcium Chloride Test ASTM F 1869.

b. Mock-Ups: Provide mockups for all flooring types.

C 2030.10 Floor Treatment (LE B (10 yrs))

a. Description: Sealing of concrete floor areas not otherwise scheduled to receive finish floor covering.

b. Performance Requirements:
   1. Water-based, colorless, odorless solution of specialized reactive chemicals which penetrates concrete surfaces to seal, densify, harden and prevent dusting.

C 2030.20 Tile Flooring (LE D (20 yrs))

a. Description: Unglazed and glazed ceramic mosaic, quarry, pressed floor, and porcelain tile.

b. Performance Requirements:
   1. Tile shall conform to Dynamic Coefficient of Friction per ANSI 137.1.
   2. Tile installations shall follow TCNA standards.
   3. Install waterproofing / crack isolation membranes for oversized floor tile over 14 by 14 inches in size or if one side is over 18-inches long, with a medium bed setting method.
   4. Install waterproofing membrane in all shower/wet locations.
   5. Chemical-Resistant Installations: Set in portland cement mortar, water-cleanable epoxy, or furan mortar and grouted with water cleanable epoxy,
**C 2030 Flooring**

**Technical Criteria**

- C 2030.30 Specialty Flooring (LE B (10 yrs))

  a. Chemical-Resistant Laboratory Flooring Description (Tile or Sheet): Smooth (for reduction of vibration and acoustic noise generated by cart traffic) tile or sheet floor coverings and installation materials that resist chemical substances without incurring damage in areas where chemicals are used and spills are possible.

  b. Laboratory Flooring Performance:

    1. Liquid Nitrogen-Resistance: Where there is the potential for Liquid Nitrogen use flooring and adhesive shall return to full performance capabilities after spill has evaporated and flooring has reached room temperature (note: solution likely points to rubber with appropriate adhesive.)

    2. Chemical Resistance: Sample chart of possible chemical resistant requirements. (Verify requirements with users.):

```
<table>
<thead>
<tr>
<th>Chemical</th>
<th>L Hour</th>
<th>Chemical</th>
<th>L Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid (concentrated)</td>
<td>SD 1</td>
<td>Kerosene</td>
<td>SD 1</td>
</tr>
<tr>
<td>Acetic acid (5%), white vinegar</td>
<td>0</td>
<td>Lighter fluid</td>
<td>0</td>
</tr>
<tr>
<td>Acetone</td>
<td>SD 1</td>
<td>Methyl alcohol</td>
<td>0</td>
</tr>
<tr>
<td>Ammonium hydroxide, NH₄OH (5%)</td>
<td>SD 1</td>
<td>Methyl ethyl ketone (MEK)</td>
<td>SA 1</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td>SD 1</td>
<td>Methylene chloride</td>
<td>SA 1</td>
</tr>
<tr>
<td>Animal Fats</td>
<td>0</td>
<td>Mineral oil, white medicinal grade</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td>SD 1</td>
<td>Mineral spirits</td>
<td>SD 2</td>
</tr>
<tr>
<td>Betadine ¹</td>
<td>0</td>
<td>Nitric acid (concentrated)</td>
<td>0</td>
</tr>
<tr>
<td>Blood</td>
<td>0</td>
<td>Nitric acid (5%)</td>
<td>0</td>
</tr>
<tr>
<td>Brake Fluid</td>
<td>SD 1</td>
<td>Motor Oil</td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td>SD 1</td>
<td>Olive oil</td>
<td>0</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>SD 1</td>
<td>Perchloroethylene</td>
<td>SA 1</td>
</tr>
<tr>
<td>Chloroform</td>
<td>0</td>
<td>Phenol disinfectant (5%)</td>
<td>0</td>
</tr>
<tr>
<td>Cresol</td>
<td>CC 2</td>
<td>Silver nitrate (5%)</td>
<td>CC 1</td>
</tr>
<tr>
<td>Cresol</td>
<td>SD 1</td>
<td>Silver nitrate (40%)</td>
<td>0</td>
</tr>
<tr>
<td>CRL (Calcium, Rust, Lime) Remover</td>
<td>CC 3</td>
<td>Sodium hydroxide, NaOH (5%)</td>
<td>0</td>
</tr>
<tr>
<td>Dichloroethylene</td>
<td>0</td>
<td>Sodium hypochlorite, bleach (5.25%)</td>
<td>0</td>
</tr>
<tr>
<td>Dimethyl sulfoxide</td>
<td>SD 1</td>
<td>Sodium metasilicate</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>0</td>
<td>Sulfuric acid (concentrated)</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>0</td>
<td>Sulfuric acid (77%)</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>0</td>
<td>Sulfuric acid, H₂SO₄ (5%)</td>
<td>0</td>
</tr>
<tr>
<td>Formaldehyde (40%)</td>
<td>0</td>
<td>Thimerosal</td>
<td>SA 1</td>
</tr>
<tr>
<td>Fuchsine</td>
<td>CC 1</td>
<td>Toluene</td>
<td>SA 1</td>
</tr>
<tr>
<td>Gasoline, unleaded</td>
<td>0</td>
<td>Trisbac sodium phosphate</td>
<td>0</td>
</tr>
<tr>
<td>Hydrochloric acid (concentrated)</td>
<td>CC 2</td>
<td>Trichloroethane</td>
<td>SA 1</td>
</tr>
<tr>
<td>Hydrochloric acid, HCl (5%)</td>
<td>SD 1</td>
<td>Trichloroethylene</td>
<td>SA 1</td>
</tr>
<tr>
<td>Hydrofluoric acid (concentrated)</td>
<td>0</td>
<td>Urine</td>
<td>0</td>
</tr>
<tr>
<td>Hydrofluoric acid (5%)</td>
<td>0</td>
<td>Vegetable Oil</td>
<td>0</td>
</tr>
</tbody>
</table>
```
Iodine  SD 1  Xylene  SD 1
Isopropyl alcohol  SD 1
Isopropyl alcohol (70%)  0

Categories
* SD: Surface dulling; Indicates that the specimen suffered from a loss of gloss
* CC: Color change; Indicates that the specimen suffered discoloration or bleaching, or both
* SA: Surface attack; Indicates that the specimen suffered surface damage such as softening, warping, swelling, blistering, peeling, raised or rough area

* Subjective Category Ratings
* 0= no change
* 1= slight change
* 2=moderate change
* 3 severe change

c. Conductive and Static-Dissipative Flooring Description: Resilient floor coverings designed to control electrostatic discharge, including solid vinyl floor tile, rubber floor tile, vinyl composition floor tile, vinyl sheet floor coverings, and rubber sheet floor coverings.

d. Conductive and Static Dissipative Flooring Performance Requirements:
   1. Bond to grounding systems as required to meet the following:
      b. Static-Dissipative: Electrical Resistance ASTM F 150 at 100V applied.

C 2030.40 Masonry Flooring (LE D (20 yrs))

a. Stone Flooring Description: Dimension stone flooring installed on a thick, mortar setting bed over waterproofing.
b. Stone Flooring Performance Requirements:
   1. All stone flooring shall conform to Dynamic Coefficient of Friction per ANSI 137.1.
   2. All stone flooring installations shall follow TCNA standards.

C 2030.45 Wood Flooring

a. Cork Flooring Description: Cork floor tile, engineered cork floor tile, and cork floating floor system for commercial projects.
b. Cork Flooring Performance Requirements: (LE B (10 yrs))
   2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to
NFPA 253.
3. Please note that the University has had a difficult time maintaining cork tile. Mopping creates warping.

c. Other Wood Flooring Description: Factory-finished, solid- and engineered-(non-cork) wood flooring.

d. Other Wood Flooring Performance Requirements:

1. Maple Flooring:  (LE D (20 yrs)) MFMA grading rules for species, grade, and cut.
2. Other Hardwood Flooring:  (LE D (20 yrs)) NWFA A500 for species, grade, and cut.

C 2030.50 Resilient Flooring  (LE B (10 yrs))

a. Resilient Sheet Flooring Description: Vinyl, rubber, and linoleum sheet flooring.
b. Resilient Sheet Performance Requirements:

1. Vinyl:  ASTM F1303 or F1913. (confirm meets criteria for CR 1030.57, Toxic Materials)
2. Rubber:  ASTM F1859 or F1860.
4. Provided heat welded seams and integral bases.

c. Resilient Tile Flooring Description: Solid vinyl, vinyl composition, rubber, terrazzo, and linoleum floor tile.

d. Resilient Tile Performance Requirements:

2. Linoleum:  ASTM F2195.
3. Terrazzo:  Precast terrazzo tile made with polyester resins.

C 2030.60 Terrazzo Flooring (see C2030.50 for Terrazzo Floor Tile)  (LE D (20 yrs))

a. Resinous Matrix Terrazzo Flooring Description: Thin-set epoxy-resin terrazzo flooring, and precast epoxy-resin terrazzo units.
b. Portland Cement Terrazzo Flooring Description: Portland cement, poured-in-place
standard and rustic terrazzo flooring, and precast terrazzo units.

C 2030.70 Fluid-Applied Flooring (LE B (10 yrs))

- Description: Resinous flooring systems applied as self-leveling slurries or as troweled or screeded mortars.
- Performance Requirements:
  1. Flammability: Self-extinguishing according to ASTM D 635.
  2. FDA or USDA for food environments.
  3. Chemical Resistance to various ASTM standards as required for scheduled use.

C 2030.75 Carpeting

- Carpet Tile Description: Modular carpet tile. (LE A (8 yrs))
- Sheet Carpet Description: Tufted carpet and woven carpet. (LE B (10 yrs))
- Preferred Carpet Type Locations: Prefer carpet tiles especially in high traffic areas and areas likely to receive spills (eg. break areas, classrooms, libraries, vending).
- Carpet Performance Requirements:
  1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
  2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA253.
  3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Suggest products that conform to reference standards and programming requirements and review with Users.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Submit actual samples with Product Data showing conformance with requirements.</td>
</tr>
<tr>
<td></td>
<td>3. Produce colored plans for User review showing locations of the various flooring products.</td>
</tr>
</tbody>
</table>
### Technical Criteria

**C 2040 Stair Finishes**

<table>
<thead>
<tr>
<th>Level</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD</td>
<td>4. Update plans and samples per User review.</td>
</tr>
<tr>
<td></td>
<td>5. Show final conformance to Programming and Performance requirements.</td>
</tr>
<tr>
<td></td>
<td>6. Have all specified submittal requirements available for User review if needed.</td>
</tr>
<tr>
<td></td>
<td>7. Allow Users to review all flooring Mockups at least one week prior to ordering materials.</td>
</tr>
<tr>
<td>Startup</td>
<td>8. None.</td>
</tr>
</tbody>
</table>

#### A. Intent

While the tread surface performance criteria for stair finish materials are the same as that for flooring, the traffic impact and wear are considerably greater than that of the adjacent contiguous areas and must be take into consideration when selecting appropriate materials. There will also be a substrate difference between stair and floor finishes that must be considered.

In order to enhance design for the visually impaired, consider incorporate contrasting colors between treads and risers with high visual contrast strips at each tread nosing.

Otherwise, refer to the Intent for Flooring, C2030.

*For Handrail and guardrail finishes, see (CR C1090.10, Interior Railings and Handrails)*

#### B. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Level</th>
<th>Requirement</th>
</tr>
</thead>
</table>

### C 2050 Ceiling Finishes
A. Intent

Ceiling finishes are an integral component of their ceilings systems (CR C1070). The Design-Build team shall consider the functional, acoustic, and aesthetic intent of the space before selecting finishes. Otherwise, refer to (C2010.A, Wall Finishes, Intent.)

A. Description & Performance

See (CR C2010.B, Wall Finishes, Description & Performance)

B. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Tier</th>
<th>Step</th>
<th>Reference</th>
</tr>
</thead>
</table>
D Services

D 1010  Vertical Conveying Systems 433
D 1010.10  Elevators 434
D 1010.20  Lifts (Handicapped and Personnel) 438
D 1010.50  Dumbwaiters 440
D 1080  Operable Access Systems 441
D 20  Plumbing 441
D 2010  Domestic Water Distribution 444
D 2020  Sanitary Drainage 448
D 2030  Building Support Plumbing Systems 450
D 2060  Process Support Plumbing Systems 452
D 30  HVAC 458
D 3010  Facility Fuel Systems 463
D 3020  Heating Systems 464
D 3030  Cooling Systems 466
D 3050  Facility HVAC Distribution Systems 470
D 3060  Ventilation (NOT APPLICABLE FOR B33) 484
D 4010  Fire Suppression 490
D 50  Electrical 494
D 5010  Facility Power Generation 496
D 5020  Electrical Service and Distribution 500
D 5030  General Purpose Electrical Power 505
D 5040  Lighting 506
D 5080  Miscellaneous Electrical Systems 509
D 60  Communications 510
D 6010.10  Data Communications Network Equipment 511
D 6020.20  Voice Communications Terminal Equipment 517
## Guiding Principles

Design high performing and durable building equipment systems that are appropriately controlled, monitored, protected from the exterior environment, and highly integrated with the architecture to minimize energy and resource consumption.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 6030</td>
<td>A/V Communications</td>
<td>527</td>
</tr>
<tr>
<td>D 6030.10</td>
<td>A/V Systems</td>
<td>527</td>
</tr>
<tr>
<td>D 6030.50</td>
<td>Electronic Digital Systems</td>
<td>533</td>
</tr>
<tr>
<td>D 6060.10</td>
<td>Distributed A/V Communications Systems</td>
<td>540</td>
</tr>
<tr>
<td>D 6090</td>
<td>Communications Supplemental Components</td>
<td>552</td>
</tr>
<tr>
<td>D 6090.20</td>
<td>Data Communications Support Spaces</td>
<td>559</td>
</tr>
<tr>
<td>D 6090.30</td>
<td>Communications Pathways – Intra-Building</td>
<td>564</td>
</tr>
<tr>
<td>D 6090.40</td>
<td>Communications Cabling – Intra-Building</td>
<td>578</td>
</tr>
<tr>
<td>D 70</td>
<td>Electronic Safety &amp; Security</td>
<td>589</td>
</tr>
<tr>
<td>D 7010.10</td>
<td>Access Control</td>
<td>590</td>
</tr>
<tr>
<td>D 7020.10</td>
<td>Intrusion Detection</td>
<td>595</td>
</tr>
<tr>
<td>D 7030.10</td>
<td>Video Surveillance</td>
<td>598</td>
</tr>
</tbody>
</table>
promote cost effective and easily accessible repair and servicing, and enhance aesthetics. Strive for excellence with high-performing, adaptive, and innovative technology for telecommunications infrastructure, universal wireless access, and audio visual / security infrastructure that seamlessly integrate with specified UCSF campus systems.
D Services

A. Description & Performance

D.00 General

a. Sustainability: See (CR 1030.53 Sustainable Design).
b. Acoustics and Vibration: See (CR F1030.10 Sound and Vibration Control).
c. Seismic Control: See (CR F30.10 Seismic Control).
d. Instrumentation and Controls: See (CR D8010, Integrated Automation Facility Controls).
   Provide serial communications interface to Building Automation System (BAS) for all plumbing, HVAC, Electrical and Lighting equipment with factory installed controllers or stand-alone control panels.
e. Product Selection: Products with less than 3-year proven track record in commercial and institutional use shall be subject to University’s approval.
f. Parts weighing 50 pounds or more, which must be removed for inspection, cleaning, or repair (e.g., motors, gear boxes, cylinder heads, casing tops, condenser, and cooler heads) shall have lifting eyes or lugs. Provide overhead attachment to building structure for chain hoist.
g. Under-Slab-On-Grade Piping: Support piping by hanging all below slab piping under the building from the first level structural slab.
h. Spare Capacity: See CR 1030.01, Spare Capacity.

D.01 Resistance to Degradation

a. Resistance to Marine Environment
   1. Services should be exposed to the exterior environment as little as possible. However, all surfaces, fasteners and joinery (including welds) that must be exposed to outdoor air, including an incoming air stream, shall be fully resistant to the marine environment, and should avoid the use of coatings.
   2. System surfaces, fasteners and joinery should be free from noticeable discoloration due to the marine environment (including oxidation) over the system’s expected lifetime.

b. Resistance to Corrosion From Dissimilar Materials
   1. All materials within piping systems shall be selected to resist corrosion from
dissimilar materials over its expected lifetime.

**D.02 Motors**

1. See Table Z1040.30-A, Facilities Design Guidelines.
2. Motors should be selected to provide highly efficient and reliable service throughout their expected life. Use single-speed motors utilizing variable frequency drives to address load changes. Motors should have a minimum of 1.15 service factor and be rated for continuous duty at 40 degrees Centigrade. Consult with the University when selecting motors for special operating conditions.
3. Motors shall be designed and constructed to avoid any build-up of moisture and dust in their interior.
4. Motors 1 horsepower and larger shall be premium efficiency in accordance with IEEE Standard 112 Test Method B.
5. Where commercially available, motors shall have permanently (double) sealed ball bearings. Where sealed ball bearing motors are not commercially available, provide auto-lubrication devices for motors.
6. Bearings shall have a minimum AFBMA L-10 Life of 50,000 hours for belt-driven applications and 150,000 hours for direct-coupled applications.
7. Motors smaller than 1 horsepower shall be single phase, 60-cycle, for 120 volt or 208 volt service, unless available power dictates a different voltage.
8. Motors 1 horsepower and larger shall be three phase, 60-cycle, 460-volt.
9. Motors driven through variable frequency drives (VFDs) shall be rated for “Inverter Duty” with triple-coated 200 degree Centigrade copper magnet wire capable of withstanding 1600V spikes (with a minimum voltage rise time of 0.1 microsecond) experienced with dV/dt IGBT waveforms as defined in NEMA MG 1-1998, Part 31. Motors shall be fully compatible with the approved variable speed drives and rated to operate from 5 percent to 200 percent of rated motor speed.
10. All motors driven through a variable frequency drive shall have an Aegis SGR, or equal, shaft grounding ring that utilizes conductive microfibers to redirect shaft current from the shaft to the motor frame, bypassing the motor bearings entirely. Shaft grounding ring shall be maintenance free, with full
circumferential contact of motor shaft. SGR shall provide efficient discharge of high-frequency shaft voltages induced by variable frequency drives.

11. Motors shall be selected such that the driven equipment brake horsepower requirement (including any applicable drive losses) is between 70% and 95% of the motor rating. Intent is to not oversize motors.

12. Constant speed motors 5 HP and larger shall be provided with VFD’s to allow soft starting.

D.03 Variable Frequency Drives

a. Plumbing & HVAC (LE D (20 yrs))

1. UCSF has standardized on ABB and Vacon drives, to match existing, predominantly ACH550 or equal for HVAC applications. Review VFD style, options, enclosures, and accessories from manufacturer’s standard product to meet project specific project requirements with Facilities.

2. In exterior applications select drives and components with integral NEMA 4X enclosures.

3. VFDs shall be cooled with conditioned environmental air provided by systems that are constructed to meet corrosion resistance performance criteria. (See CR D.01 Resistance to Degradation).

4. Bypass starters, where required, shall be located in a separate enclosure, external to the VFD.

5. Provide VFDs with across-the-line bypass:
   a. Where the normal operating speed of the motor is within 10% of 60 Hz.
   b. For belt driven fans, and replace fan sheaves as required during system balancing so that fan operates at design condition near 60 Hz.

6. Where fully redundant equipment such as fans or pumps are equipped with VFD’s, a bypass starter will not be required.

7. Provide primary/secondary VFDs in the same enclosure where redundancy is required and the normal operating speed of the motor is less than 54 Hz or greater than 66 Hz.

8. Where redundancy is not required and motor does not operate near 60 Hz,
provide VFD without across-the-line bypass.

9. Provide across-the-line bypass starters where the normal operating speed of the motor is within 10% of 60 Hz. For belt driven fans, replace fan sheaves as required during system balancing so that fan operates at design condition near 60 Hz.

   a. Exception: Where fully redundant equipment such as fans or pumps are equipped with VFD’s, a bypass starter will not be required.

10. Provide redundant primary/secondary VFDs in the same enclosure where redundancy is required and the normal operating speed of the motor is less than 54 Hz or greater than 66 Hz.

11. Voltage and current distortion generated by VFD and attenuation devices, as installed, shall not exceed the following criteria as referenced by IEEE Standard 519, General Category:

   a. Total harmonic distortion (THD) shall not exceed 5% RMS of fundamental input voltage at full load with maximum 3% RMS on any single harmonic at the point of common coupling to the distribution system.

   b. Line voltage distortion shall not exceed 5% in amplitude of fundamental input voltage.

D.04 Pipe & Duct Bank Penetrations

1. Utility pipes and conduits penetrating exterior walls shall have sufficient flexibility for anticipated settlement of building or backfill (see Preliminary Geotechnical Investigation Report (CR Z1040.30). Take particular care with cast iron and pressure piping. Provide backfill to support utility piping entering or leaving the building.

2. For new buildings constructed on piles, assume that soil beneath the ground floor slab will settle and that braced supports for underground piping and conduits, anchored to the ground floor slab, will be required. Ensure that pea gravel backfill will flow around piping and conduits as the ground settles.

3. For pipe and conduit penetrations provide a minimum opening after installation. Provide effective seals around all penetrations to prevent passage
SERVICES  

D Services  

Technical Criteria  

May 28, 2016 Mission Bay East Campus Phase 1 (Block 33)  
University of California, San Francisco, Project No: M4603  

4. Where pipes are insulated, provide for continuous insulation through openings.  
5. Where duct banks terminate at exterior walls provide sufficient space to allow for transition from PVC to RMT(or equivalent) conduit and the transitions and bends required to enter the building without compromising performance or future flexibility (cable pull clearances).  

D.05 Meters  

a. General (LE C (15yrs))  
   1. All meters shall communicate with the BAS. See (CR D8010, Integrated Automation Facility Controls).  
   2. See (CR 1030.50, Sustainable Design, for additional metering criteria).  
   3. Meters for revenue purposes (eg. Café) (note: IDT to confirm revenue locations in the design phase) shall meet or exceed revenue-grade accuracy criteria.  
   4. Water service piping should be laid out to facilitate sub-metering of water loads described below.  

b. Domestic & Non-Potable Water:  
   1. Provide sub-meters and backflow preventers in serviceable locations inside the building unless otherwise directed.  
   2. Sub-metering shall be sufficient to verify the water savings analysis from 1030.54(a).  
   3. Sub-meters shall:  
      a. Have no moving parts.  
      b. Have strainer in line before meter.  
   4. Sub-meters shall be accurate under low-flow conditions:  
      a. For Recharge Users.  
      b. TIER 2: For All users.  
      c. Low-Flow Accuracy for Meters \( \leq 1" \): \( \pm (2\% \text{ Measured Value (MW)} + 0.5\% \text{ Final value of the measuring range (VMR)}) \)  
      d. Low-Flow Accuracy for Meters \( >1" \) and \( \leq 2" \): \( \pm (0.8\% \text{ MW} + 0.5\% \)
5. Provide sub-metering at basic building divisions:
   a. Sub-metering downstream of the water utility meter, or campus utility connection.
   b. Each floor of the building.

6. Provide sub-metering for all major water services within the facilities such as:
   a. Domestic cold water and cold water makeup for domestic hot water.
   b. Each major piece of water-consuming equipment, such as sterilizers.
   c. Each make-up water service to HVAC systems and equipment (e.g., cooling tower make up/blow down).
   d. Irrigation water.
   e. Restrooms, laboratories, clinical space, food service, etc.

7. Provide sub-metering to differentiate between major building programs:
   a. Office loads.
   b. Clinic loads.

8. Provide sub-metering for separately recharged users (University to provide information during finalization of programming).
   c. Natural Gas:
      1. Provide sub-metering for the following locations:
         a. Downstream of the natural gas utility meter, or campus utility connection.
         b. Each natural gas appliance. Where appliances are controlled to work in tandem (i.e., centralized domestic water heating plant) a single submeter may be provided for those appliances.

d. Chilled and Heating Hot Water:
   1. General
      a. No moving parts shall be required.
      b. Entire assembly shall be furnished with a NIST traceable certificate
2. Flow Meters
   a. Meters shall be electromagnetic flow meter type with a 15:1 turndown ratio and an accuracy of +/-1% or better over the entire turndown range. The turndown shall be based on maximum design flow rate not on the meter.
   b. Each meter shall be factory programmed for its specific application, and be field-programmable using the panel keypad.

3. Energy (BTU) Monitoring Stations
   a. Provide hydronic energy metering system consisting of a flow meter as described above, and a matched pair of temperature sensors.
   b. Temperature sensors shall be factory bath-calibrated together so that the calculated differential temperature used in the energy calculation is accurate within +/- 0.15° F, including combined errors from the individual sensors and internal calculations.

4. Provide Flow Meters for the following locations:
   a. The primary chilled and heating hot water bridge connections.

5. Provide BTU Monitoring Stations for the following locations:
   a. The primary chilled water and heating hot water distribution loops.
   b. Each secondary chilled water and heating hot water distribution loop.

6. Air Distribution:
   a. Provide air flow meters for the following locations:
      a. All central air systems to measure total supply air CFM.
      b. All central air systems to measure return air CFM.
      c. All central air systems to measure outside air CFM.

2. Performance requirements
   a. Total supply air CFM for central air systems: Turndown ratio shall be minimum of 10 to 1.
   b. Return air CFM for central air systems: Turndown ratio shall be
D. Services

minimum of 10 to 1.

c. Outside air CFM for central air systems: Turndown ratio shall be minimum of 10 to 1.

f. Compressed Air:

1. Compressed air shall be metered only when directed by the University. The meter shall have DDC compatible pulse type attachment for remote registering of flow in cubic feet.

g. Electrical Meters:

1. Provide metering for the following locations:

   a. Sub-metering of building’s electrical usage at the building level and floor-by-floor levels for each disaggregated load type.
   
   b. Revenue-grade metering for tenant vendor spaces.
   
   c. TIER 2: Provide additional sub-meters in locations described above, to meter office areas and clinic areas separately.

2. Performance Requirements for high-end, whole-building meter:

   a. Provide metering to measure, record, automatically report and log kilowatt-hours (kWh), peak kilowatts (kW) and other electrical parameters.
   
   b. Electrical parameters shall be available on a local graphical user interface in addition to BAS communication described above.
   
   c. If a high-end electrical meter (power quality, harmonics, wave-form capturing, etc.) is used for whole-building, coordinate meter and software selection with the University.
   
   d. Meters for the whole building and tenant spaces shall have an accuracy of +/-0.5%.

3. Performance Requirements for sub-meters:

   a. Electrical meters shall be installed externally of service panels.
   
   b. Sub-meters shall be accurate to +/-1% of reading and be sized to capture normal operating loads.
a. Pressure Gauges & Sensors

1. Provide visual display (pressure gauges or digital readout from BAS pressure sensors) across:
   
   a. Pumps.
   b. Pressure regulating assemblies.
   c. Cooling tower water strainers having permanent fine mesh liners.
   d. At other locations requested by the University.

2. Install differential pressure gauges with bypass and bleed valves so that all air can be purged from gauge tubing.

b. Temperature Gauges & Sensors

1. Provide visual display (temperature gauges or digital readout from BAS temperature sensors) at:

   a. Pumps.
   b. Temperature regulating assemblies.
   c. Chilled, heating and condenser water supply and return connections to major equipment such as boilers, chillers, cooling towers and air handling units.

D.07 Valves

a. Valve Performance

1. Provide multiple parallel pressure regulators on service lines 1¼” NPS and larger.
2. Pressure rating of the valves shall exceed the maximum working pressure of the system by 20%.
3. Shut off valves shall be rated bubble tight.
4. Valves shall be accessible and maintainable in-place under pressure.

b. Valve Type Applications

1. Provide ball valves for shutoff service on water systems, sizes 2 inches and smaller.
2. Provide circuit balancing valves for throttling and bypass service on water systems, sizes 4 inches and smaller.
3. Provide butterfly valves for shutoff service on water systems, sizes 2-1/2 inches and larger.

4. Provide butterfly valves with infinite position memory-stop locking gear operators for throttling and bypass service on water systems, sizes 6 inches and larger.

5. Provide gate valves for shutoff service on other piping systems for sizes 2-1/2 inches and larger.

6. Provide globe valves for (non-balancing) throttling service on other piping systems.

7. Provide positive shutoff gate or globe valves for whole building isolation for sizes 2-1/2 inches and larger.

8. Provide silent check valves and throttling style butterfly valves at pump discharge for sizes 2-1/2 inches and larger.

c. Valve Locations

1. Provide a shut-off valve within a valve box at any new connection point to underground services and mains, in addition to the shut-off valve inside the building.

2. Provide isolating valves across each piece of equipment. Valves shall be arranged so that it is possible to clean strainers and service or remove equipment without draining system or springing piping.

3. Provide valves to isolate separate floors, separate wings, machinery rooms and other natural subdivisions of the building. Provide valves on all branches near connections to risers.

4. Provide isolation valves near the main riser and pipeline on each branch piping that serves each specific area of the building for supply systems serving the building. Locate these valves for easy access, allowing local isolation for repairs without affecting adjacent areas.

5. Provide valves at services left for future connections (tees, stubs, etc.), unless they are in a valved zone, or can be isolated by existing valves with minor loss of pipe contents when opened.

6. Valves and equipment shall be accessible from common, not usually occupied areas (i.e. corridors).

7. Valves shall be accessible in mechanical rooms without climbing onto
d. Valve Operators (LE No less than the valves they operate)
   1. Provide chainwheel operators on valves 4 inches and larger where the operator is 8 feet or more above the floor or operating platform, and on other valves which would otherwise be inaccessible due to height or congestion of work. Extend chain to 3 feet above floor or operating platform. Provide heavy-duty chain hooks secured to wall construction or other suitable structural attachment in order to maintain clear passageways.
   2. Valves 4 Inches and Smaller within 8 Feet of Floor: Provide locking handle with position indicator and memory stop.

e. Calibrated Balancing Valves
   1. Provide calibrated balancing valves at each heating and cooling coil section, at chillers and heat exchangers, and at other locations to facilitate system testing and balancing.
   2. Automatic Flow Limit Valves: Valves that automatically limit flow rate using spring and orifice devices are discouraged.

f. Triple-Duty Valves are discouraged.

g. Hydronic System Water Flow Meters for System Metering and Balancing (Valves)
   1. Flow meters are not required where:
      a. Flow metering and balancing can be combined without additional pressure loss to the system. In this case provide calibrated balancing valves.
      b. Where continuous water flow and energy (BTU) monitoring is provided, the flow meter furnished as part of that assembly can be used for system balancing.
   2. Provide installation of both gauges in an aluminum or rigid plastic carrying case with gauges and piping manifolds permanently mounted.

D.08 Identification (LE F (40 yrs))

   a. Electrical: See (CR D50.01, Electrical - Identification)
   b. Communications: See (CR D6090.11, Communications – Identification)
   c. Electronic Safety & Security: See (CR D7090.11, Electronic Safety & Security –)
d. Equipment:

1. New equipment shall be identified using UCSF standard abbreviations and nomenclature.
2. Provide engraved plastic labels that are riveted or epoxy-glued to the equipment. Labels on rooftop equipment should be fastened with stainless steel pop rivets or screws. Cardholders in any form are not acceptable. Provide blue labels with white lettering. Primary equipment identification shall be minimum 3/4" high and underlined, and additional information shall be minimum 1/4" high.
3. Equipment labels shall state the equipment name and number, area of the building served, year installed, and the following primary performance data:
4. Plumbing Systems:
   a. Flow rates, Pressure drops, Entering and Leaving Temperatures, etc.
5. HVAC Systems:
   a. Flow rates, Pressure drops, Entering and Leaving Temperatures, etc.
   b. Switchboards/Switchgear: Voltage, phase, wire quantity, short circuit ratings (See CR 50.01, Electrical - Identification).
   c. Transformers: kVA rating, primary and secondary voltages (See CR 50.01, Electrical - Identification).
   d. Panelboards: Voltage, phase, wire quantity, current, short circuit ratings (See CR 50.01, Electrical - Identification).

e. Piping:

1. Identify and color-code all piping, including concealed piping. Provide directional arrows to indicate direction of flow. See (CR Appendix: Table D3050.90-A Pipe and Valve Color Identification).
2. Identification shall consist of wrap-around plastic markers, equal to Seton Set-Mark “Snap-Around Markers”, or equal, with stainless steel spring fasteners for larger sizes. Coordinate with Facilities where stenciled pipe identification may be required (piping in trenches, tunnels, etc.).
3. Locations:
   a. Adjacent to each valve, including vent and drain valves.
b. At each branch and riser take-off.

c. At each pipe passage through wall, floor, and ceiling construction, on both sides of penetration.

d. On all horizontal runs spaced 25-feet maximum.

e. Labels must be as conspicuous as possible from normal points of reference, except where labels would detract from finished areas.

f. Pipe and valve color identification should allow for easy identification of the type of service based on standard utilized at other UCSF Facilities. Coordinate Pipe and Valve labelling with UCSF Facilities.

g. Labels shall spell out the full name in capital letters. Order custom labels as necessary. For services not listed, use agreed upon Drawing Symbols, Label Names, and Colors. All labels shall indicate flow direction.

f. Valves

1. Identify all valves with 2” x 4” minimum size laminated plastic tags. Tags shall have a light background with black or blue lettering. Exception: Use a red background and white lettering for fire protection valves.

2. Tags shall state the system served by the valve, valve size, the coil, room number(s) and/or area of the building served by the valve, whether the valve is normally open (N.O.) or normally closed (N.C.), and purpose of the valve.

3. Control valve tags shall state the manufacturer and complete model number of the valve and actuator, water flow rate (gpm) or steam flow rate (lbs./hr.), valve size, equipment served, and valve flow coefficient.

4. Circuit balancing valve tags shall state the valve manufacturer and model number, balanced water flow rate, date installed, and the note, “Use calibrated flow charts furnished for this valve.”

5. Attach tags with a light brass chain. Exception: For valves on dry standpipes, sprinkler risers, and wet standpipes that exposed in occupied spaces or stairwells, attach valve tag to wall adjacent to valve.

6. Valve Charts: For new systems, provide complete schematic flow diagrams of each new piping system, indicating the location and function of each valve, and whether the valve is normally open or closed. Charts shall identify each
system and show the actual arrangement, line sizes, equipment, coils, and other essential features of system.

g. Flow Meters

1. Provide engraved laminated plastic tag with brass chain indicating size, system, flow rate, and differential pressure reading at design flow rate.

D.09 Insulation (LE F (40 yrs))

a. General:

1. In addition to promoting energy efficiency, insulation shall be provided on all cold surfaces of equipment, piping or ductwork to prevent condensation.

b. Equipment: Plumbing & HVAC

1. Equipment and component removable insulation shall have Velcro tape type attachment.
2. For hot equipment, provide pre-fabricated removable insulation covers for components that require periodic service or access, such as heat exchanger heads or pumps.
3. For cold equipment, insulation shall be removable without damage (other than breaking vapor seal) for components that require periodic service or access.

c. Piping:

1. Exterior insulation and exposed insulation in mechanical and machine rooms or spaces shall be protected with aluminum jacket. Fittings shall have aluminum fitting covers.

d. Jacketing for Exterior Insulation

1. Materials for exterior insulation jacketing should be selected for appearance and durability that will resist the specific wear and tear that is anticipated for each location throughout the project.

e. Duct Insulation

1. Duct insulation materials should be selected for appearance and durability that will resist the specific wear and tear that is anticipated for each location throughout the project.
2. Duct insulation on roof shall slope to shed water.

C. Verification & Validation (All Tiers)

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<tr>
<td><strong>SD</strong></td>
<td>1. Narrative description of any proposed equipment that will be exposed to the marine environment and measures to be taken to achieve required resistance.</td>
</tr>
<tr>
<td><strong>DD</strong></td>
<td>2. See Contract.</td>
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<tr>
<td><strong>CD</strong></td>
<td>3. Plans and elevations showing locations of removable insulation covers.</td>
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<tr>
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<td>4. Indicate Pressure Regulating Valves pressure settings on the Drawings.</td>
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<td>5. Show all Relief Valve locations on the Drawings.</td>
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<td>6. Schedule indicating all meters, turndown capability, locations, and design flow rates.</td>
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<td>7. Narrative description of expected normal operating range for all meters. Demonstrate that each meter can measure accurately over the normal operating range.</td>
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<td>8. Plans showing locations of all meters, indicating manufacturer’s requirements for proper installation.</td>
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<tr>
<td><strong>Construction</strong></td>
<td>9. Plans and elevations showing locations of removable insulation covers.</td>
</tr>
<tr>
<td><strong>Completion</strong></td>
<td>10. VFD factory testing documentation.</td>
</tr>
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<td></td>
<td>11. Plans and elevations showing locations of removable insulation covers.</td>
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**D 1010 Vertical Conveying Systems**

**A. Intent**

The efficient and convenient vertical conveyance of people and materials should be seamlessly integrated into the vertical and horizontal traffic within the building, and be compatible with the adjacent spaces in which they terminate. The solution should provide convenience, but still encourage
occupants to opt for regular physical exercise (climbing stairs). The Integrated Delivery Team shall select conveyor quantities, types and sizes that work together in design configurations that, over their expected lifetime, successfully:

1. Utilize non-proprietary components, including controllers.
2. Are serviceable by companies other than the manufacturer/distributor.
3. Provide the safest and most efficient means of transfer of materials and/or people between floors, including destination dispatch control where applicable.
4. Allow for safe and accessible maintenance and repair with minimal time and effort.
5. Maximize energy efficiency using regenerative power where applicable.
6. Utilize proven technology in all components, but also allow for upgrading to future, newly proven technologies (ie. Interactive flat screen messaging, fiber optics, etc.).
7. Provide for integration with other forms of material handling systems.
9. Utilize cab materials appropriate for the intended material and traffic use, including resistance to:
   a. Corrosive material spills.
   b. Equipment collisions. Utilize cab materials appropriate for the intended material and traffic use, including resistance to:
10. Reduces the University’s cost of ownership.

The team shall contract with the University’s selected vendor, to provide conveying systems that satisfy UCSF’s prescriptive Division 14 Specifications, Conveying Systems, at the University’s contracted price rates.

**B. Description & Performance**

**D 1010.00 General (LE D (20 yrs))**

a. Selected vendor: Otis Elevator

**D 1010.10 Elevators**

**A. Intent**
SERVICES
Block 33

The Integrated Delivery Team shall select elevator quantities, types and sizes that work together in design configurations that, over their expected lifetime, successfully:

1. Provide vertical circulation for building passenger and special needs personnel, material and vehicular traffic.
2. Facilitate anticipated payloads beyond minimum capacity.
3. Operate within the stated wait times (passenger and passenger/service only).
4. Reconfigurable systems to serve various other functions as decided in future re-appropriation schemes.
5. Withstand the Design Earthquake without the need to repair elevator support or bracing components; and operate when power is available when subjected to the Magnitude 6.0 Scenario Event. Satisfy additional criteria in accordance with (CR F1030.31, Seismic Performance Objectives).

The team shall also consider the functional, aesthetic, vibration and acoustic intent of the various Lobby and nearby spaces upon which the elevators open, and select elevator materials that, over their expected lifetime, successfully satisfy the same intent criteria as that for flooring (CR 2030), wall finish (CR 2010), and ceiling materials (C 2050).

B. Description & Performance

D 1010.11  General

a. Minimum Capacity:  3,500 lbs. and meet local stretcher requirements.
b. Lobby wait times: NTE 45 seconds for group operation.
c. Minimum horizontal passenger (as opposed to service, material or freight) travel distance to nearest elevator:
   1. TIER 1:  150 feet
   2. TIER 2:  125 feet
   3. TIER 3:  100 feet
d. A minimum of one freight or passenger / service elevator shall travel all floors of the building. When rotating mechanical equipment is located at the roof level, one elevator shall also travel to the roof. If the roof includes a mechanical (HVAC) penthouse, this elevator shall terminate within the penthouse with space to maneuver mechanical equipment from the elevator into adequate interior open space for repairs and staging.
e. Traction Types:
Technical Criteria

D 1010.10  Elevators

1. Gearless Traction Machines and / or geared traction units.
2. Provide a machine room for the elevator controller, sheaves, and hoisting equipment.
3. All hoist machines to incorporate AC Motors with Regenerative Motor Drives.
4. Elevators to be configured for regenerative power

f. Hydraulic Types:
   1. All hydraulic elevator designs except reciprocal lifts must incorporate borehole or hole-less hydraulic cylinder (not telescopic) and adjacent control room at bottom landing.
   2. All machines to incorporate AC Motors with solid state reduced voltage motor starter.
   3. Incorporate the latest proven technologies for energy saving (ie. digital positioning systems, electronic control valves etc.).

   g. Utilize finishes, technology, engineering methods, and integrated systems to remove potential hazards from pits (ie. mold, gases, flooding, confined space, etc.)

D 1010.12  Freight Elevators

a. Description: Restricted to freight handlers and operators only – limited access. No passengers permitted.
b. Performance Requirements:
   1. May have vertical slide doors or horizontal slide doors.
   2. Loading and sill design shall be based on capacity + weight of wheeled vehicles.

D 1010.13  Passenger Elevators

a. Description: Designed for passenger use.
b. Performance Requirements:
   1. Horizontal slide doors.

D 1010.14  Service Elevators

a. Description: Elevator for light deliveries and service personnel.
b. Performance Requirements:
   1. Horizontal slide doors.
2. Washable (assumed vinyl) cab pads with means of securing to elevator walls.
3. Durable finishes and flooring.
4. D 1010.15 Passenger / Service Elevators

   c. Description: A service elevator located within, and operating in conjunction with, a passenger elevator group (bank).

   d. Performance Requirements:
      1. Provide a means of inclusion and exclusion from passenger group during peak or designated periods.
      2. Provide a control means (Independent riser) of temporarily removing the operation from the group.
      3. Match the finishes of the other passenger elevators in the group.

D 1010.16 Control Equipment (TIER 2)

   a. Design control equipment with built-in demand or destination dispatch capabilities as may be required.
   b. Operation configurable by authorized persons in multiple remote locations.
   c. Special operation for Code Blue or Riot control or Emergency Evacuation.

C. Verification

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<thead>
<tr>
<th>SD</th>
<th>1. Update the information required at the Proposal stage.</th>
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<tbody>
<tr>
<td></td>
<td>2. Narrative describing:</td>
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<td>b. All elevator components.</td>
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<td>c. Schedule of individual elevator deliveries.</td>
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<td>d. The building systems supporting all elevator systems, and their schedule for testing and inspection.</td>
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<td>e. A plan to protect the elevator finishes, if the Integrated Delivery Team plans to use the permanent elevators for construction purposes.</td>
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<tr>
<th>DD</th>
<th>3. Updated SD phase verification.</th>
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<td>4. Load information for building systems design.</td>
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</table>
D 1010.20 Lifts (Handicapped and Personnel)

A. Intent

The Integrated Delivery Team shall select handicapped and personnel lift quantities, types and sizes that work together in design configurations that, over their expected lifetime, successfully:

1. Facilitate anticipated payloads beyond minimum capacity.

The team shall also consider the functional, aesthetic, vibration and acoustic intent of the various lobby and nearby spaces upon which the lifts serve.

B. Description & Performance

D 1010.21 General

a. Capacity: \( \leq 750 \text{ lbs.} \)

b. Type: Hydraulic:

1. All hydraulic lift designs can incorporate borehole or hole-less hydraulic
2. All machines to incorporate AC Motors with solid state reduced voltage motor starter.
3. Incorporate the latest proven technologies for energy savings.

C. Verification

<table>
<thead>
<tr>
<th>Phase</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal</td>
<td>1. Provide information on elevators to be specified, including number, type, capacity and speeds, wait times, travel, stops and openings, inside car and outside platform dimensions.</td>
</tr>
<tr>
<td></td>
<td>2. Update the information required at the Proposal stage.</td>
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<tr>
<td></td>
<td>3. Narrative describing:</td>
</tr>
<tr>
<td></td>
<td>a. Code issues, building design issues, special lifting issues.</td>
</tr>
<tr>
<td></td>
<td>b. All lift components.</td>
</tr>
<tr>
<td></td>
<td>c. Schedule of individual lift deliveries.</td>
</tr>
<tr>
<td></td>
<td>d. The building systems supporting all lift systems, and their schedule for testing and inspection.</td>
</tr>
<tr>
<td></td>
<td>e. A plan to protect the finishes, if the Integrated Delivery Team plans to use the permanent lifts for construction purposes.</td>
</tr>
<tr>
<td>DD</td>
<td>4. Updated SD phase verification.</td>
</tr>
<tr>
<td></td>
<td>5. Load information for building systems design.</td>
</tr>
<tr>
<td></td>
<td>6. Custom drawing details.</td>
</tr>
<tr>
<td>CD</td>
<td>7. Updated DD phase verification.</td>
</tr>
<tr>
<td></td>
<td>8. Outline specification for each lift, complementing UCSF’s prescriptive Division 14 Specifications, Conveying Systems.</td>
</tr>
<tr>
<td></td>
<td>9. Structural details and calculations for all lift components demonstrating compliance with project requirements.</td>
</tr>
<tr>
<td>Startup</td>
<td>10. See Contract.</td>
</tr>
<tr>
<td></td>
<td>11. TBD.</td>
</tr>
</tbody>
</table>
D 1010.50 Dumbwaiters

A. Intent

The Integrated Delivery Team shall select dumbwaiter quantities, types and sizes that work together in design configurations that, over their expected lifetime, successfully transports materials between floors and:

1. Contains liquid spills where such potential exists.

B. Description & Performance

D 1010.51 General

a. Capacity: 50-500 lbs.
b. Traction Types:
   1. Traction Machines winding drum and / or geared traction units.
   2. Incorporate machine, sheaves and controls adjacent to, or in, hoistway.
   3. All hoist machines to incorporate AC Motors.
c. Spill Containment where applicable: Provide a dropped, curbed cab floor capable of containing liquids, with a raised, perforated decking of a material resilient to the nature of the spill.

C. Verification

SD 1. Update the information required at the Proposal stage.
   2. Narrative describing:
      a. Code issues, building design issues.
      b. All dumbwaiter components.
      c. Schedule of individual dumbwaiter deliveries.
      d. The building systems supporting all dumbwaiter systems, and their schedule for testing and inspection.

DD 3. Updated SD phase verification.
   4. Loading information: counter height or floor loading for systems design.
5. Custom drawing details.
6. Updated DD phase verification.
7. Outline specification for each dumbwaiter, complementing UCSF’s prescriptive Division 14 Specifications, Conveying Systems.
8. Structural details and calculations for all dumbwaiter components demonstrating compliance with project requirements.

CD

10. Manufacturer’s technical maintenance, trouble shooting and repair manuals.
11. Any “tools” (including software) that are required to maintain the units.
12. Manufacturer’s warranty.
13. At expiration of warranty, load and test the latest firmware and software onto the equipment.

D 1080  Operable Access Systems

(see CR E1030.41, Window Washing Systems)

D 20  Plumbing

A. Intent

Plumbing equipment and infrastructure shall be provided so as to provide the project with all required amenities and services required to support the project program requirements, including the University’s water efficiency goals.

The Integrated Delivery Team shall consider the following when creating isolation schemes and locating piping, valves and fixtures:

1. Create isolation or bypass schemes that minimize potential water damage from leaks and affect the smallest portion of users.
2. Provide redundancies for concurrent maintenance.
3. Easy access to isolation valves to quickly be able to shut off and maintain portions of the water system.

Additionally, the Team shall consider methods of providing long-term, high quality potable water minimizing the need for distributed filters or other items requiring maintenance.

B. Description & Performance

D20.00 Guidelines and References:

a. See (CR D, Services for Services Level Criteria)
b. Operability:

   1. The plumbing systems shall be designed to operate in a stable fashion and without undue wear and tear on any component under all expected load conditions resulting from widely varying internal and external factors.
   2. Central systems shall be designed so that individual pieces of equipment such as pumps, water heaters etc. can be taken out of service without requiring the entire system to be off-line.
   3. All systems shall be designed so that fixtures or individual pieces of equipment can be removed and replaced without disassembling any adjacent equipment, system, or building architecture and without requiring draining of the system piping.

c. Pressure Zoning:

   1. System pressure in building shall be designed and zoned such that it will be limited to a maximum differential of 60 PSI across contiguous floors.

d. Pumps

   1. Exhaust all options (such as oversized pipe) and multiple pressure regulator zones before designing a booster pump system to meet water pressure requirements.
   2. Select all pump motors to be variable speed and operate at 1,800 rpm or less.
   3. All pump designs shall be fully redundant.
   4. Domestic water booster pumps:

      a. Shall be provided as a packaged, pre-assembled, and fully
engineered system with all pumps, pipe, hydro pneumatic tank, valves, electrical panels, VFD’s and have single point of power connection. Control panels required for pump system control and connection to building central control system shall also be provided with pump package.

b. Do not size any one pump to more than 50% of the load.

c. Water pressure on campus varies depending on elevation and location. Confirm available pressure for each site by conducting a hydrant flow test and provide as required to meet project needs.

5. Hot Water Recirculating pumps:

a. Furthest outlet of major point of use (ie. Restrooms, Showers, Town Centers) will not be located more than 25 feet from recirculating water loop. Secondary points of use (ie. Janitor’s Mop Sinks) may be served by Instantaneous Hot Water Heaters.

e. Softeners

1. In general, the University prefers not to have water softeners in its buildings in order to reduce maintenance. However, the Integrated Delivery Team shall identify through detailed programming (CR 3010.20, Program Completion) where there are special equipment needs for softened or otherwise treated water, in which case the following shall be provided:

   a. Provide water conditioning systems with totaling water meters on the conditioned water supply line.
   
   b. Water softeners shall have an automatic regeneration system.
   
   c. Domestic water supply to water softener shall be provided with dual reduced pressure principal backflow devices set in parallel.
   
   d. Size each RPP BFP at 2/3 of maximum flow rating.

f. Water Hammer Arresters (LE D (20 yrs))

1. Water hammer arresters shall be provided on both hot and cold water lines serving fixtures and equipment using flushometer valves or quick-closing valves.

2. Size and locate in accordance with Plumbing and Drainage Institute Manual WH-201.
C. Verification & Validation

SD
1. Narrative description of proposed plumbing system including discussion of how the system will meet the technical performance requirements.
2. Preliminary calculations for plumbing equipment capacities.
3. Calculations for plumbing system space requirements.

DD
4. Cut sheets of all fixtures, equipment and devices.
5. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.
6. Single line diagrams demonstrating isolation schemes for each distribution system.

CD
7. Cut sheets of all fixtures, equipment and devices.
8. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.

Completion
9. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.

D 2010 Domestic Water Distribution

A. Intent

Domestic Water Distribution equipment and infrastructure shall be provided so as to provide the project with all required plumbing related amenities and services as required to support the project program requirements. Plumbing equipment, infrastructure, fixtures, and other technologies shall be provided as required to achieve facility water use reduction goals. Hot water distribution shall be designed for safety of occupants (eg. scalding).

B. Description & Performance (See D20 for system level performance)
a. See (CR D20 Plumbing) for system-level criteria.
b. All plumbing equipment shall be provided with isolation valves.
c. Branch shutoffs shall be provided for each restroom.

D 2010.10 Facility Potable-Water Storage Tanks (LE D (20 yrs)) (POTENTIAL PLACEHOLDER FOR MEDICAL/CLINICAL)

a. Description: Tanks for storage of potable and industrial water.
b. Performance Requirements:
   1. Pressurized tanks shall be sized for low flow conditions.

D 2010.20 Domestic Water Equipment (LE D (20 yrs))

a. Description: Equipment for distribution of domestic water, including pumps, softeners, water filtration equipment, domestic water heaters, solar domestic water heaters, and domestic water heat exchangers.
b. Domestic Water Heaters:
   1. Tank-type water heaters shall be set at 140° F and provided with mixing valves to distribute water at lower temperatures as follows:
      a. 110° F for restroom lavatories
      b. 120° F for showers
   2. Minimize the number of mixing valves in the domestic hot water design.
   3. If a dishwasher, laundry washer, or other type of equipment requires a higher temperature, provide a booster heater as required.
   4. All water heaters, either electric or gas fired shall be commercial grade, with adjustable range thermostat to allow hot water settings between 100 and 140°F.
   5. Instantaneous water heaters shall only be used for satellite points of use (eg. Janitor’s Closets) shall have a warranty of at least 5 years, be robust, and shall be installed in a way that allows for maintenance or replacement of the water heater without having to disturb any other equipment or plumbing fixtures.

D2010.40 Domestic and Non-Potable Water Piping (LE F (40 yrs))

a. Description: Distribution of domestic water, including piping systems, valves and piping
b. Non-Potable Water System:

1. Non-Potable water distribution may not initially have a non-potable water source, in which case it should be served by the Potable Water System. Provide a valving arrangement to switch over to a Non-Potable source in the future.

2. Non-Potable Water shall be provided to the following:
   a. Water closet flushing.
   b. Urinal flushing.
   c. Hose bibs.
   d. Irrigation System
   e. Cooling Tower Makeup
   f. Other Process Cooling systems.

c. Piping Systems

1. Size systems serving restrooms using flush-valve curves, dedicated equipment branches and mains shall be sized based on flow requirements with diversity.

D2010.60 Plumbing Fixtures (LE D (20 yrs))

a. Description: Terminal devices on the domestic water piping system such as water closets, urinals, lavatories, sinks, showers, including rough-in piping, trim, fittings and connections to vent piping.

b. Performance Requirements:

1. Plumbing fixtures for a toilet room shall, in general, be wall-hung for janitorial efficiency and hygiene.

2. Water closets and urinals shall have exposed flush valves of the following types:

3. Urinals (for enhanced accessibility):
   a. Size should be maximized, not minimized.
   b. Accessible units should be at lower elevations as required and all others at standard higher elevations.
4. Lavatories
   a. Lavatories shall be countertop.
   b. Lavatory facets shall be automatic type with infrared sensors and 120V power.
   c. In clinical areas lavatory sensors shall be on backup, generator power.
   d. Provide at least one set of hose bibs with vacuum breaker (hot and cold) under the lavatories in each public toilet room.

5. Sinks
   a. Sinks, lavatories and washbasins shall have quarter-turn stops.
   b. Service sink in custodial closets shall be floor type.
   c. Janitorial sink shall have separate faucet for soap connection.

D2010.61 Emergency Plumbing Fixtures (LE D (20 yrs))

a. Description: Terminal laboratory devices on the domestic water piping system such as safety showers, eye washes, and combination safety shower/eye washes.

b. Performance Requirements:
   2. Comply with ANSI Z358.1.

D2010.90 Domestic Water Distribution Supplementary Components (LE D (20 yrs))

a. Description: Common work results for plumbing, expansion compensation, meters and gauges, valves and specialties, hangers and supports, heat tracing, vibration and seismic controls, identification, instrumentation and controls, and water hammer arrestors.

b. Performance Requirements:
   1. Exterior hose bibs shall be provided at buildings and plazas to wash down walks, loading docks and drives. Provide non-potable water to all such hose bibs.
   2. Provide recessed wall box type with loose key stop and vacuum breaker for all hose bibs located in areas accessible to the public. Areas not accessible to the public can be exposed but a vacuum breaker shall be provided.
C. Verification & Validation (See CR D20.C, for system level Verification & Validation).

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Provide calculations demonstrating projected water use and water savings for each of the designs proposed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Preliminary detailed fixture unit calculations based on architectural plan.</td>
</tr>
<tr>
<td></td>
<td>3. Calculations demonstrating water use and water savings for each of the designs proposed.</td>
</tr>
<tr>
<td></td>
<td>4. Design criteria for piping working pressures and temperatures, pressure drop, velocity.</td>
</tr>
<tr>
<td></td>
<td>5. Preliminary detailed calculations for piping system pressure drop, pump flow and pressure capacity, pump HP.</td>
</tr>
<tr>
<td>CD</td>
<td>6. Final detailed fixture unit calculations.</td>
</tr>
<tr>
<td></td>
<td>7. Final calculations demonstrating water use and water savings for each of the designs proposed.</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Completion</td>
<td>10. Provide all testing reports for flushing and pressure testing of plumbing systems.</td>
</tr>
</tbody>
</table>

**D 2020 Sanitary Drainage**

**A. Intent**

Sanitary Drainage equipment and infrastructure shall be provided so as to provide the project with all required plumbing related amenities and services as required to support the project program requirements. Plumbing equipment, infrastructure, fixtures, and other technologies shall be provided
as required to achieve facility water use reduction goals.

Food preparation sinks, regardless of the level of food service, shall be connected to grease waste piping and sink interceptor. Other drains shall protect from grease and debris from entering the sewage piping.

**B. Description & Performance**

**D 2020.00 General**

a. Performance Requirements:

**D 2020.10 Sanitary Sewage Equipment (LE D (20 yrs))**

a. Description: Sewage capturing, conveyance, pumping, or treatment equipment.

b. Performance Requirements:
   1. Grease Interceptor:
      a. Any grease generated by Food Preparation operations shall be intercepted at the point-of-use by equipment located above the slab-on-grade before discharging to sanitary sewage piping.
      b. Provide equipment of sufficient capacity to assure cleaning will not be required more than once a month.
      c. Location: The Integrated Delivery Team shall inform the University at the beginning of the project when they will need to know the point-of-use locations for the Sanitary Sewer system. Coordinate locations with the University.

**D 2020.30 Sanitary Sewage Piping (LE F (40 yrs))**

a. Description: Sewage piping system.

b. Performance Requirements:
   1. Connect to existing underground sanitary sewerage sitework (CR G3020, Sanitary Sewerage Utilities) of adequate capacity.
   2. Design slab-on-grade horizontal sanitary piping from water closets and urinals to be installed at a uniform grade of ¼” per foot (2%) to 5-feet outside the building.
### D 2030 Building Support Plumbing Systems

#### A. Intent

Building Support Plumbing Systems shall be provided so as to provide the project with all required plumbing related amenities and services as required to support the project program requirements. Plumbing equipment, infrastructure, fixtures, and other technologies shall be provided as required to achieve facility water use reduction goals.

#### B. Description & Performance (See D20 for system level performance)

**D 2030.00 General**

<table>
<thead>
<tr>
<th><strong>SD</strong></th>
<th>1. See (CR D20.C, Plumbing, Verification &amp; Validation).</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>3. Preliminary detailed fixture unit calculations based on architectural plan.</td>
</tr>
<tr>
<td></td>
<td>4. Detailed roof plan showing all plumbing vent locations to ensure coordination of outside air intake locations, (CR D3060, Ventilation).</td>
</tr>
<tr>
<td><strong>CD</strong></td>
<td>5. See (CR D20.C, Plumbing, Verification &amp; Validation).</td>
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<tr>
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<td>7. Provide all testing reports for flushing and pressure testing of plumbing systems.</td>
</tr>
</tbody>
</table>

3. No sanitary sewer or sanitary waste systems shall be pumped except as a last resort and then only with permission of the University and backed up by the Emergency Generator. See (CR Table Z1040.30-A, Facilities Design Guidelines (Excerpted)).
D 2030.10  Stormwater Drainage Equipment  (LE D (20 yrs))

a. Description: Stormwater capturing, conveyance, pumping, or treatment equipment.

b. Performance Requirements:
   1. Sump pumps shall have smart controllers with a float failure detection system so if any float or two floats fail, the system can still run both pumps as needed. Pump controller shall also alarm building controls system.

D 2030.20  Stormwater Drainage Piping  (LE F (40 yrs))

a. Description: Stormwater piping system.

b. Performance Requirements:
   1. Overflow or secondary drains shall not spill at a location such that when the drain is in use, it would affect people.
   2. Areaway drains shall be provided outside of the building. Trash has a tendency to accumulate in areaways and clog the drains, so drains shall be oversized at least one size. Slope any areaway away from the building. Layout of drains in large areaways, greater than 100 square foot, shall be with more than one drain or provide a trench drain. Areaway drainage shall not connect to subsoil drain.
   3. Downspouts shall be connected to underground piping system or may spill on a splash block when near a catch basin or alternate drainage system that will direct water away from structure.
   4. Do not drain water from outside the building to interior sump pumps. If a sump pump is required, it shall be located outside of the building. Areaway drains, rain leaders, downspouts, or other aboveground drainage points shall not be connected to subsoil drains.

D 2030.60  Collection of Gray Water for Use as Non-Potable Water  (LE D (20 yrs))

a. Description: A separate drainage system for collection and treatment of gray water from lavatories only. See (CR 1030.56.B.b.1, Water Efficiency – Dual Plumbing) as to whether reuse of water is required.

b. Performance Requirements:
   1. Provide a complete, automatic Gray Water System to treat and reuse sanitary waste for non-potable uses.
D 2030.61  Collection of Black Water for Use as Non-Potable Water (LE D (20 yrs))

   a. Description: Collection and treatment of black water. See (CR 1030.56.B.b.1, Water Efficiency – Dual Plumbing) as to whether reuse of water is required. A separate drainage system is not required for this option.

   b. Performance Requirements:

      1. A complete, automatic Black Water System to treat and reuse sanitary waste for non-potable uses.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
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</tr>
<tr>
<td>Completion</td>
<td>7. See (CR D20.C, Plumbing, Verification &amp; Validation).</td>
</tr>
</tbody>
</table>

D 2060 Process Support Plumbing Systems

A. Intent

Process Support Plumbing Systems shall provide specific program components with utility systems not required by general buildings, such as office buildings. Plumbing equipment, infrastructure, fixtures, and other technologies shall be provided as required to achieve facility water use reduction goals.

B. Description & Performance (See D20 for system level performance)

D 2060.00  General

a. Performance Requirements:
D 2060 Process Support Plumbing Systems

Technical Criteria


D 2060.10 Compressed Air Systems (LE D (20 yrs)) (NOT CURRENTLY IN PROGRAM, BUT HERE IN CASE USERS REQUEST DURING DESIGN PHASE)

a. Description: Provide a complete lab compressed air system to serve lab benches, fume hoods and biological safety cabinets.

b. Performance Requirements:

1. Compressed air shall be oil free, instrument grade.
2. Provide a pair of simplex air compressors (one compressor on one tank) with each compressor served by a dedicated desiccant type air dryer.
3. Capacity will be based 2 outlets per laboratory module, 2 outlets per alcove and 4 outlets per laboratory support module (1 scfm/outlet; all single outlets).
4. Compressed air system equipment shall include duplex filtration equipment complete with automatic drain devices.
5. Each compressor/tank base shall be complete with flexible connections and vibration isolators.
6. Compressed air system shall include a master pressure regulating valve in the adjacent mechanical room. Outlet pressure to be set at 40 psig.
7. Compressed air piping shall be Type “L” copper tubing and wrought copper sweat type fittings.
8. Provide dedicated isolation valve for each lab bench umbilical drop zone.
9. Provide dedicated isolation valve for each fume hood and each biological safety cabinet.

D 2060.20 Lab Vacuum System (LE D (20 yrs))

a. Description: Provide a complete dry lab vacuum system to serve lab benches, fume hoods and biological safety cabinets.

b. Performance Requirements:

1. Capacity will be based on 4 outlets (0.5 SCFM/outlet @ 15" Hg; all single outlets) per laboratory module, 2 outlets per alcove and 4 outlets per laboratory support module.
2. All lab vacuum points of use shall be piped to a centralized HEPA duplex filter assembly within lab prior to being piped to the dedicated lab vacuum equipment in the adjacent mechanical room.
3. Lab vacuum system shall be selected for an operation of 22” to 24” of Hg.
4. Lab vacuum equipment shall be duplex dry screw type complete with control panel, receiver, exhaust manifold, flexible connections, inlet filter, inlet check valve and associated controls mounted on a common base. Common base shall be complete with vibration isolators. Each vacuum pump shall be sized for 100% full system demand.
5. Pump motors shall be premium efficiency and TEFC type.
6. Lab vacuum piping shall be Type “L” copper tubing and wrought copper sweat type fittings.
7. Lab vacuum exhaust piping shall be Schedule 40 black steel pipe and standard weight butt-welding fittings. Lab vacuum exhaust shall terminate full size outside with a return bend.
8. Provide dedicated isolation valves for each lab bench umbilical drop zone.
9. Provide dedicated isolation valves for each fume hood and each biological safety cabinet.

D 2060.30  Medical Gas Systems  (LE D (20 yrs))

a. Description: Provide complete medical gas system(s) for designated procedure rooms (see Program and Planning portion of this criteria document for locations).

b. Performance Requirements:

1. Each system shall be sized for 100% full system demand.
2. All system equipment shall be located in dedicated equipment room.
3. Piping systems shall be ASTM B 819 medical gas tube.
4. Provide dedicated zone valve for each system for each procedure room.
5. Provide number of outlets for each procedure room as per the University’s requirements.
6. Each outlet shall have a minimum flow rate of:
   a. Medical Air: 0.71 CFM per outlet.
   b. Oxygen: 0.71 CFM per outlet.
   c. Medical Vacuum and Waste Anesthetic Gas Disposal: 1 SCFM per inlet.
7. System shall be selected for an operation of:

c. Medical Vacuum and: 15 inch to 30 inch Hg.

d. Waste Anesthetic Gas Disposal: Per University’s requirements.

8. System shall be arranged to provide continuous operation at peak demand with the following out of service:

   a. Medical Air: Largest single compressor.
   b. Oxygen: Primary oxygen system.

9. Systems shall consist of the following:

   a. Medical Air: duplex compressors, aftercoolers, air receivers, dryers, filters, regulators and local alarms. A common medical air intake is acceptable and sized in accordance with manufacturer’s recommendation.

   b. Oxygen: duplex manifolds, regulators, piping systems and local alarms. Two equal manifold headers, each with a sufficient number of gas cylinder connections for an average days’ supply, but not fewer than two connections, and with headers connected to the final line pressure regulator assembly in such a manner that either header can supply the system.

   c. Medical Vacuum and Waste Anesthetic Gas Disposal: dry duplex rotary claw vacuum pumps, discharges, vacuum receivers and local alarms.

10. Vibration:

   a. Equipment shall be each on a separate base complete with anti-vibration mountings, in accordance with manufacturer’s recommendations, and (CR F1030.10, Sound and Vibration Control).

11. Piping systems for medical vacuum and waste anesthetic gas disposal will connect independently to the vacuum producing equipment.

12. Piping systems shall be independent of Lab Vacuum System (CR D2060.20, Lab Vacuum System).
a. General:

1. All laboratory processed water systems shall be separate from other uses in the building.

D 2060.51  Purified Water System

a. Description: Provide a complete Type III purified water system to serve all points of use within the lab.

b. Performance Requirements:

1. Deionized water shall be sized for a range of 5 to 8 feet per second and shall be fully circulated.
2. All piping mains to points of use shall drop down to each point of use (without dead legs) and rise back up for a fully circulated system.
3. System shall include a domestic water makeup through a water meter, duplex backflow preventers, pretreatment filter, carbon filter, prefilter assembly, RO unit, ion exchange tank, storage tank, duplex booster pumps, control panel, controls, secondary filter, UV unit, tertiary filter, all supply and return piping, back pressure valve.
4. Piping shall be Schedule 10S 316L stainless steel with orbital welded joints.

D 2060.52  Laboratory Waste and Vent System

a. Description: Provide a complete lab waste and vent system to serve all lab sinks and cup sinks within the lab. Effluent from sinks and cup sinks may be required to be autoclaved prior to actual drainage to a system.

b. Materials:

1. Typical Locations:
   a. TIER 1: Flame-retardant, chemical-resistant polypropylene, with fusion-joined connections (similar to Georg Fisher “Fuseal”).
   b. TIER 2: Glass

2. Hot Point-of-Use Locations (eg. autoclaves):
   a. Silicon-impregnated cast iron within 25-feet of equipment discharge.

c. Performance Requirements:
1. Lab waste system shall be provided with PH and sampling port assembly for testing of effluent.
2. Lab vent piping shall terminate to the exterior of the building.

**D 2060.53  Industrial Water for Laboratory**

a. Description: Provide a complete industrial cold and industrial hot water system to serve all points of use within the lab.

b. Performance Requirements:

1. Source of water will be from the domestic water on the same floor and go through duplex backflow preventers. Duplex backflow preventers will be located in adjacent mechanical room.
2. Industrial water will be sized for a maximum of 3 GPM/outlet @ 35 – 40 PSIG.
3. Industrial hot water will be generated by a dedicated storage type electric water heater with all piping to points of use. A temperature mixing valve will be provided to supply a system temperature of 120 degrees F. Piping will be insulated.
4. Provide dedicated isolation valves for each lab bench umbilical drop zone.
5. Provide dedicated isolation valves for each fume hood.
6. Piping shall be Type “L” copper tubing and wrought copper sweat fittings.
7. Water heater and the mixing will be located in the adjacent mechanical room.

**D 2060.54  Tempered Water for Laboratory Emergency Shower and Eyewashes**

a. Description: Provide a complete tempered water system to serve all emergency showers and eyewashes in the lab.

b. Performance Requirements:

1. Source of water will be from the domestic water on the same floor and go through duplex backflow preventers, dedicated storage type electric water heater, thermostatic mixing valve assembly and all tempered water piping.
2. Piping shall be Type “L” copper tubing and wrought copper sweat fittings.
3. Water heater and mixing valve will be located in adjacent mechanical room.

C. Verification & Validation (All Tiers)

| SD | 1. Narrative description of proposed Plumbing systems including discussion of how the system will meet the technical performance |
### Technical Criteria

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Design criteria for all spaces.</td>
</tr>
<tr>
<td>2.</td>
<td>Preliminary calculations for Plumbing equipment capacities.</td>
</tr>
<tr>
<td>3.</td>
<td>Calculations for Plumbing system space requirements.</td>
</tr>
<tr>
<td>4.</td>
<td>Preliminary detailed calculations.</td>
</tr>
<tr>
<td>5.</td>
<td>Cut sheets of all equipment and devices.</td>
</tr>
<tr>
<td>6.</td>
<td>Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.</td>
</tr>
<tr>
<td>7.</td>
<td>Final detailed calculations.</td>
</tr>
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<td>Cut sheets of all equipment and devices.</td>
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</tr>
<tr>
<td>10.</td>
<td>Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.</td>
</tr>
</tbody>
</table>

### D 30 HVAC

#### A. Intent
The Heating, Ventilation and Air Conditioning (HVAC) systems shall be provided in a manner that address the heating, cooling, and ventilation requirements of the project, while meeting additional performance criteria related to energy efficiency, interior environmental conditions, occupant comfort, occupant controllability of thermal conditions, indoor air quality, acoustics and vibration, durability, operability, maintainability, redundancy, safety, consistency with campus standards, flexibility to accommodate future changes, energy monitoring and other sustainability goals.

#### B. Description & Performance

**D 30.00 General**

- See (CR D, Services for Services Level Criteria)
b. References:

1. Follow SMACNA HVAC Duct Construction Standards.
2. Follow ASHRAE Low Pressure Duct Fittings Guide.

c. Outdoor Design Conditions:

1. Summer Design Dry Bulb (DB): 84°F DB
2. Summer Design Mean Coincidental Wet Bulb (WB): 65°F WB
3. Summer Design Dry Bulb (DB) for selecting air-cooled equipment: 95°F DB
4. Winter Design Dry Bulb (DB): 38°F DB

d. Indoor Design Conditions: The table below indicates the general application of criteria to space types. See the Space Data Sheets for individual room overrides of the general criteria. The table below indicates the primary governing standard or code to be applied to each space, along with some useful approximations of values that would apply under typical conditions. The latter is provided to make this criteria more accessible to a wide audience, but is not intended to usurp Codes, Standards or Professional Engineering judgement, and should not be inferred to represent thermostat setpoint criteria. Also, be aware that Operative temperatures, which include radiant contributions, is different than Air temperature, and that the temperatures in the chart below assume certain clothing and activity levels, and consequently cannot be used as criteria for designing mechanical systems.
### Technical Criteria

#### D 30 HVAC

#### Mission Bay East Campus Phase 1

**Block 33**

**May 28, 2016**

**University of California, San Francisco, Project No: M4603**

<table>
<thead>
<tr>
<th>Location</th>
<th>Operative T Comfort Range (°F)</th>
<th>Pressure (MERV)</th>
<th>Relative Humidity (%)</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office, Workstation, Conference, Classrooms, Commons, Reception, Circulation, File Storage, Mail</td>
<td>70-77 (ASHRAE 55)</td>
<td>75-81 (ASHRAE 55)</td>
<td>5cfm/person + 0.06cfm/sf (CMC)</td>
<td>n/a</td>
</tr>
<tr>
<td>Copy, Print</td>
<td>70-77 (ASHRAE 55)</td>
<td>75-81 (ASHRAE 55)</td>
<td>5cfm/person + 0.06cfm/sf (CMC)</td>
<td>n/a</td>
</tr>
<tr>
<td>Break Room, Kitchenette</td>
<td>70-77 (ASHRAE 55)</td>
<td>75-81 (ASHRAE 55)</td>
<td>5cfm/person + 0.06cfm/sf (CMC)</td>
<td>n/a</td>
</tr>
<tr>
<td>Restroom</td>
<td>70-77 (ASHRAE 55)</td>
<td>75-81 (ASHRAE 55)</td>
<td>50cfm/ (wc+ urinal) (CMC)</td>
<td>Negative (CMC)</td>
</tr>
<tr>
<td>MEP</td>
<td></td>
<td></td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Telecom</td>
<td>n/a</td>
<td>See Table D6090.20-A Telecom Space Buildout</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Mechanical, Electrical &amp; Plumbing</td>
<td>60 (ASHRAE 55)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Medical/Therapeutic (OSHPD-3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical/Clinical Non-Primary Care</td>
<td>70-77 (ASHRAE 55)</td>
<td>75-81 (ASHRAE 55)</td>
<td>CMC</td>
<td>n/a</td>
</tr>
<tr>
<td>Procedure, Pre-Op, Post-Op</td>
<td>CMC</td>
<td>CMC</td>
<td>CMC</td>
<td>CMC</td>
</tr>
<tr>
<td>Exam</td>
<td>CMC</td>
<td>CMC</td>
<td>CMC</td>
<td>CMC</td>
</tr>
<tr>
<td>Operating Room</td>
<td>CMC</td>
<td>CMC</td>
<td>CMC</td>
<td>CMC</td>
</tr>
</tbody>
</table>

**Notes:**
1. Operative Temperature criteria are approximate and assume Relative Humidity between 30-50% (for SF climate).
2. Operative Temperature includes contribution from radiant heating or cooling.
3. Operative Temperature criteria can be modified with increased ventilation (air speed) and different clothing assumptions.

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e. **Thermal Mass Effects:** The design and construction of the HVAC systems shall consider the impact of building mass on the performance of the HVAC system with respect to comfort, controllability, and energy consumption.

f. **Building Operating Schedule(s):** The HVAC system design shall address the potential for different operating schedules in various areas of the building and allow heating, ventilation and air conditioning conditions to be independently adjustable to meet various area requirements at all times.

g. **Thermal Zoning:** Zoning of spaces shall follow good design practice with respect to core...
versus perimeter spaces, exposure, and shall comply with the following:

1. Thermostats to have a digital display and means for occupant control including push-button override.
2. External enclosed offices may be zoned together if they have the same exposure.
3. Up to four enclosed offices may be on one terminal unit.
4. Each enclosed office zone shall have a thermostat in one office and temperature sensors in the remaining offices.
5. All enclosed offices shall provide means of indicating occupancy to the automation controller.
6. Corner enclosed offices with glazing on west, east or south exposures shall have separate zones.
7. Separate zones shall be provided for executive, dean and chair’s offices, conference rooms, large meeting rooms, and large team rooms.
8. Spaces that are not similar in occupancy and use shall not be zoned together. Except Mail, Copy/Fax rooms can be on adjacent terminals as long as they are interior zones or face same exposure. Depending on usage type, Break Rooms/Kitchenettes shall be on dedicated zone or have dedicated exhaust.

h. Operability:

1. The HVAC systems shall be designed to operate in a stable fashion, without excessive cycling and without undue wear and tear on any component under all expected load conditions resulting from widely varying internal and external factors.
2. Central systems shall be designed so that individual pieces of equipment such as pumps, fans, boilers, chillers, cooling towers, etc. can be taken out of service without requiring the entire system to be off-line. Loss of any individual piece of equipment shall not reduce the total system capacity to less than 50% of full capacity.
3. All systems shall be designed so that individual pieces of equipment can be removed and replaced without disassembling any adjacent equipment, system, or building architecture and without requiring draining/evacuating of the system piping.

Use of unitary equipment shall be minimized and utilized only for areas that would require supplemental heating or cooling on a different schedule than the central system. The University must approve the use of packaged unitary equipment.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Tier</th>
<th>Description</th>
</tr>
</thead>
</table>
| SD   | 1. Narrative description of proposed HVAC system including discussion of how the system will meet the technical performance requirements.  
2. Design criteria for temperatures in all spaces.  
3. Preliminary calculations for HVAC equipment capacities.  
4. Calculations for HVAC system space requirements. |
| DD   | 5. Design criteria for temperatures in all spaces.  
6. Filtration efficiency.  
7. Preliminary detailed ventilation calculations.  
8. Cut sheets of all equipment and devices.  
9. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.  
10. Design criteria for temperatures in all spaces.  
11. Filtration efficiency.  
12. Final detailed ventilation calculations.  
13. Cut sheets of all equipment and devices.  
14. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.  
15. Spreadsheet indicating all spaces and their Title 24 ventilation requirements, list of all zone terminal units, airflow data (min, max, heating max), number of people, square feet, design heating load, and design cooling loads. |
| CD   | 16. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.  
17. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance. |
| Completion | 18. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance. |
D 3010 Facility Fuel Systems

A. Intent

Facility fuel systems shall be provided to deliver natural gas to all gas-fired equipment and to provide fuel oil to support the project’s Facility Power Generation system.

B. Description & Performance

D 3010.00 General

a. Description:

1. Natural gas distribution system.
2. Fuel oil system for backup power and emergency power generating equipment.

b. Performance Requirements:

1. See (CR D30.B, HVAC, Description & Performance) for system-level criteria.
2. Provide a complete fuel oil storage and delivery system to serve the needs of the Facility Power Generation system. See (CR D5010 Facility Power Generation) for requirements relating to the size of the system and required durations for stored fuel.

D 3010.10 Fuel Piping

1. Integrated Delivery Team shall coordinate with utility provider and provide gas service piping, pressure regulator, and a gas meter to the building. Integrated Delivery Team shall cover all costs of coordination, fee, and construction provided by utility to provide gas service to project. All work shall be in compliance with utility provider requirements.
2. Locate meter in secure location, to be approved by client. (Note: Utility provider may require the gas meter to be located on a separate foundation outside the building envelope.)
3. Provide earthquake shut-off valve downstream of utility gas meter.

D 3010.11 Diesel Fuel Storage
1. Note: This section applies to fuel storage tanks whether integral to, or independent from, the Emergency Generator.

2. Locate above ground with anti-siphoning valves and leak detection. Provide a spill tank or reservoir to contain fuel from supply and return lines.

3. Provide fuel polishing system.

4. Size so calculated capacity is only 80% of tank capacity after taking into consideration fuel reduction from testing and refueling schedules. [FDG: Calculated capacity is 60% of tank capacity.]

5. Prevent moisture intrusion into tanks through vents.

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### C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. See (CR D30.C, HVAC, Verification &amp; Validation).</td>
</tr>
<tr>
<td></td>
<td>2. Minutes from meeting with Fire Marshall and Fire Department to identify specific project code requirements within 3 months of SD phase start date.</td>
</tr>
<tr>
<td></td>
<td>3. Determine natural gas pressure requirements for the project and coordinate with utility.</td>
</tr>
<tr>
<td></td>
<td>4. Complete utility application for natural gas service.</td>
</tr>
<tr>
<td></td>
<td>5. Schematic facility fuel system riser diagram.</td>
</tr>
<tr>
<td></td>
<td>6. Site plan showing facility fuel system storage location.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>7. See (CR D30.C, HVAC, Verification &amp; Validation).</td>
</tr>
<tr>
<td></td>
<td>9. Structural details and calculations demonstrating compliance with project requirements.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12. Reports from testing per NFPA 31.</td>
</tr>
</tbody>
</table>
A. Intent

Provide heating equipment and systems to support or supplement the needs of the HVAC distribution systems. Heating systems shall be provided in a manner that addresses the heating requirements of the project, while meeting additional performance criteria related to energy efficiency, occupant comfort, occupant controllability of thermal conditions, acoustics and vibration, durability, operability, maintainability, redundancy, safety, consistency with campus standards, flexibility to accommodate future changes, energy monitoring and other sustainability goals.

B. Description & Performance

D 3020.00 General

a. Description: Heat generation equipment and supplementary components.
b. Performance Requirements:
   1. See (CR D30.B, HVAC, Description & Performance) for system-level criteria.

D 3020.10 Heat Generation

a. Description: Boilers (LE 20-30yrs, see below), breechings (LE F (40 yrs)), chimneys (LE F (40 yrs)) and stacks (LE F (40 yrs)), fuel-fired heaters (LE B (10 yrs)), and heat exchangers (LE D (20 yrs))
b. Performance Requirements:
   1. Boilers:
      b. Condensing (LE C (15 yrs)): Industrial quality, stainless steel. High efficiency condensing boilers should have provisions to have condensate neutralized and piped to drain.
      c. The use of stand-alone boiler sequencing panels is discouraged.

D 3020.20 Heating System Supplementary Components

a. Description: Hangers, supports and anchors, vibration and seismic controls, insulation, identification, instrumentation and controls, testing, adjusting and balancing.
b. Performance Requirements:
   1. (See Table Z1040.30-A, Facilities Design Guidelines)
C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Requirements</th>
</tr>
</thead>
</table>
| SD    | 1. See (CR D30.C, HVAC, Verification & Validation).  
        3. Preliminary detailed calculations for heating system equipment capacities. |
        5. Final detailed calculations for heating system equipment capacities. |
        7. See (CR D30.C, HVAC, Verification & Validation). |
| Completion | 7. See (CR D30.C, HVAC, Verification & Validation). |

D 3030 Cooling Systems

A. Intent

Provide cooling equipment and systems to support or supplement the needs of the HVAC distribution systems. Cooling systems shall be provided in a manner that addresses the cooling requirements of the project, while meeting additional performance criteria related to energy efficiency, occupant comfort, occupant controllability of thermal conditions, acoustics and vibration, durability, operability, maintainability, redundancy, safety, consistency with campus standards, flexibility to accommodate future changes, energy monitoring and other sustainability goals.

B. Description & Performance

D 3030.00 General

a. Description: Cooling equipment and supplementary components.

b. Performance Requirements:

1. See (CR D30, HVAC, Description & Performance) for system-level criteria.

D 3030.01 Refrigerant Piping

a. Description: Refrigerant piping valves (LE D (20 yrs)) and specialties (LE D (20 yrs)) for central and decentralized cooling systems.
b. Performance Requirements:

1. Design Criteria:
   a. Size and arrange refrigerant piping to ensure adequate refrigerant flow and uniform return of lubricating oil, and to prevent slugging of liquid refrigerant into compressors, or refrigerant flash in the liquid line.

2. Refrigerant Piping Materials:
   a. (See Table Z1040.30-A, Facilities Design Guidelines)

3. Refrigerant Piping Installation:
   a. Support refrigerant piping to prevent strain on equipment, and to maintain required slopes without sagging.
   b. Insulation shall be continuous through supports and penetrations. Uninsulated pipes shall be isolated from supports by means of resilient isolators.
   c. Direct expansion valves shall be located over DX coil drain pans or auxiliary drains pans to capture dripping condensate.
   d. Refrigerant piping and specialties shall never be installed below ground.
   e. Provide refrigerant isolation valves at each major component in the system. Include integral charging port where required.

4. Refrigerant Piping Evacuation: Follow manufacturer’s evacuation procedures to the lesser of manufacturer’s recommended specifications or 250 microns.

5. Refrigerant lines shall be kept absolutely clean and dry prior to operation.

6. Follow Manufacturer’s recommendations for testing prior to startup.

D 3030.10 Central Cooling

a. Description: Where the site does not have access to Campus Chilled Water (See CR 1040.02, Site-specific Conditions) provide: Refrigerant compressors and condensers, packaged compressor and condenser units, water chillers (LE D (20 yrs)), and cooling towers (LE D (20 yrs)).

b. Performance Requirements:

1. Chillers
2. Chiller Controls
   a. Condenser and cooler heads shall be hinged for easy access.
   b. IFM flow meters shall be used for water flow proving.
   c. Provide condenser and evaporator flow switches, similar to IFM flow meters. (See CR Appendix Table Z1040.30-A Facilities Design Guidelines). Paddle and differential pressure type flow switches are discouraged.
   d. A pump down cycle of the non-recycling start type shall be provided for each compressor 20 tons or larger.
   e. Provide differential pressure sensors across CHW and CW bundles.

3. Split-System Water Chillers, Remote Condenser
   a. Provide refrigerant storage tank, sized to store the complete refrigerant charge when system is serviced.

4. Cooling Towers:
   a. Provide complete stainless steel construction and TEFC, premium efficiency, severe duty motors, and direct drive fans.
   b. Provide externally-mounted vibration switch.
   c. Provide basin sprayer nozzles to keep solids suspended for removal by sidestream filtration system.
   d. Provide sidestream filtration system with automatic blowdown. The system start/stop shall be controlled remotely by the BMS.
   e. Provide chemical treatment system.
   f. Consider closed circuit cooling towers to reduce chiller maintenance.

5. Condenser Coils (Air-Cooled):
   a. (See Table Z1040.30-A, Facilities Design Guidelines)

D 3030.50 Thermal Cooling Storage
   a. Description: Cooling thermal energy storage equipment.
   b. Performance Requirements:
      1. Chilled water storage tank designed to maintain stratification without
SERVICES

D 3030 Cooling Systems

Degradation of chilled water supply temperature during operation. Ice storage systems are discouraged.

D 3030.70 Decentralized Cooling

a. Description: Packaged terminal air conditioners and heat pumps, split system air conditioners and heat pumps, air and water source unitary heat pumps (LE B (10 yrs)), convection cooling units, chilled beams (LE D (20 yrs)), fan coil units, unit ventilators.

b. Performance Requirements:

1. Refrigeration equipment, primarily outdoor air-cooled condensing units, are generally not the most efficient choice and have a relatively short life expectancy on UCSF campuses. Refrigerant based cooling systems often lack the redundancy and/or controllability required for critical applications. Carefully review features and system options with Facilities during the preliminary design phase, including interface with the building energy management system.

2. Condenser Coils (Air Cooled):
   a. (See Table Z1040.30-A, Facilities Design Guidelines)

3. Heat Pumps:
   a. (See Table Z1040.30-A, Facilities Design Guidelines)

D 3030.90 Cooling System Supplementary Components

a. Description: Hangers, supports and anchors, vibration and seismic controls, insulation, identification, instrumentation and controls, and testing, adjusting and balancing.

b. Performance Requirements:

1. (See Table Z1040.30-A, Facilities Design Guidelines)

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. See (CR D30.C, HVAC, Verification &amp; Validation).</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. See (CR D30.C, HVAC, Verification &amp; Validation).</td>
</tr>
<tr>
<td></td>
<td>3. Preliminary detailed calculations for cooling system equipment capacities.</td>
</tr>
</tbody>
</table>
D 3050 Facility HVAC Distribution Systems

A. Intent

The Facility HVAC Distribution Systems shall be provided in a manner that addresses the heating, cooling, ventilation, and zoning requirements of the project while meeting additional performance criteria related to energy efficiency, interior environmental conditions, occupant comfort, occupant controllability of thermal conditions, indoor air quality, acoustics and vibration, durability, operability, maintainability, redundancy, safety, consistency with campus standards, flexibility to accommodate future changes, energy monitoring and other sustainability goals.

Distribution Systems shall also address maintenance and isolation needs of the project in a way that allows areas not in need of maintenance to continue to operate and not require draining or flushing of systems.

The systems shall be fully resistant to the corrosive incoming air streams of the local marine environment over the life expectancy of the systems and components. Distribution systems should be designed and installed to keep system leakage to absolute minimum during life expectancy of the system both through quality of components and installation.

B. Description & Performance

D 3050.00 General

a. Description: Hydronic and air distribution systems, equipment and supplementary components.

b. Performance Requirements:

1. See (CR D30.B, HVAC, Description & Performance) for system-level criteria.
D 3050 Facility HVAC Distribution Systems

D 3050.10 Facility Hydronic Distribution

a. Description: Piping systems and equipment for distribution of heating water, chilled water, and condenser water, including piping systems (LE F (40 yrs)), pumps (LE D (20 yrs)), and tanks (LE F (40 yrs)).

b. Performance Requirements:

1. Heating Hot Water, Chilled Water, and Cooling Tower Water Piping

   a. Piping materials shall be selected to deliver low contaminant water to minimize the need for frequent strainer cleaning, and to maximize the lifetime of the equipment it serves.

2. Miscellaneous Drain and Vent Piping:

   a. (See Table Z1040.30-A, Facilities Design Guidelines)

3. Flanges, Unions, and Couplings

   a. Should be selected of materials compatible with the piping distribution system and of a pressure class that is, at a minimum, required for its associated piping service. Unions or flanges are required on both sides of all strainers, pressure regulators, control valves, solenoid valves, backflow preventers, water filters, flow meters, and other devices that may need to be removed or replaced, and wherever necessary for the assembly of piping. Provide unions or flanges immediately adjacent to equipment and coil connections, and on the equipment or room side, and immediately adjacent to isolation and line shutoff valves. Unions and flanges shall be installed to allow removal of equipment without springing pipe.

   b. Flanges: should be designed for leak-free operations through careful selection of gasket design and materials. Flanges should be bolted together with fasteners that will withstand corrosion and allow for easy disassembly when required for maintenance through the life of the system. Slip on flanges are discouraged.

   c. Unions: should be of durable materials selected to meet the life expectancy of the piping distribution system. Unions that use O-rings as a sealing element are discouraged.
d. **Di-Electric Couplings:** The need for di-electric couplings for applications that require connections of ferrous piping to copper piping or coils should be minimized through careful design. Where required, di-electric couplings should be custom designed of quality components. All components of di-electric couplings (gaskets, bolts and nuts) should provide for the protection of the piping and or coil systems being connected over the system’s life expectancy. Commercial dielectric couplings are discouraged.

e. **Grooved-End Couplings:** The need for grooved-end couplings should be minimized and only be allowed for specific services and at specific locations and with University Facilities Services approval. Unless otherwise approved, grooved-end fittings and couplings are only acceptable for steel heating water, chilled water, and condenser water piping larger than 2 inches. Couplings shall be leak-tight and allow angular deflection, expansion, and contraction. Grooved-end couplings shall only be installed in accessible locations. Clamp-on or saddle type fittings, plain end couplings and drilled-in tee connections are discouraged. Grooved-end flanges, valves and specialties are discouraged.

f. **Fittings:** Provide standard manufactured fittings. Field fabricated fittings, mitered ells, welded branch connections, notched tees, stepped bushings, orange peel reducers, drilled-in tee fittings, and clamp-on branch connections are discouraged. Reducing bushings may only be used for instrument connections.

4. **Chilled Water Storage Tanks:**
   a. Consider using chilled water storage tanks to alleviate frequent compressor cycling for small chilled water systems.

5. **Piping Installation – Air Venting and Removal:**
   a. Provide proper venting and air removal equipment such that air will not accumulate in heating water, chilled water and condenser water piping.
   b. Provide automatic air vents at main system air removal equipment, at main risers, and at large coils. Wherever automatic air vents are
provided, provide a means of manual ventilation.

c. Provide manual air vents at smaller coils and equipment.

6. Piping Installation – Sloping and Draining:

   a. Where possible, connect heating water and chilled water branch piping to bottom of mains to allow self-venting of branch piping.

   b. Provide blowdown valve and hose connection at all low points in piping and at locations where scale or debris could accumulate. Locate drains to allow drainage of portions of system for maintenance and replacement of all equipment.

   c. Air Conditioning Coil Condensation Drainage: Provide condensate drainage at all locations where condensate could accumulate. Terminate condensate drain lines over floor drain, funnel, or floor sink such that condensate flow does not spill onto floors or create a hazard. Provide suitable traps and vents such that condensate flows freely, without accumulation, especially where drain lines penetrate ducts, air handler casings, plenums, or other pressurized spaces. Drainage shall be by gravity. Condensate pumps are not acceptable without UCSF approval.

7. Thermal Expansion Compensation

   a. Design piping system to allow for thermal expansion and contraction. Locate guides and anchors to allow expansion and movement without warping or loss of line of grade or causing damage to equipment or building. Provide shutoff valves on both sides of manufactured seismic and expansion joints.

8. Cleaning and Chemical Treatment

   a. Piping systems shall be delivered clean and free of debris, and that all strainers will be cleared of debris prior to turn-over. The University expects that no chemical treatment program requirements other than standard practices implemented by the University will be required to maintain the function of the heating hot water, chilled water and condenser water system over its expected lifetime.
9. Centrifugal Pumps
   
a. Select pumps and controls system for maximum efficiency in delivering chilled water, heating hot water and condenser water over a range of operating conditions. Ensure that pump operates at specified system water temperatures without vapor binding or cavitation, and is non-overloading in parallel or individual operation.

b. Provide isolation valves at the suction and discharge lines at each pump, and check valves downstream of all pumps.

c. Provide for flexibility in pump operations and maintenance by including Hand/Off/Auto switches for motor starters and Variable Frequency Drives.

d. Ensure pump shaft is properly installed and aligned to within no more than one-half the manufacturer’s recommended tolerance for parallel and angular variance. Grout between pump and base.

D 3050.50 HVAC Air Distribution
   
a. Description: Systems for distribution of air including air handling units (LE D (20 yrs)), fans (LE D (20 yrs)), ductwork (LE F (40 yrs)) for supply systems, return systems, and general exhaust systems, and accessories. See (CR D3060 Ventilation) for special exhaust systems.

b. Performance Requirements:

1. General: Performance of air distribution systems will have a major impact on energy consumption, acoustics and vibration, thermal comfort, and indoor air quality. Refer to related performance criteria in these areas.

2. Life Expectancies of following components shall match the life expectancies of their systems except where noted.

3. Return Air Ceiling Plenums: Ceiling plenum must be kept clean and may not include any friable materials such as sprayed-on fire proofing. Plenums should be able to be easily cleaned throughout the life of the system to allow the building to continuously be able to provide good air quality to its occupants.

4. Underfloor Air Plenums: All areas of any underfloor air distribution plenums shall be equipped with an automatic liquid leak detection system, monitored
by the BAS. Underfloor air plenums must be designed to remain as clean as possible throughout the life of the system in order to continuously be able to provide good air quality to building residents. They must be easily accessed for cleaning without the need for special needs for tools or engineering efforts to rebalance the system after cleaning has occurred.

5. Floor vents where used shall:
   a. Not blow cold/hot air directly onto people in workstations.
   b. Be easily adjustable by occupants.
   c. Not be barriers to employee movement within work areas, including chair caster movement.

6. If internal acoustic insulation is recommended for use in supply or exhaust ductwork, then it shall be non-shedding, non-fiberglass type, provided with sheet metal nosing, adhesive, and mechanical fasteners in order to prevent friable material from coming loose and creating a negative impact on air quality during the life of the system.

7. Sound attenuating flexible duct connections at diffusers shall have woven CPE fabric interior lining.

8. Duct Penetrations
   a. For duct penetrations provide a minimum opening remaining after installation. Provide effective seals around all penetrations to prevent passage of sound, rodents, vermin, fire, smoke, and liquid spills.
   b. Where ducts are insulated, provide for continuous insulation through openings.

9. Air Handling Equipment
   a. Fan systems designed for parallel or manifold operation shall be protected against backward rotation of fan wheels.
   b. Fan Wall Technology: Each individual fan comprising the fan wall should be able to be controlled and isolated to enable maintenance or repair without shutting off the entire fan wall. Provide VFD control panel with individual fan output terminals and disconnect switches. Control panel shall include both a primary and stand-by
variable frequency drive.

c. In all Fan applications, direct drive fans are preferred over belt driven for reduced maintenance needs and increased efficiency. Use VFDs for capacity adjustment and control.

10. Belts  (LE N/A)

   a. Minimize the need for belts wherever possible to reduce maintenance needs for the system. Where belt drives are unavoidable, provide belts that are durable, require minimal maintenance and provide high efficiency transfer of rotational energy between motor shaft and fan wheel.

   b. Provide belt driven fans larger than 2 horsepower with at least two belts for increased reliability.

11. Bearings  (LE 100,000hrs)

   a. Provide minimum AFBMA L10 life of 100,000 hours.

12. Casings

   a. Dividing panels between components, shall be fastened securely so that separation will not occur during the air handling system life. Roof panels shall be sloped a minimum slope of 1/2 inch per foot to shed water. Divert rainwater spilling from the roof away from access doors and electrical components on the outside of the unit.

   b. For units with walk-in sections provide marine lights in each accessible section.

   c. Ensure tight edge seal for access doors.

13. Coils

   a. Water Coils: Provide coils sized to prevent clogging and loss of efficiency throughout the life of the system with wall thickness that allows the coil to meet life expectancy without leakage or significant loss of efficiency. Properly sized and designed coil bends are an area of particular importance to maintain life and efficient operations of the system. Turbulators are discouraged.

   b. For each cooling coil, provide continuously-sloped drain pans. Size
drain pans and robust drain connection to handle maximum coil condensation without overflow and to collect all condensation to prevent contact and corrosion of the air handling unit. Provide intermediate welded stainless steel drain pans for stacked coils with downspout to lower drain pan.

c. Coil headers shall be inside the unit. Provide header vent and drain valves at each coil, at accessible locations and discharging into drain pans.

d. Coil inlet perimeter shall be blanked off to ensure that no air bypasses the coil.

e. Coils shall be individually removable. Configure piping to permit coil replacement without affecting other coils or connecting piping. Individual coils shall be separately valved so that, if any individual coil fails, it can be isolated, drained, filled, and vented while the remaining coils stay in operation. Provide a manual circuit balancing valve for each coil.

f. Individual coils shall be fully accessible on both the upstream and downstream sides to permit inspection and cleaning.

14. Filters (LE N/A) and Filter Holding Frames

a. Locate filters at the inlet of air handling equipment to protect all downstream components. Provide additional final filters at the outlet of air handling equipment only when required to meet stringent air quality criteria (e.g. HEPA filtration).

b. Where high efficiency filtration is required, consider the use of lower efficiency pre-filters upstream of the higher efficiency after filters to extend the useful life of the after filters.

c. Where MERV 13 or higher filters are used, use high capacity extended media filters.

d. Filters should be selected to provide high efficiency filtration to provide good air quality for building occupants, support the building’s energy efficient performance, maximize time between replacements and not require high cost replacement components.
such as special carbon filtration pre-filters. Filter frames shall include built-in header on top and bottom to avoid damage during installation and removal.

e. Filter holding frames shall be factory fabricated as part of the air handling unit with either walk-in upstream access or side access. Walk-in upstream access is preferred.

f. Filter Fit: Provide a maximum leakage of 0.5% at 1" wg differential pressure across the filter bank.

g. Moisture eliminators shall be installed at all outside air intake louvers.

h. Filter Gauge: Provide a robust differential pressure measurement station for each filter tied into the building control system so that maintenance personnel can be alerted to change filters based on differential pressure readings.

i. Electrostatic filters are discouraged.

j. See (CR Table Z1040.30-A, Facilities Design Guidelines).

15. Economizer Section and Automatic Dampers:

   a. Return air dampers shall be opposed blade. Outside air and exhaust air dampers shall be parallel blade arranged to open in the same direction as adjacent louvers.

   b. Leakage: Provide guaranteed maximum leakage of 10 CFM per square foot at 1 inch WG static pressure differential when closed.

   c. Damper position shall be monitored through the BAS.

16. Air Handling Unit Air Intake and Discharge Openings:

   a. Air intakes for building ventilation systems shall be located so as not to re-entrain pollution or odors (eg. Keep air intakes away from loading docks, vehicular areas, exhaust, vents, and trash areas.) Consider prevailing winds.

   b. Provide access for upstream and downstream maintenance and cleaning of all louvered or screened openings.

   c. Provide drainable outside air dampers with drain gutters in head frame and each blade, and downspouts in jambs.

   d. Provide bird protection at all air intakes (see CR B2080.80, Bird
17. Refrigeration Systems (For Units with Integral Compressors and DX Cooling Coils):
   a. See (D3030 Cooling Systems).

18. Fire and Smoke Dampers (LE to match HVAC ductwork)
   a. Fire and Smoke dampers are required to undergo inspection and testing every 4 years. Minimize the number of Fire and Smoke dampers used throughout the building in order to minimize testing and inspection. Ensure that any fire and smoke dampers are easily found and can be readily accessed for inspection and testing. Provide hinged access doors in ductwork.
   b. Provide indicator light with test switch for each fire-smoke damper. Monitor OPEN and CLOSED positions with Fire Alarm System.
   c. Provide a stenciled or printed self-adhesive label attached to all fire damper access panels. Tag shall read “FIRE DAMPER” in one-inch high, red letters on white background. Tag shall also indicate building name, floor, fire damper number, electrical circuit number feeding the damper actuator, and the damper point address in the Fire Alarm System. Supplemental data shall be minimum 1/4-inch high.

19. Air Terminal Units (LE to match Air Handling Unit)
   a. (See Table Z1040.30-A, Facilities Design Guidelines)

20. Balancing Dampers (LE to match HVAC ductwork)
   a. Shall provide a means of balancing the airflow throughout the building over the life of the building. Damper Blades should be capable of tightly closing without leakage.

21. Sound Attenuators (LE to match HVAC ductwork)
   a. The use of sound attenuators is discouraged. Acceptable acoustic performance should be achievable through proper equipment selection and duct sizing.

22. Report from the Integrated Delivery Team’s Corrosivity Expert/Consultant
SERVICES

Mission Bay East Campus Phase 1 (Block 33)  May 28, 2016
University of California, San Francisco, Project No: M4603

Technical Criteria

D 3050 Facility HVAC Distribution Systems

providing recommendations and requirements for achieving expected lifetimes of the HVAC Distribution Systems as it concerns degradation from environmental agents, whether through direct exposure or exposure to the incoming air stream. Updated report to analyze and verify the expected lifetimes of the final, proposed HVAC Distribution Systems design.

D 3050.90 Facility HVAC Distribution Systems Supplementary Components

a. Description: Expansion compensation, meters and gauges, valves and specialties (LE D (20 yrs)), hangers, supports and anchors, vibration and seismic controls (LE F (40 yrs)), insulation (LE F (40 yrs)), identification, instrumentation and controls, and testing, adjusting and balancing (LE D (20 yrs)).

b. Performance Requirements:

1. Strainers
   a. Provide basket strainers for larger sizes installed near the floor to improve service access.
   b. Strainers are required ahead of pump suctions, control and regulating valves, and at other appropriate locations.
   c. Strainers shall be provided with blowdown valve and hose connection.
   d. Provide permanent magnets in strainers at each pump suction. (See Table Z1040.30-A, Facilities Design Guidelines.)

2. Automatic Air Vents
   a. Provide automatic air vents on air separators and at system high points where air will periodically accumulate.

3. Manual Air Vents
   a. Provide manual air vents at all high points and at all downward elbows where air could accumulate in heating water, chilled water, and cooling tower water piping.
   b. Air vent bleed lines shall be routed to facilitate line venting without inhibiting access to valves or equipment. For manual air vents above finished ceilings bleed lines shall terminate at an accessible location.
c. Provide manual air vents and drain valves on the equipment side of all coil and equipment isolation valves such that all branch piping at equipment or coil can be drained and filled without having to drain or vent main piping.

d. Provide manual air vents and drain valves between each set of isolation valves in distribution piping such that all piping between isolation valves can be vented and drained with that section of pipe isolated from the rest of the system.

4. Expansion Tanks
   a. Provide with system connection, air charging valve, and drain plug. Provide observation glass to the tank.

5. Pipe Flexible Connectors
   a. Corrugated metal braided flexible connectors are preferred.

6. Water System Relief Valves
   a. Provide discharge piping to drain with adequate capacity for anticipated maximum discharge.

7. Chemical Pot Feeders
   a. Provide discharge piping to drain with adequate capacity for anticipated maximum discharge.

8. Air Separators
   a. Provide centrifugal type air separators in heating water and chilled water systems. The air separator should be located in the warmest portion of the system.

9. Solids Separators
   a. Consider the use of centrifugal solids separators for cooling tower systems.
   b. Provide discharge piping to drain with adequate capacity for anticipated maximum discharge.

10. Temperature/Pressure Test Ports
    a. Provide test ports on the inlet and outlet connections to coils,
chillers and heat exchangers, and at other locations to facilitate system testing, balancing, troubleshooting, and servicing.

11. Pipe Thermometers
   a. Provide pipe thermometers on the inlet and outlet connections to main building heating and cooling coils, chillers, heat exchangers, cooling towers, and near each energy management system temperature sensor.

12. TIER 2: Ultraviolet Treatment of Cooling Coils:
   a. Provide a complete, automatic system to deliver UV light to all wetted surfaces within all air distribution systems.

C. Verification & Validation (All Tiers)

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11. Plans showing all HVAC distribution (eg. coil locations, valves) with architectural access panels.

12. Design criteria for air terminal unit pressure drop, velocity and sound power level.

13. Design criteria for air inlets and outlets pressure drop, velocity and sound power level.

14. Report from the Integrated Delivery Team’s Corrosivity Expert/Consultant analyzing and verifying the expected lifetime of the proposed HVAC Distribution Systems design as it concerns corrosion from environmental agents.


16. Spreadsheet indicating all spaces and their Title 24 ventilation requirements, list of all zone terminal units, airflow data (min, max, heating max), number of people, square feet, design heating load, and design cooling load.

17. Design criteria for piping working pressures and temperatures, pressure drop, velocity.

18. Final detailed calculations for piping system pressure drop, pump flow and pressure capacity, pump HP.

19. Detailed calculations for thermal expansion compensation and anchorage for all piping systems.

20. Plans and elevations indicating locations of all vents and drains in each piping system.

21. Plans and elevations showing locations of all air intakes and outlets and any pollutant sources in or on the building and site.

22. Air handling unit layout plan and sectional views showing all components, access doors, casing openings and service clearances.

23. Plans showing all HVAC distribution (eg. coil locations) with architectural access panels.

24. Design criteria for ductwork working pressures and temperatures, pressure drop, velocity, pressure class, seal class and leakage class.

25. Final detailed calculations for duct system pressure drop, fan flow and
26. Locations of all fire and smoke dampers.
27. Design criteria for air terminal unit pressure drop, velocity and sound power level.
28. Design criteria for air inlets and outlets pressure drop, velocity and sound power level.
29. Provide plan for University approval that outlines approach to protecting piping system from foreign matter during construction as well as testing protocol to ensure the system is clean, free of debris and that proper water quality is delivered.
30. Drawings shall show economizer damper and louver sizes and arrangements.
31. Show all automatic air vents on the Drawings.
32. Schedule expansion tank sizes and charging pressures on the Drawings.
33. Schedule pot feeders on the drawings.
34. Schedule solid separator sizes, flow rates and pressure drops on the Drawings.

D 3060 Ventilation (NOT APPLICABLE FOR B33)

A. Intent

Special exhaust systems shall be provided to safely exhaust contaminated air captured by equipment such as kitchen hoods and fume hoods. The systems shall work in concert with other HVAC systems and shall meet additional performance criteria related to energy efficiency, interior environmental conditions, occupant comfort, occupant controllability of thermal conditions, indoor air quality, acoustics and vibration, durability, operability, maintainability, redundancy, safety, consistency with campus standards, flexibility to accommodate future changes, energy monitoring and other
B. Description & Performance

D 3060.00 General

a. Description: Special exhaust systems serving equipment such as kitchen hoods and fume hoods, including fans (LE E (30 yrs)) and ductwork (LE D (20 yrs)).

b. Performance Requirements:
   1. See (CR D30.B, HVAC, Description & Performance) for system-level criteria.
   2. See (CR D3050, Facility HVAC Distribution Systems) for additional requirements for fans and ductwork.
   3. Sound Attenuators: The use of sound attenuators is discouraged. Acceptable acoustic performance should be achievable through proper equipment selection and duct sizing.

D 3060.30 Special Exhaust Systems

a. Kitchen Hood Exhaust Fans (NOT APPLICABLE FOR B33)
   1. Provide upblast fan with fully welded construction.
      a. Exhaust discharge shall be 50 feet horizontally downwind from outside air intakes (measured in the prevailing wind direction) and minimum of 10 feet vertically above the air intake.

b. Kitchen Hood Exhaust Ductwork (NOT APPLICABLE FOR B33)
   a. Provide uncoated black steel for grease exhaust ductwork. A UL listed positive pressure double wall grease exhaust system is also acceptable.
   b. Hot or cold rolled, open-hearth soft steel sheet capable of welding or double seaming without fracture, meeting ASTM A366, A568 or A569, and ANSI B32.3.
   c. Continuously welded longitudinal and transverse joints, minimum 3/8-inch SMACNA Type T-21a flanges. Maximum 1 inch high reinforcement angles, same material as duct, tack welded to duct maximum 6 inches on center on alternate sides. Reinforcement thickness and spacing as required for duct Pressure Class.
d. Grease exhaust ductwork shall be sloped back to hood or drainage points.

c. Fume Hood Exhaust Fans (NOT APPLICABLE FOR B33)

1. Exhaust stacks shall be designed to force air above the wind envelope, so that the exhaust is carried away from the building.

   a. Exhaust stack height shall be determined by a wind study if that is part of the project requirements. Discharge from exhausts shall be analytically designed to ensure adequate dispersion and dilution to mitigate effluent gas impinging on air intakes of the emitting building and nearby buildings.

   b. Dilution air introduced into exhaust manifolds upstream of the exhaust fans may be considered in order to maintain minimum discharge velocities.

   c. Housed centrifugal fans are typically used for fume hood exhaust. High induction fans or separate stainless steel stacks with high velocity discharge nozzles can be considered where exhaust plume must extend high above the roof. Review design approach with Facilities.

   d. Locate fans so that a negative pressure exists in all fume exhaust ducts within the building.

   e. Fume hood exhaust discharges shall be 50 feet horizontally downwind from outside air intakes (measured in the prevailing wind direction) and minimum of 10 feet vertically above the air intake.

   f. Inline fans with motors or drives exposed to exhaust air streams are not permitted.

   g. Flexible duct connections to fume hood exhaust fans shall be made using heavy glass fabric double coated with hypalon; Duro Dyne Corporation “Durolon,” or equal.

   h. Fan scroll, side panels, and support frame shall be continuously welded Type 316L stainless steel.

   i. Full or narrow width backward-inclined steel blades, as selected for optimum performance, continuously welded to hub. Fan shaft and wheel dynamically balanced to within 0.10-inch/second RMS
velocity at maximum rpm. Double thickness airfoil shaped wheels should be selected for fans larger than 24 inches.

j. Fan shafts shall be Type 316 stainless steel, or equivalent, sized for fan Class, but not less than 1-inch diameter.

k. Arrange for bearings to be outside of the air stream.

d. Fume Hood Exhaust Ductwork – General (REQUIRED IF FUME HOODS IDENTIFIED DURING PROGRAMMING IN DESIGN PHASE)

1. All fume hoods connected to a common exhaust system shall be served by a common supply air system.

   a. Provide at least one stand-by fume hood exhaust fan (N+1) in central fume hood exhaust systems. Provide leak-tight Type 316 stainless steel isolation dampers to isolate individual fans.

   b. Fume exhaust ducts shall be accessible for maintenance.

e. Fume Hood Exhaust Ductwork – Exterior (REQUIRED IF FUME HOODS IDENTIFIED DURING PROGRAMMING IN DESIGN PHASE)

1. Material: Fiberglass Reinforced Polyester (FRP). Minimum 1/8-inch wall thickness, constructed from chopped glass fiber between 0.5 inch to 2.0 inches in length, with minimum 30 percent glass content by weight, and minimum 7,000 psi tensile strength. Laminate resin shall include minimum 0.1 percent (by weight) ultraviolet absorber; Tinuven P, Cyasorb UV-9, or equal. Fabricate in maximum lengths possible to minimize the number of transverse joints.

   a. Interior duct surface shall be smooth and coated with Dynel interior chemical surfacing mat with Silane finish and styrene soluble binder in 20-mil maximum thickness. Chemical resistance shall be equal to Hetron 197, developed by Durex Plastic Division of Hooker Chemical Corp.

   b. Exterior surface color shall match building exterior, unless otherwise directed. Obtain color by a 20-mil fire retardant, air-dried gel coat. Clean and prepare surfaces and provide appropriate exterior primer prior to finish coats.

   c. Provide factory-made slip-fit joints of same material on ends of
d. Fiberglass material, sealants, wraps and coatings shall be rated in accordance with ASTM E84.

e. Joint Draw Bands for Connection to Dissimilar Ductwork: Minimum 22-gauge, 4-inch wide, Type 316 stainless steel with No. 1 or 2B finish, secured with two Type 316 stainless steel 3/16-inch diameter stove bolts and nuts. Install with a complete coating of approved caulking.

f. Fume Hood Exhaust Ductwork – Interior (REQUIRED IF FUME HOODS IDENTIFIED DURING PROGRAMMING IN DESIGN PHASE)

1. Material: Ductwork, dampers and all accessories in contract with the airstream shall be constructed of Type 316 stainless steel except where noted below.

   a. Rectangular: Minimum 18-gauge Type 316 stainless steel with Pittsburg lock or continuously welded longitudinal seams and SMACNA Type T-21 welded flange or Type T-22 stainless steel companion angle flanged transverse joints. Flange angles shall be minimum 1 by 1 by 1/8 inch with welded corners, joined using 5/16-inch diameter stainless steel bolts maximum 4-inch on center. Fittings shall be long radius type with welded longitudinal seams.

   b. Round: Minimum 18-gauge Type 316 stainless steel. Longitudinal seams shall be Acme lock with welded joints. Transverse joints shall be welded slip joints or Van Stone flanged duct connections, SMACNA Type RT-2, with 1/2-inch flared duct angles and hypalon gaskets. Connect flanges with stainless steel nuts and bolts at 4 inches on center. Make welded slip joints so that condensing moisture inside the duct flows toward the hood. Fittings shall be minimum 18 gauge Type 316 stainless steel, long radius, with continuously welded seams.

   c. Sealants: Caulking material shall be chemical resistant, hypalon-based. Gasket material shall be PTFE, Teflon, or modified chemical
resistant closed-cell silicone foam strip. Gasket width shall match flange width, thickness as required to accommodate surface irregularities and seal joint airtight.

d. Galvanized Steel Ductwork: For non-corrosive fumes where ductwork is fully accessible, and where specifically approved by Facilities and EH&S, use galvanized steel ductwork as required for general exhaust. Use chemical resistant sealants specified above. For combined fume hood and general exhaust systems, use fume hood exhaust materials specified above up to point of connection with a larger general exhaust duct. Galvanized steel ductwork may be used for the mixed air stream.

D 3060.90 Ventilation Supplementary Components

a. Description: Hangers, supports and anchors, vibration and seismic controls, insulation, identification, instrumentation and controls, and testing, adjusting and balancing.

b. Performance Requirements:

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16. Locations of all fire and smoke dampers.

17. Design criteria for air terminal unit pressure drop, velocity and sound power level.

18. Design criteria for air inlets and outlets pressure drop, velocity and sound power level.


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**D 4010 Fire Suppression**

**A. Intent**

Fire Suppression System shall be provided as required for safeguard the life safety and protection of people and goods as required by code and all applicable NFPA guidelines for each of the occupancies and program areas included in the project. The project shall also meet all the requirements of FM Global, City of San Francisco code (including all Bulletins and Ordinances), and the requirements of the UCSF Fire Marshall.

**B. Description & Performance**
D 4010.00 General

a. Description: Provide Automatic Fire Protection system for full project coverage and protection in accordance with all requirements by UCSF Fire Marshall. System type (wet, pre-action, dry-pipe, or gaseous) shall be selected as appropriate for each program space and specialty areas.

b. Performance Requirements:
   1. FM Global compliant design.
   2. San Francisco Municipal Code, including all Bulletins and Ordinances.
   3. UCSF Fire Marshall Requirements. Integrated Delivery Team shall hold meeting with UCSF Fire Marshall early in project design to determine all applicable codes and any other requirements as requested by the Fire Marshall.
   4. In San Francisco all standpipe fire hose valve outlet adapters are 3”.

D 4010.10 Water Based Fire Suppression

a. Description: Provide complete automatic fire sprinkler/combination standpipe system with appropriate zoning and sprinkler head layout.

b. Performance:
   1. Provide fire hydrant flow test to determine fire service water flow and pressure available at the project site. This information shall be combined with the safety factor identified in D4010.10.b.2 and used as the basis for hydraulic calculations and develop the fire sprinkler system/standpipe design.

   2. Provide a safety factor of 15 psi for the static and residual pressures to the fire hydrant flow test to account for future pressure drops in the City water grid due to future development in the project site area.

D 4010.11 Fire Pump

a. Description: Provide fire pump, jockey pump, control panel and interface with fire-alarm system.

b. Types:
   1. Discuss and review with University the type of pump to be used (vertical turbine, horizontal split case, etc.) as well as power source (electrical or diesel).

c. Performance Requirements:
1. Provide fire pump system that will augment fire service flow and pressure to the project as determine by the project hydraulic calculations.

**D 4010.12 Pre-Action Fire Suppression (Single and Double Interlock) (TIER 2)**

a. Application: Discuss with University when this type of system is to be used for specialty spaces.

b. Description: Provide complete automatic pre-action fire sprinkler system appropriate valves/zoning, pre-action valve closet, and sprinkler head layout.

c. Performance: Provide a fire protection system that will prevent accidental water discharge due to sprinkler head failure or accidental activation.

**D 4010.13 Dry-Pipe Fire Suppression (TIER 2)**

a. Application: Discuss with University when this type of system is to be used for specialty spaces.

b. Description: Provide complete automatic dry-pipe fire sprinkler system appropriate valves/zoning, dry-pipe valve closet, and sprinkler head layout.

c. Performance: Provide a fire protection system that will prevent accidental water discharge due to sprinkler head failure or accidental activation.

**D 4010.50 Gaseous Fire Extinguishing System (TIER 2)**

a. Application: Discuss with University when this type of system is to be used for specialty spaces.

b. Description: Provide complete automatic gaseous fire sprinkler system appropriate gas canisters, valves/zoning, canister and valve closet, and sprinkler head layout.

c. Performance: Provide a fire protection system that will prevent accidental activation, and will eliminate water use in the fire protection system in specialty spaces.

**C. Verification & Validation (all tiers)**

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<td>2. Meeting with Fire Marshall and Fire Department to identify specific project code requirements within 3 months of SD phase start date.</td>
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<td><strong>Technical Criteria</strong></td>
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<td><strong>4.</strong> Schematic Fire Protection system riser diagram showing fire water point of connection.</td>
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<tr>
<td><strong>16.</strong> Testing and verification as required by NFPA, City of San Francisco (Fire Department), and local Fire Marshal.</td>
<td></td>
</tr>
<tr>
<td><strong>17.</strong> Field Quality:</td>
<td></td>
</tr>
<tr>
<td>a. Test automatic sprinkler piping before covering or concealing, in accordance with NFPA 13, Section 25.1. Remove and replace all defects identified during testing and retest after corrections have been made.</td>
<td></td>
</tr>
<tr>
<td>b. Provide minimum 72-hour notification prior to any test to the University’s Representative.</td>
<td></td>
</tr>
<tr>
<td>c. Schedule tests at times acceptable to University and Fire Marshall.</td>
<td></td>
</tr>
<tr>
<td>d. Upon completion of inspections and tests, a “Contractor’s Material and Test Certificate” shall be completed and signed by the Integrated Delivery Team and any witnesses to the tests. Submit the original of the completed certificate to the University’s</td>
<td></td>
</tr>
</tbody>
</table>
D 50 Electrical

A. Intent

The facility electrical system is responsible for providing power and lighting throughout the facility that is both safe and maintainable, reliable and well integrated with other systems. The electrical system shall be designed so that equipment is easily accessible and readily maintainable by facilities personnel and limits the need for specialized equipment. The distribution should be reliable so that any outages are localized and downtime minimized. The power and lighting shall be well integrated and concealed within building architectural elements without sacrificing required maintenance accessibility. Electrical system data and controls should be easily accessed and integrated with other building systems to promote a unified holistic building system and not separate and redundant systems.

Life expectancy of electrical equipment assumes that preventive maintenance is routinely performed to ensure proper operation over the expected life and that equipment is not subject to extreme ambient conditions and temperatures or repeated switching operations.

D 50.00 General

a. See (CR D, Services for services-level criteria)

D 50.01 Identification

a. Electrical distribution system equipment, conduit and wire shall have identification. Equipment number or plan identification shall be unique to the building; e.g., “LP-11” shall not be used in an addition if the building already has an “LP-11”. Labels shall be based on the University Electrical Equipment Numbering and Identification Scheme included in this Section.

b. Medium Voltage Identification

1. All new high voltage equipment, transformers, switches and vaults are to be assigned numbers. A proposed Hi-voltage connection drawing must be issued to the University electric shop for the numbers to be issued.

2. The numbering scheme provided by the University accomplishes the following:
SERVICES

D 50  Electrical

a. Establishes a unique identifier for all system components and eliminates possible duplication.

b. Identifies equipment by type as listed in the following table:

<table>
<thead>
<tr>
<th>Mark or Tag</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>12kV Distribution Circuit</td>
<td>UC-1</td>
</tr>
<tr>
<td>FI</td>
<td>Fault Interrupter</td>
<td>FI-01</td>
</tr>
<tr>
<td>MH</td>
<td>Manhole</td>
<td>MH-102</td>
</tr>
<tr>
<td>OFC</td>
<td>Oil-Filled Cutout</td>
<td>OFC-01</td>
</tr>
<tr>
<td>OS</td>
<td>Oil Switch</td>
<td>OS-01</td>
</tr>
<tr>
<td>PMH</td>
<td>Pad-Mounted Housing</td>
<td>PMH-01</td>
</tr>
<tr>
<td>PMS</td>
<td>Pad-Mounted Switch</td>
<td>PMS-02</td>
</tr>
<tr>
<td>SF6</td>
<td>Sulfer Hexafluoride Gas Switch</td>
<td>SF6-01</td>
</tr>
<tr>
<td>T</td>
<td>Transformer</td>
<td>T-001</td>
</tr>
</tbody>
</table>

c. Use the substation name abbreviation for 12kV circuit breaker identification such as UC, CP1, CP2, ES for University Substation, Central Plant 1, Central Plant 2, East Substation.

d. Allows for the addition of new devices by type in an ordered manner.

e. Facilitates the creation of computer database to keep records on equipment.

f. Reduces confusion when referring to a piece of equipment to enhance communication.

3. The 12kV circuit breakers located at the substation and distribution substations will be unchanged. Existing device numbers shall be reused when replacing equipment. Consult with the University on device number assignment before labeling equipment. The University is continually adding device numbers so tracking and controlled assignment is required.

4. New and future equipment shall be assigned a number during the design phase of a project to minimize the need for new nameplates after construction.

c. Low Voltage Identification

1. The following low voltage equipment numbering scheme shall be followed:
D 5010 Facility Power Generation

**Mark or Tag** | **Description**
--- | ---
DP | 208/120V Distribution Panelboard
LP | 208/120V Panelboard – Receptacles & Lighting
HDP | 480/277V Distribution Panelboard
HLP | 480/277V Panelboard - Lighting
ATS | Automatic Transfer Switch
CB | Circuit Breaker
DS | Disconnect Switch
EDP | Emergency 208/120V Distribution Panelboard
ELP | Emergency 208/120V Panelboard
EHDP | Emergency 480/277V Distribution Panelboard
EMCC | Emergency Motor Control Center
MSB | Main Switchboard
MCC | Motor Control Center
T | Transformer
US | Unit Substation

2. Utilize numbering convention as follows:
   a. First letter or number = floor designation; B = basement, 1, 2, 3, etc. (B)
   b. Subsequent lower case letter = panel number on each floor; a, b, c, etc. (Ba). Example 1: Emergency 277/480V Distribution Panelboard installed in basement is “EHDP-B”. Example 2: Second 480/277V panelboard installed on third floor for lighting is “HLP-3b”.

**D 5010 Facility Power Generation**

**A. Intent**

Facility Power Generation is "standby" electrical power that services the following select building loads during interruptions to the building "normal" utility power supply: Emergency, Legally Required Standby, and Optional Standby classifications. In addition to the programmed Optional Standby power loads, the Integrated Delivery Team shall coordinate with UCSF during Schematic Design to validate which additional loads are considered critical and to be placed on the Optional...
Standby power system, and reconfirm these requirements in each design phase. Additional loads identified at this time include:

B. Description & Performance

D 5010.00 General
   a. See (CR D50, Electrical, for system-level criteria.)

D 5010.10 Generator (LE D (20 yrs))
   a. Description: Supplementary source of energy utilized during a utility power outage.
   b. Performance Requirements:
      1. Provide spare capacity per (CR 1030.01, Spare Capacity) to allow for future growth.
      2. All generators shall be provided with a fixed load bank installation for monthly, Code-required testing.
      3. Location and enclosure shall be selected in accordance with acoustical requirements (CR F1030.10).
      4. Run-time duration:
         a. TIER 1: Not less than 24 hours.
         b. TIER 2: Not less than 48 hours.
      5. Optional loads on generator shall include:
         a. See (CR B2050, Exterior Doors & Grills)
         b. See (CR D7010.10, Access Control)
         c. Sanitary Sewerage Pumps if allowed (CR D2020.10, Sanitary Sewerage Equipment)
         d. Stormwater Sump Pumps
         e. Security Systems
         f. Telecommunication Equipment
         g. HVAC systems for telecommunication rooms
         h. Institutional (eg. research, academic, clinical, etc.) Freezer/refrigeration equipment
         i. Building Automation Control system (BAS)
         j. Lighting for electrical service rooms, telecommunications rooms,
Technical Criteria

SERVICES

Block 33

D 5010 Facility Power Generation

k. Generator enclosure lighting

D 5010.11 Uninterruptable Power System (UPS)

a. Description: Supplementary power source dedicated for equipment located in IDF and BDF rooms.

b. Performance Requirements:

1. UPS shall be equipped with an external maintenance bypass cabinet.
2. UPS shall be fed from a standby power distribution panel for generator backup power.
3. UPS output shall serve a dedicated distribution board, which in turn serves IDF/BDF panel boards located within each IDF and BDF rooms, respectively.
4. IDF/BDF panels shall serve all critical loads within the IDF/BDF rooms, including but not limited to server racks, security equipment, etc.
5. Electrical distribution to server racks in IDF/BDF rooms shall be provided by overhead busway system to permit flexibility of adding and modifying loads without shutting down power.
6. Provide control and monitoring functions capable of communicating with the building’s BMS system. Items to monitor shall include, but are not limited to:
   a. Battery run time remaining (for Battery-Style only)
   b. Low Battery (for Battery-Style only)
   c. Unit on Batteries (for Battery-Style only)
   d. Unit on Line (for all types)
   e. Unit Ready (for all types)
7. Type Option 1: Battery-style.
   a. **Duration:** Accommodate failed start and restart of the Emergency Generator, plus 50% safety factor of the combined total.
   b. Provide controls and alarms to prevent total discharge of the battery.
   c. The battery cabinets shall be configured and connected to the UPS module in such a manner that it shall be possible to remove battery cabinets from the system without having to make extensive
modifications to the system.

8. Type Option 2: Flywheel-style.
   a. **Duration**: Accommodate failed start and restart of the Emergency Generator, plus 25% safety factor of the combined total.

**D 5010.20 Automatic Transfer Switch (LE D (20 yrs))**

   a. **Description**: Switch that automatically transfers power of the load circuit from “normal” source to “standby” source and vice versa.
   b. **Project Requirements**: The Block 33 project shall be considered an office building for the purposes of this section.
   c. **Performance Requirements**:
       1. **Transition**: During testing and when transferring back to the “normal” power source provide:
          a. Buildings with Clinics or Labs: Closed Transition (power without interruption of load).
          b. Other buildings: Open Transition.

**C. Verification & Validation (all tiers)**

<table>
<thead>
<tr>
<th></th>
<th>1. List of emergency loads, legally required standby loads and optional standby loads for review.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3. Type and duration of Uninterruptible Power System (UPS) for review.</td>
</tr>
<tr>
<td></td>
<td>4. Calculation demonstrating sizing of the generator, including spare capacity (CR 1030.01, Project Criteria, Spare Capacity). Plans shall clearly show the required equipment size, including fuel tank, concrete pad size and clearances.</td>
</tr>
<tr>
<td></td>
<td>5. Manufacturer’s data for duration of Failed Start and Restart Time of Emergency Generator.</td>
</tr>
<tr>
<td></td>
<td>6. Manufacturer’s data for type and duration of UPS.</td>
</tr>
<tr>
<td></td>
<td>7. Fully coordinated electrical single line diagram showing the generator.</td>
</tr>
</tbody>
</table>
D 5020  Electrical Service and Distribution

A. Intent

Electrical Service and Distribution infrastructure shall be provided to distribute electrical power throughout all areas of the building to the downstream loads. The distribution shall be designed to ensure longevity of the system, continuous electrical service and mitigate any power outages associated with circuit overloads and false breaker trips. Circuits shall be wired to localize outages associated with breaker trips as much as possible. The installation shall allow sufficient clearances and access to raceways, wiring and equipment that require maintenance and future replacement. Additionally, potential water intrusion shall be considered and mitigated during design of plumbing and electrical systems.

B. Description & Performance

D 5020.00  General

a. See (CR D50, Electrical, for system-level criteria.)

D 5020.10  Electrical Service  (LE D (20 yrs))

a. Description: Main incoming electrical service and equipment to support electrical distribution for Block 33, while accounting for the building’s organic growth over the life time of the building and allowing the facilities staff the flexibility to access, maintain and replace the equipment, as needed.

b. Performance Requirements:

1. Identify source power factor with utility provider.
2. To minimize utility upcharges provide power factor correction as needed to raise power factor to the following minimums:
   a. TIER1: 85%
   b. TIER2: 90%
3. Direct burial of primary conductors is not allowed.
4. Use of aluminum wiring for medium voltage applications is not permitted.
5. Encase primary voltage duct bank in a minimum of 3 inches of concrete.
6. Primary distribution system conduits shall be a minimum of 5-inch and use a minimum of 500KCM cable.
7. Primary distribution cables shall be single conductor 15kV type with 133% insulation.

D 5020.12 Medium Voltage Transformers (LE D (20 yrs))

a. Description: Transformation of incoming primary utility service from medium voltage to secondary distribution voltage for use within the building.
   b. Performance Requirements:
      1. Only use liquid-filled type transformers; shall utilize Factory Mutual (FM) approved less flammable liquid.
         a. Outdoor installation is not allowed.
         b. Provide retention area for spill-containment to be used with liquid-filled type transformers.

D 5020.13 Switchgear (LE D (20 yrs))

a. Description: Main building electrical switchgear, located within the main electrical room and distributing power to the downstream building level distribution.
   b. Performance Requirements:
      1. Switchgear Type:
         a. Buildings with Clinics or Labs: Provide double-ended switchgear.
         b. Other buildings TIER 1: Provide single-ended switchgear and capability and space to become a double-ended switchgear to accommodate building use changes in the future.
         c. Other buildings TIER 2: Provide double-ended switchgear.
2. Switchgear breakers shall be electrically operated and withdrawable power circuit breaker type.
3. Each main breaker shall be equipped with a Reverse Power Relay (ANSI relay device 32).
4. Switchgear shall be PV-ready for future solar installation. See requirements of (CR 1030.54, Clean Energy).

D 5020.30 Power Distribution (LE D (20 yrs))

a. Description: Electrical distribution system rated at 480/277V, 3-phase, 4-wire or 208/120V, 3-phase, 4-wire distributed within the building via means of dry-type transformers, branch circuit panelboards and appropriately sized conduits and conductors.

b. Performance Requirements:
   1. Distribution equipment shall allow for future program modifications, such as furniture reconfiguration, addition of circuits, etc., by allowing sufficient SPARE capacity and pathways.
   2. Care shall be taken when finalizing location of electrical distribution equipment. Electrical equipment shall located within rooms dedicated for electrical equipment only. Ensure issues such as water intrusion within electrical rooms are mitigated during the design phase, and sufficient clearances and access is provided for future maintenance and replacement of equipment.

D 5020.31 Low Voltage Transformers (LE D (20 yrs))

a. Description: Building utilization transformers dedicated for low-voltage distribution (208/120V) within the building.

b. Performance Requirements:
   1. All low-voltage transformers provided within the building shall be in compliance with the Department of Energy (DOE) 2016 Efficiency standard.
   2. Transformers used within labs and computer intensive spaces shall be specified to withstand the heat generated from harmonic and unbalanced loads.

D 5020.32 Panelboards (LE D (20 yrs))
a. Description: Branch circuit distribution boards dedicated for mechanical, receptacle and lighting distribution.
b. Performance Requirements:

1. Panels shall be located within rooms dedicated for electrical equipment only, with the exception that panels for labs and clinical spaces can be located in adjacent corridors.
2. For future work, provide empty raceways from panelboard terminated in an accessible location.
3. Overcurrent protection in panelboards shall be of bolt-on type.
4. Panelboards dedicated for spaces with significant amount of harmonic loads shall be provided with 200% neutral.

**D 5020.33 Electrical Wiring System** (LE n/a)

a. Description: Raceways and enclosures, cable trays and wiring necessary for distributing power within the building.
b. Performance Requirements:

1. Branch circuits for all areas shall be provided with dedicated neutrals.
2. MC cable, where used, shall be installed in a neat and workmanlike manner. However, for panels flush-mounted in walls spare conduit provisions shall be made at panelboards to permit the installation of future additional circuit conductors.
3. Three-phase services shall not be used to supply single-phase loads.
4. Conductors for power and lighting and fire alarm shall be either:
   a. MC cable, except in laboratories, clinical or other spaces anticipated to have future changes.
   b. In conduit or approved raceway. See (CR 5020.33, General Purpose Electrical Power Performance).
5. Aluminum conductors are only permitted for feeders 100A or greater.

**D 5020.70 Grounding** (LE D (20 yrs))

a. Description: Electrical system connected to earth in a manner to limit the voltage imposed by lightning, surges or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operation.
Mission Bay East Campus Phase 1 (Block 33)  
University of California, San Francisco, Project No: M4603  
May 28, 2016  

**SERVICES**

**D 5020 Electrical Service and Distribution**

b. Performance Requirements:

1. Provide dedicated grounding riser and isolated ground conductors installed from the source transformers to the load for all of the following:
   a. A minimum of one outlet per laboratory, location to be determined during design.
   b. Telecommunications systems.
   c. Where recommended by proposed or known future equipment specifications.
   d. Where identified by the users or lab planner during programming in the design phase.

2. Provide separate ground conductor to run with all branch circuits and feeders.

**D 5020.90 Electrical Service and Distribution Supplementary Components (LE n/a)**

a. Description: Supplementary support components such as hangers and supports, raceways and boxes, cable trays, vibration and seismic controls, wiring connectors, and instrumentation and controls.

b. Performance Requirements:

1. Raceway systems shall be designed to properly deal with the constraints of the building environment including corrosion, exposure to physical damage, vibration, movement, temperature variation, moisture, electrical area classification and other conditions which may be unique to an application.
2. All dedicated outlets shall be clearly identified as such.
3. Electrical distribution system equipment, conduit and wire shall be identified in accordance with UCSF Building Systems Identification Standards.

**C. Verification & Validation (All Tiers)**

<table>
<thead>
<tr>
<th>SD</th>
<th>1. See Contract.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Plans and elevations showing maintenance access areas for all equipment and other items requiring periodic maintenance.</td>
</tr>
<tr>
<td></td>
<td>3. Submit calculations demonstrating the spare capacity (CR 1030.01, Project Criteria, Spare Capacity) provided at the main incoming</td>
</tr>
</tbody>
</table>
D 5030  General Purpose Electrical Power

A. Intent

General purpose power is the means of delivering power from the distribution equipment to the point of use wiring devices, such as receptacles. Devices shall be located and specified to match the architectural aesthetics of each area, and be thoughtfully located for optimal functionality.

Flexibility shall be provided in the design to allow for future re-programming and reconfiguration of end-use devices and furniture systems. General purpose power shall support the following enhanced ergonomics:

1. Sit-to-stand desks shall be supported by the allocation of power to the office workstations.
2. Receptacles at/in desk/tables shall be designed within universal reach, and so as not to disrupt smooth, contiguous, convenient working surfaces.

B. Description & Performance
Technical Criteria

D 5040  Lighting

D 5030.00  General Purpose Electrical Power Performance (LE n/a)

a. See (CR D50, Electrical, for system-level criteria.
b. Description: Means of delivering power from the distribution equipment to the point of use wiring devices such as receptacles and switches.
c. Performance Requirements:

1. Building power shall be designed to be concealed from view and consistent with architectural design.

2. Electrical distribution within labs shall be in raceways located above work surfaces. Raceways shall be pre-assembled complete including bases, covers, end plates, wiring, receptacles, fitting and connections, to exact lengths to match the lengths of the work surfaces and workstations.

C. Verification & Validation (All Tiers)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. See Contract.</td>
</tr>
<tr>
<td>DD</td>
<td>2. See Contract.</td>
</tr>
<tr>
<td>CD</td>
<td>3. Equipment points of connection, convenience outlets, etc shall be circuited with the plans clearly identifying the panel feeding the devices. Dedicated equipment for a specific consultant or use shall be identified for clarity</td>
</tr>
<tr>
<td>Startup</td>
<td>5. TBD</td>
</tr>
</tbody>
</table>

D 5040  Lighting

A. Intent

Lighting and lighting control systems are major electrical power loads, and must be holistically integrated into the overall design for optimum building energy performance. Integration of electric lighting with natural daylight shall be maximized to reduce electrical energy consumption.

Systems shall be designed for average illuminance, equivalent spherical illuminance, uniformity ratios, visual comfort probability, and special purpose lighting.
Lighting and fixtures shall be selected and arranged by the Integrated Delivery Team to achieve the following:

1. Enhanced safety through greater visibility for occupants and staff, particularly during power outages and emergencies.
2. Minimal maintenance costs in general and reduced types and wattages of lamps, ballasts, LEDs, and LED drivers.
3. Easily accessed lamps, ballasts, LEDs, and LED drivers for replacement. Where it is unavoidable to require special access, provide access for changing fixtures without the need to rent special lifting equipment.
4. Occupant comfort, both in sitting and standing postures, and intuitive, personal control.
5. Occupant productivity and safety, particularly through placement and reflectance of lighting that does not cast shadows on work areas.
6. Minimal glare based on furniture arrangement.
7. Enhanced aesthetics integrated with the building architecture.
8. Enhanced legibility of signage through uniform lighting that maintains the contrast between content and background from primary viewing locations.
9. Enhance wayfinding and orientation for users with low vision conditions:
   a. Consider incorporating lighting plans that reinforce cardinal directions with a distinctive difference for corridors or primary circulation flow in the north-south orientation versus east – west.
10. Lighting controls should be integrated with an overall control strategy so that the control system takes a holistic approach to reduce redundancies and inefficiencies and utilize common elements.

B. Description & Performance

D 5040.00 General

a. See (CR D50, Electrical, for system-level criteria.)

D 5040.10 Lighting Control (LE B (10 yrs))

a. Description: A lighting control system that integrates with the Integrated Automation Facility Controls.

b. Performance Requirements:
### D 5040 Lighting

**1. See (CR D8010, Integrated Automation Facility Controls).**

**D 5040.50 Lighting Fixtures (LE D (20 yrs))**

- **a. Description:** Lighting fixtures specified and installed to promote well-being of the building occupants without sacrificing the energy requirements of the building.

- **b. Performance Requirements:**
  1. Target foot-candle levels for each space type within the building per IESNA standards.
  2. Task lighting shall be accounted for when performing footcandle calculations. Perform task tuning process to confirm general illumination of 30 footcandles is provided on the work surface.
  3. Emergency lighting power to come from Facility Power Generation, not local batteries.

### C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. Provide drawings that map target foot-candle levels per standards to all proposed spaces.</td>
</tr>
<tr>
<td></td>
<td>2. Lighting fixture cutsheet package for review and approval by Architect and UCSF.</td>
</tr>
<tr>
<td></td>
<td>3. Floor plans indicating lighting layout (including egress lighting fixtures), initial zoning, furniture and equipment, and foot-candle levels, both targeted and proposed. Provide foot-candle levels for normal daytime operations and after-hours operations.</td>
</tr>
<tr>
<td></td>
<td>4. Provide lighting control sequence of operations for each lighting control zone. Sequence shall include control parameters such as time delays, zone schedules, lighting sweeps, and footcandle setpoints (for daylight harvesting).</td>
</tr>
<tr>
<td></td>
<td>5. Update lighting control sequence of operations per DD phase.</td>
</tr>
<tr>
<td></td>
<td>6. Manufacturer’s shop drawings for lighting control system equipment layout, device interconnection and wiring, device and sensor coverage.</td>
</tr>
<tr>
<td></td>
<td>7. Task tuning and lighting control optimization shall be coordinated with campus staff including the Campus Energy Manager, Controls.</td>
</tr>
</tbody>
</table>
D 5080 Miscellaneous Electrical Systems

A. Intent

Provide a system for the protection of all electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

B. Description & Performance

D 5080.00 General

a. See (CR D50, Electrical, for system-level criteria.)

D 5080.10 Lightning Protection (Match LE of the Superstructure)

a. Protection provided to safeguard people and property from the risks and hazards associated with lightning strikes.

b. Performance Requirements:

1. Provide lightning protection system certified by a nationally recognized testing laboratory, and in compliance with NFPA 780, to ensure the building can withstand lightning strikes.

D 5080.20 Surge Protective Devices (LE D (20 yrs))

a. Description: Electrical system protection specified to depress and/or eliminate damage to electrical equipment related to electrical surges.

b. Performance Requirements:

1. Ensure the electrical system for the building has adequate electrical protection provided to avoid equipment damage and to prolong equipment lifetime by eliminating damage caused due to electrical surges.
C. Verification & Validation (All Tiers)

SD  1. Lightning Risk Assessment Study for UCSF’s review.

DD  2. See Contract.


D 60  Communications

A. Intent

Strive for excellence through the use of high-performing, adaptive, and innovative technology for telecommunications infrastructure, ubiquitous wireless access, audio visual infrastructure, and security infrastructure that integrates with all specified UCSF campus systems. The Integrated Delivery Team (IDT) shall consider the functional intent of the building and its users and then select communications system that, over their expected lifetime, successfully support:

1. The programmatic criteria.
2. Connectivity of facility users’ communications devices.
3. Connectivity of emergency responders’ devices.
5. Presentation of digital content to individuals and groups.
6. Audio-video conferencing for individuals and groups.
7. Capture of instructors’ presentations for web based access and redistribution.
8. The facility users’ effectiveness in their daily work activities.
9. Building Analytics
10. Smart Building Programming
11. Data integration into an enterprise data warehouse.

The effectiveness of communications are also highly dependent upon the physical environment in which they’re located. The IDT needs to think of the entire communications environment as a system, including:

12. All of the components that comprise the acoustic environment.
13. The physical configuration of spaces, including their aspect ratio and furniture.
14. Lighting.

Many of these systems’ technologies are developing rapidly. Consequently, it is important that
D 6010.10 Data Communications Network

The IP Ethernet based wired and wireless Local Area Network systems are the foundation of all University communication systems and shall be required for the building startup, commissioning and ongoing occupancy. The Communications Infrastructure shall be designed and constructed to support the successful implementation of the University provided wired and wireless LAN hardware by the Integrated Delivery Team (IDT).

A. Intent

The University shall design, procure and configure wired and wireless Ethernet network systems for the building. The Wired Ethernet network will support all Ethernet devices with a physical Ethernet port. Wired Ethernet devices typically include the following devices.

1. VoIP Phones
2. VoIP Gateways
3. Video Conferencing Systems and CODECs
4. Wifi Access Points
5. Printers
6. Multi-purpose Copier/Printer/Scanners
7. Work Stations, Computers and Laptops
8. Lighting Control System Interfaces
9. Energy Management System Interfaces to Electrical and Mechanical Devices
10. Access Control Panels
11. Video Surveillance Cameras and Network Video Recorders
12. Room Scheduling Panels
13. Digital Signage Display Systems
14. AV System Components
15. LED Displays and Video Projectors
16. Point-Of-Sale Systems
17. Medical Instruments

b. Performance:

1. The University ITS department shall assign IP addresses to all IDT-provided and installed Ethernet devices.
2. All devices with Ethernet ports that the IDT shall provide and install shall be identified to the University in the submittal phase of the project in order for the University to take these devices into consideration when designing the Ethernet system for the building.
3. The IDT shall accept University provided Ethernet equipment at the building site. The Integrated Delivery Team shall secure the equipment, install the equipment and interconnect the equipment to the buildings structured cabling system and electrical system.
4. No IDT Ethernet switches or hubs shall be provided, utilized or installed at the building site. All Ethernet devices shall have a direct connection to the University design Ethernet network.

D 6010.12 Data Communications Switches

a. Description: The University shall design, procure and configure Ethernet network switches for the building. All Ethernet devices in the building, University-provided or IDT-provided, shall be interconnected directly to the Ethernet network switches in the building. The IDT shall not utilize non-University Ethernet switches or hubs to interconnect Ethernet devices in the building.

1. The University shall provide temporary Ethernet switches to the IDT for use in testing and configuration of building management system that are utilized to
manage the mechanical and electrical system in the building before the telecom BDF, IDFs and CPFs are completed, cleaned, secured and ready for the installation of the permanent Ethernet switches.

2. The University utilizes Juniper rack mount Ethernet switches to support all Ethernet devices in the building. The Juniper Switches shall be rack mounted in the BDF and IDFs.

3. The Juniper network switches utilize dual load sharing power supplies and are designed to support 802.3af POE Plus 30watt POE devices.

b. Performance:

1. University Technicians shall schedule time with the IDT for inspection of the BDF and IDF spaces that the Ethernet switches shall be located. Prior to Inspection the BDF and IDF spaces that are to receive Ethernet switches shall have all Telecom, Electrical, Mechanical, Fire Alarm, Access Control and general contracting work completed.

2. Electrical power and lighting systems shall be complete and operational
   a. Mechanical systems and control system shall be complete and operational
   b. Fire Alarm sensors shall be installed.
   c. Access Control panels shall be installed and all wiring completed
   d. BDF and IDF interiors of equipment racks, vertical cable managers, cable runways, grounding system shall be complete and dust free.
   e. Structured cabling systems shall be terminated and tested. Termination blocks and panels shall be labeled.
   f. Test results for structured cabling systems shall be provided to the University, reviewed and accepted by the University.
   g. Access Control card reader on the BDF and IDF to be occupied shall be operational.
   h. BDF and IDF to be occupied shall have all surfaces, fixtures, enclosures and equipment from deck to deck completely and thoroughly vacuum cleaned and wiped down to be completely free of all debris, dust and film.

3. Upon acceptance of the BDF and IDF spaces that are to be occupied the University shall schedule time with the IDT for the University ITS staff to bring
the Ethernet switches to the building, into the BDF and IDF's and mount the
switches in the equipment racks.

4. Wired Ethernet switches shall be located at the bottom of IDT-provided
equipment racks in the IDF's. This location shall be taken into consideration by
the IDT when procuring the Visipatch patch cords that are to be used to
interconnect the Ethernet switches to the building's copper structured cabling
system.

5. The IDT shall provide, place and label category 6 patch cords between the wall
mounted Visipatch 360 terminal blocks and the ports on the rack mounted
Ethernet switches per patching schedules provided by the University.

   a. The University ITS staff shall meet with the IDT prior to patch cord
      placement to review the patch cable installation and labeling
      protocols required by the University.

   b. The IDT shall provide a sample labeled patch cable prior to creating
      labels for all patch cables and prior to beginning the patch cable
      installation.

6. The University ITS staff shall place and label IDT-provided single mode patch
cables between the rack mounted fiber optic termination panel and the rack
mounted Ethernet Switches in the BDF and IDF's.

D 6010.13 Data Communications Wireless Access Points

a. Description: The University utilizes Aruba Networks WIFI system throughout campus
buildings. The University will be responsible for the design, procurement and
configuration and testing of the WiFi system for the building. The WiFi System shall be
installed in the building as late as possible so as to avoid damage to WiFi Access Points.

1. WiFi coverage shall uniform throughout the building interior

2. WiFi coverage is expected in outdoor courtyards and seating areas adjacent to
the building. The outdoor locations shall be architecturally and electrically
integrated with the building exterior and site landscaping design

3. The Wireless Access System utilizes the category 6 network cabling that the
IDT provides to interconnect the Wireless Access Points (WAPS) with the
Network switches in the IDF's. The Design of the WiFi System will need to be
completed by the University prior to the IDT completing the construction
documents for the building. The Wifi System design will require a minimum of 100 percent complete Design Development drawings as the Wifi design and RF signal coverage is dependent on wall partition location and materials as well as floor and ceiling materials. The WAPS are typically located on the ceilings of the building and are designed to attach to a variety of suspended ceiling grid systems as well as to tabbed back boxes or mud rings in hardpan ceilings and or underside of exposed concrete decks. There shall be no exposed cabling and or connectors at the WAP locations when the project is completed.

a. Each WAP requires two Category 6 four pair copper cables
b. On average the IDT should expect a minimum density of one WAP per 800 GSF. This will increase in the areas of auditoria, classrooms and conference rooms based on a high density of users in a specific area.

c. WAPs are provided with low voltage electrical power from the network switches in the IDFs through the one of the two category 6 copper cables at each WAP. This power method is referred to as Power Over Ethernet (POE).

d. WAPs located in areas with exposed structural concrete shall be mounted to double gang deep concrete boxes that are cast in place during the building construction. Conduit pathways may stub to the floor above or route through the structural deck to adjacent areas with and accessible ceiling system.

e. WAPs shall not be located under any raised floor system or in a space, enclosure or fixture that the WAP indicator lights cannot be clearly observed.

b. Performance:

1. University ITS department shall schedule time with the IDT prior to completion of Design Development drawings to discuss the locations of Wireless Access Points throughout the building. The University utilizes the services of a WiFi/RF consultant to develop the design for the Wireless Access System that will be implemented at the building.

   a. The WiFi/RF Consultant will require a complete set of 100 Percent
Design Development drawings as well as access to the IDT to understand the composition and structure of wall partitions, floor structures and the materials associated with these items so that the consultant can design the layout of the WAPs to provide the optimal WiFi coverage to the building users.

2. The IDT will pick up the locations of the WAPs as provided by the University and the Universities Consultant and indicate the required back boxes and pathways as well as structured cabling on the Design-Build Construction drawings.

3. The IDT will provide and place and test all required pathways and structured cabling to support the Wifi System.

4. The University shall provide to the IDT the WAPs and the IDT shall install and label each WAP in the building per the University’s installation and labeling requirements.

C. Verification & Validation (All Tiers)

1. Indicate the elements of the structured cabling system as well as the back boxes, and pathways that will be utilized to support the Wired and Wireless Network.

2. Indicate all types of IDT Ethernet devices that will be implemented at the building.

3. Provide a construction schedule that shows the BDF, IDFs and CPFs completion ahead of other areas in order for the wired network to be available for start-up of mechanical and electrical systems.

4. Provide material submittals for all materials associated with the IDT’s installation of the University-provided wired and wireless Ethernet system.

5. Provide a project schedule with dates of completion and availability of the BDF, IDFs for installation of the University provided wired Ethernet switches.

6. Provide meeting and work session time with the University’s RF consultant to walk through the building design and give the consultant the information on partition and floor materials need to
complete the Wifi System Design.

7. Provide Reflected ceiling plans that indicate the locations of the WAPs and the associated Category 6 copper cabling.

8. Provide a complete list and description of all Wired IP devices that the IDT will provide and install in the building. The University requires this in order to assign IP addresses for these devices.

9. Provide a labeled sample of the Visipatch 360 patch cord that the IDT will provide, install and test between the University provided wired LAN switches and the DB team provided Structured Cabling terminations at the Visipatch blocks in the IDFs.

10. Provide a schedule of all WAPs to be installed with the University required WAP labeling IDs included in the schedule.

11. Provided a project schedule with dates of completion and availability of the BDF, IDFs for installation of the University provided wired Ethernet switches.

12. Provided a project schedule with dates of completion and availability:

13. BDF, IDFs for installation of the University provided wired Ethernet switches.

14. Infrastructure that supports WAPs so that the University knows when to have WAPs delivered to the Building.

15. Provide onsite support staff that can trouble shoot any structured cabling and or electrical power issues that could arise during the start-up of the wired and wireless network systems.

D 6020.20 Voice Communications Terminal

Equipment

A. Intent

Voice communications at the University is accomplished with VoIP and AT&T dial tone. Life Safety systems and non UCSF entities utilizes AT&T dial tone. University employees utilize VoIP. The
D 6020.20 Voice Communications Terminal

B. Description & Performance

D 6020.21 General

a. Description: The University utilizes Voice over IP (VoIP) to provide telephone services to the majority of users in new campus buildings. Buildings built prior to 2011 utilize AT&T CENTREX to provide telephone services to building users. Overall the University is in the process of moving away from AT&T CENTREX for the majority of its Telephone service, however this can vary by building use and or departmental requirements.

   1. Elevator Phones, Fire Alarm Dialers and back-up Alarm circuits utilize AT&T CENTREX. On the Mission Bay Campus there are two AT&T Minimum Points of Entry, MPOEs that provide dial tone to these type of devices.

      a. Genentech Hall 500 16th Street
      b. Helen Diller Family Comprehensive Cancer Ctr, 1450 3rd Street.

b. Performance:

   1. The IDT shall provide, install and configure the elevator phones, fire alarm dialers and other dialers associated with back up alarms in the building.
   2. Section D6090 indicates the cabling requirements for these non-VoIP telephone devices.

D 6020.22 University Systems

a. Description: The University utilizes Voice over IP (VoIP) to provide telephone services to the majority of users in new campus buildings. Buildings built prior to 2011 utilize AT&T CENTREX to provide telephone services to building users. Overall the University is in the process of moving away from AT&T CENTREX for the majority of its Telephone service, however this can vary by building use and or departmental requirements.

   1. The VOIP phones sets require one Category 6 four pair copper cable and are powered through Power Over Ethernet (POE) from the University provided Ethernet Switches located in the IDFs of the building.

b. Performance:

   1. The University’s ITS organization will design, procure and configure the VoIP
system for the Building.
2. The IDT will coordinate the schedule for Installation of the VOIP devices, accept these devices from the University at an agreed upon time towards the end of the construction phase and install these devices throughout the building.
3. The IDT shall carry line items in the construction schedule indicating the beginning of VoIP Phone placement by floor of the building.
4. The Structured Cabling system indicated in D6090 Communications Supplementary Components that is design and provided by the IDT shall support the implementation of all University Voice Communications Terminal Equipment.
5. See (CR G5010.30) for Site Communications Distribution.

**D 6020.23 Elevator Phones**

a. Description:

1. Elevator Phones, utilize AT&T CENTREX. On the Mission Bay Campus there are two AT&T Minimum Points of Entry, (MPOEs) that provide dial tone to these type of devices:
   a. Genentech Hall 500 16th Street
   b. Helen Diller Family Comprehensive Cancer Ctr, 1450 3rd Street

2. The AT&T CENTREX dial tone is brought to each building BDF from one of the two campus MPOEs over outside plant copper cabling. There are three existing 1800 pair feeder cables on the Mission Bay campus that connect the MPOEs to Cross Boxes located on Gene Friend Way and Nelson Rising Lane.

b. Performance:

1. The University ITS organization is responsible for management of the AT&T CENTREX service and will meet with the IDT during Construction Document phase of the project discuss the quantity of AT&T Centrex circuits and the location of the existing outside plant cross boxes that the project will need to route OSP copper cabling to for the AT&T Centrex Services.

2. The IDT will develop a complete list of all AT&T Centrex circuits required by the project and work closely with UCSF ITS to understand what telephone services can be delivered on AT&T CENTREX for University Buildings.
3. The IDT is responsible for the design of the elevator system including the telephone units required in each elevator car. The trailer cable to the elevator car shall be designed and built to include all required low voltage conductors to support the elevator car telephone as well as other low voltage devices such as card readers required to control the elevator car. See (CR D7010.10, Access Control).

4. The Structured Cabling system indicated in D6090 Communications Supplementary Components that is design and provided by the IDT shall support the implementation of AT&T Centrex lines between the building entrance protector located in the BDF and Elevator phones located in the elevator cars in the building.

5. See (CR G5010.30) for Site Communications Distribution.

D 6020.24 Alarm Dialers

a. Description:

1. Fire Alarm Panels utilize AT&T CENTREX. On the Mission Bay Campus there are two AT&T Minimum Points of Entry (MPOE) for the demarcation of AT&T telephone dial tone. There is existing campus telephone feeder cabling between the MPOE and cross connection boxes on the UCSF campus north of 16th street.

2. Security Alarm Panels utilize AT&T CENTREX service for backup alarm communications. The UCSF Campus network is utilized as the primary communications connection for Security Alarm Panels.

b. Performance:

1. See (CR D6020.23.b, Elevator Phones - Performance).

2. The Structured Cabling system indicated in D6090 Communications Supplementary Components that is design and provided by the IDT shall support the University’s implementation of POTS lines between AT&T Centrex lines between the building entrance protector located in the BDF and alarm dialers located in the building.

3. See (CR G5010.30) for Site Communications Distribution

D 6020.25 VOIP Audio Gateways

a. Description: AV Systems with Microphones, Speakers and Digital Audio Processors
should include a VoIP Gateway in the Digital Audio Processor to allow the AV system to provide Audio Conferencing through the University’s VoIP network. This allows Audio Conferencing through the AV system and not through adding a separate VoIP conference phone system on the room’s table top.

b. Performance:

1. See (CR D6030.10, A/V Systems)
2. The IDT shall design, provide, configure, test and demonstrate VoIP Audio Gateways in the AV systems that utilize Microphones, Speakers and Digital Audio Processors.
3. See (CR D6010.10, Data Communications Network Equipment).
4. The Structured Cabling system indicated in D6090 Communications Supplementary Components that is designed and provided by the IDT shall support the VoIP Audio Gateways.

D 6020.26 UCSF VOIP Telephones

a. Description:

1. UCSF Utilizes VoIP for campus telephone service. UCSF ITS support, designs, procures and configures the VoIP devices and system for UCSF users.
2. Cisco phone devices are utilized. These phones are powered by “Power Over Ethernet” and use the “SIP” VoIP protocol.
3. Emergency 911 services utilize Cisco Emergency Responder, which uses the Phones IP Address to determine location of 911 caller.
4. Cisco Model 7841 Phones for General Staff, includes a multiple-line display and speaker phone functionality. Supports a maximum of 4 lines.
5. Cisco Model 8851 Phones for advanced users requiring more than 4 lines, or Automatic Call Distribution (ACD) features.
6. Cisco Model 8861, adds wireless capabilities and the same features as Cisco Model 8851.
7. Cisco Model 8831 Conference Room Phones will be utilized in conference rooms and provide full duplex speaker phone functionality.

b. Performance:

1. UCSF utilizes Cisco Systems VoIP telephone Sets
   a. UCSF ITS will meet with UCSF faculty and staff that will be relocating
to the new building and will work with them to match Cisco VoIP telephone sets to their voice communications requirements.

b. The Category 6 structured cabling system indicated in Section D6090 Communications Supplementary components shall support either VoIP Ethernet devices and or Analog Telephone devices.

c. VoIP Telephone devices are provided with power through IEEE 802.3af Power Over Ethernet, POE.

2. The IDT will be responsible for placing and interconnecting the VoIP telephone sets through-out the building.

**D 6020.27 UCSF Fax Gateways**

a. **Description:**

1. Cisco Analog Gateways are utilized to support fax services at the buildings multipurpose Printer/Scanner/Fax Devices. The analog gateways provide POTS lines, (plain old telephone service) to support fax devices in the building.
   
   a. Cisco Model VG-310, a 24 port solution  
   b. Cisco Model VG-320, a 48 port solution  
   c. Cisco Model VG-350, a 96 port solution

b. **Performance:**

1. UCSF ITS supports analog gateways to support POTS lines for fax services through-out new campus buildings.

2. UCSF ITS will meet with UCSF faculty and staff that will be relocating to the building and will work with them to support fax services through the multipurpose printer/scanner/fax machines located in the building.

   a. UCSF provided and installed fax gateways will be located in the BDF. The buildings backbone copper cabling and horizontal station cabling will be utilized to distribute the POTS lines to the fax device locations throughout the building.

   b. The Structured Cabling system indicated in D6090 Communications Supplementary Components that is design and provided by the Integrated Delivery Team shall support the Universities implementation of POTS lines between fax gateways located in the
SERVICES

D 6020.20 Voice Communications Terminal

BDF and Fax machines located in the building.

- UCSF will provide the IDT with termination locations of Analog POTS lines throughout the building during the construction document phase of the design.

D 6020.28 Point of Sale Devices

a. Description

1. Cisco Analog Gateways are utilized to support point of sale devices at the buildings. The analog gateways provide POTS lines, (plain old telephone service) to support the point of sale card reader terminals.
   
   a. Cisco Model VG-310, a 24 port solution
   b. Cisco Model VG-320, a 48 port solution
   c. Cisco Model VG-350, a 96 port solution

b. Performance:

1. UCSF ITS supports analog gateways to support POTS lines for point of sale devices through-out new campus buildings.
2. UCSF ITS will meet with UCSF faculty and staff that will be relocating to the building and will work with them to determine the location of point of sale devices throughout the building.

   a. UCSF provided and installed fax gateways will be located in the BDF. The building’s backbone copper cabling and horizontal station cabling will be utilized to distribute the POTS lines to the fax device locations throughout the building.

   b. The Structured Cabling system indicated in D6090 Communications Supplementary Components that is design and provided by the Design-Build IDT shall support the Universities implementation of POTS lines between fax gateways located in the BDF and point of sale devices located in the building.

- UCSF will provide the IDT with termination locations of Analog POTS lines throughout the building during the construction document phase of the design.

D 6020.29 CA Poison Control System (CPCS) (Upcoming UCSF Meeting to Determine)
a. Description: The California Poison Control System, managed by the University of California San Francisco, School of Pharmacy, Department of Clinical Pharmacy, consists of four answering sites: UC Davis Medical Center (Sacramento Division), San Francisco General Hospital (San Francisco Division), Children’s Hospital Central California (Fresno/Madera Division), UC San Diego Medical Center (San Diego Division). The central administrative office is located at UCSF’s Laurel Heights campus in San Francisco. CPCS is a certified member of the American Association of Poison Control Centers.

1. The California Poison Control System (CPCS) has a dedicated IP enabled PBX Avaya phone system supported by ConvergeOne.

2. The CPCS central admin office at Laurel Heights has an Avaya G450 Media Gateway (single T1 PRI-23 voice 1 control) to connect them to the telephone system.

3. CPCS utilizes a non-UCSF ATT AVPN MPLS layer 3 statewide fiber data network protected by an ATT managed Network Based fire wall. The WAN connects the four statewide ACD answering sites and the Laurel Heights central admin office.

4. The CPCS central admin office connection to statewide AVPN is 20M fiber connection – Managed by AT&T and terminated in Ciena 3930 network interface device in the office space at UCSF Laurel Heights.

5. Other Hardware located in two Server cabinets in the Laurel Heights central admin office space.

   a. HP c3000 Blade Cabinet with 3 server blades
   b. HP MSA 2012i ISCSI Storage Area Network
   c. HP DL350 File and Print Server with Tape Backup unit
   d. Avaya 9135 UPS with 1 Extended Battery Module
   e. Cisco 2960 Ethernet Switches
   f. Cisco 2921 Router
   g. Copper patch panels for termination of the twisted pair network cabling used to connect the hardware to the VoIP Phones and Ethernet Printers in the central Admin Office Suite.

6. The Avaya UPS unit is connected to a 30 amp 120 volt emergency power circuit.

7. The Laurel Height central admin office for the CPCS will be relocated to the
block 33 building.

b. Performance

1. The IDT will develop office space within the new Building for the CPCS per their programmatic requirements.
2. The Building’s Data Communications Support spaces BDF and IDFs shall be utilized to support the Voice Data and Networking hardware currently located in two Server cabinets.
   a. The IDF that supports the structured cabling terminations for the CPCS central admin office suite at the new building will be enlarged in size to support an 11 foot by 8 foot space and two new server cabinets. See (CR D6090.20, Data Communications Support Spaces).
   b. The AT&T AVPN 20M fiber service will enter the new building through the BDF and may have to be terminated in the BDF if AT&T does not extend it through building backbone pathways to the IDF that the CPCS system hardware will be located.
   c. The final termination of the AT&T AVPN location in the new building will need to be worked out between the CPCS support staff and the Service Provider. Additional hardware may be required to allow a portion of the CPCS system to be located in the BDF and interconnected to the IDF using the building’s backbone fiber optic infrastructure.
3. The Building’s structured cabling system shall be utilized to support the Voice and Data Networking requirements of the CPCS.
   a. The Structured Cabling system indicated in D6090 Communications Supplementary Components that is design and provided by the IDT shall support connectivity between the user devices in the office suite and the various devices that make up the CPCS system at the central admin office location.
4. The CPCS and the University shall be responsible for the physical relocation of the CPCS systems hardware and end user devices.
5. The IDT shall be responsible for the provision of placement and labeling of...
copper and fiber optic patch cords between the wall mount terminal blocks in the IDF and the CPCS hardware as well as between the BDF and IDF if required.

6. The IDT shall be responsible to facilitate the Service provider field technicians that will be terminating the 20M AVPN fiber service and the Primary rate copper lines at the location in the building BDF or IDF that services the CPCS central admin office in the building.

### C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Indicate in a narrative the elements of the communications support spaces, pathways and structured cabling system will be utilized to support the Voice communications systems.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Indicate all types of IDT voice communications devices in addition to those provided by the University that will be implemented at the building.</td>
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<td>3. Provide a construction schedule that shows the coordination with the voice communications systems and the IDT’s implementation of all voice communications devices.</td>
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<tr>
<td>DD</td>
<td>4. Provide material submittals for all Voice communications devices to be provided by the IDT.</td>
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<td>5. Provided a project schedule with dates of completion and availability of the BDF, IDFs for installation of the both the IDT provided and University provided Voice communications systems and devices.</td>
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<tr>
<td></td>
<td>6. Provide meeting and work session time with the Universities Voice communications staff including the CPCS IT staff to walk through the building design and coordinate the communications support spaces, pathways and structured cabling to insure the successful integration of the Voice Communications Systems with the infrastructure indicated in section (CR D6090, Communications Supplementary Components).</td>
</tr>
<tr>
<td>CD</td>
<td>7. Provided a project schedule with dates of completion and availability of the BDF, IDFs for installation of the University-provided wired</td>
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SERVICES

May 28, 2016 Mission Bay East Campus Phase 1 (Block 33)
527
University of California, San Francisco, Project No: M4603

D 6030 A/V Communications

Technical Criteria

Ethernet switches.

Construction

8. Provided a project schedule with dates of completion and availability of BDF, IDFs and structured cabling for installation of the University-provided Voice Communications Systems.

9. Provide test results for all structured cabling for review by the University Voice communications staff prior to the implementation of the Voice communications systems in the building.

10. Provide meeting and work session time with the University’s Voice communications staff including the CPCS IT staff to coordinate the schedule for delivery of university provided voice communications devices by the IDT.

Startup

11. Provide onsite support University IT staff that can trouble shoot any structured cabling and or electrical power issues that could arise during the implementation and start-up of the Voice Communications systems.

D 6030 A/V Communications

A. Intent

The Integrated Delivery Team (IDT) shall provide conference rooms and classrooms with Audio-Visual systems sized and configured to support high quality presentation, video conferencing and course capture activities for the room’s physical size, occupancy and support protocol. The rooms shall be designed for ease of:

1. Occupant utilization of the AV system.
2. Installing and connecting wall and table top based audio visual equipment.
3. Integration with furniture systems.

D 6030.10 A/V Systems

A. Intent
The Integrated Delivery Team (IDT) shall provide conference rooms and classrooms with Audio-Visual systems sized and configured to support high quality presentation, video conferencing and course capture activities for the room’s physical size, occupancy and support protocol. The rooms shall be designed for ease of:

1. Occupant utilization of the AV system.
2. Installing and connecting wall and table top based audio visual equipment.
3. Integration with furniture systems.

B. Description & Performance

D 6030.11 General

a. Description:

1. See CR D6030.50, Electronic Digital Systems for additional AV criteria.
2. See CR D6060.10, Distributed AV Communications Systems for additional AV criteria.
3. AV system functional levels for shall be presentation, Video Conferencing and media capture:

   a. Presentation systems are the source, routing and display devices that provide highly intelligible communication of speech, music, graphics to groups of people. This includes equipment such as microphones, loudspeakers, flat panel displays, video projectors, projection screens, computers and the interface, mixing, processing, routing and control equipment that connects these devices together and allows the user to select the appropriate sources and operate the system.

   b. Videoconferencing is defined as real-time, two-way symmetric audio video communications. Video conferencing are comprised of hardware and software CODECs (coder/decoder), cameras, microphones, audio echo cancellers, processing, routing, switching and display equipment.

   c. Media capture is defined as a once way delayed (asynchronous) audio, video and computer data file that can be archived, edited and posted to a web based streaming sever for later viewing. The course capture system shall have the ability to stream and record...
The system is a one-way system with no support for communications in real time by the views with the class session attendants.

b. Performance

1. Campus buildings shall be provided with a complete physical infrastructure to support the complete build-out of the following, even if the video conferencing systems are to be implemented in the future:
   a. Conference rooms: the presentation system and video conferencing systems.
   b. Classrooms and Assembly rooms: the presentation system, video conferencing systems and media capture systems.

c. References

1. ANSI/Infocomm 2M-2010 Standard Guide for Audio visual Systems Design and Coordination Processes shall be utilized in the AV system design and implementation process.
2. UCSF Educational Technology Services, Crestron control programming for classroom and public conference room environments.
3. UCSF ITS/TeleHealth Standards.

D 6030.12 Conference Rooms

a. Description:

1. Conference room AV systems shall provide Presentation and Video Conferencing functionality.
   a. Video display and projection systems viewing height and width shall be designed to support small font document viewing by all occupants seated at tables in a conference room.
   b. Cisco Unified Communications is the UCSF standard for Video, Voice and Web collaboration in conference rooms supported by UCSF ITS/TeleHealth.
   c. The standard control interface for collaboration in the Cisco Unified Communications environment is the Cisco Touch 10 control panel attached to the Universities wired network.
d. The Video Conferencing system shall also support audio only conferencing.

b. Performance:

1. See CR Table D6030.12-A Conference Room AV Systems.
2. The Conference Room AV Systems utilize the University IP based network as well as audio and video cabling and components and require a high degree of architectural and electrical coordination and integration to be successfully implemented by the IDT.
3. Conference Room AV System device and cabling shall be integrated with the furniture systems as well as floor and wall enclosures.

D 6030.13 Classroom

a. Description:

1. Classroom AV systems shall provide Presentation and Media Capture functionality.
   a. Video display and projection systems viewing height and width shall be designed to support small font document viewing by all occupants seated throughout classrooms.
   b. Crestron is the UCSF ETS Standard for control hardware and software in classrooms and public conference rooms that will be supported by UCSF ETS.
   c. Sonic Foundry is the Standard for Media Capture hardware and software in the classroom environment at UCSF.

b. Performance:

1. See (CR Table D6030.13-A Classroom AV Systems).
2. The Classroom AV Systems require a high degree of architectural lighting and electrical coordination and integration to be successfully implemented by the IDT. Image heights, size, resolution, brightness, viewing angles, camera capture angles, image resolution, lighting contrast and angle to captured images must be carefully coordinated for a successful and acceptable classroom implementation.

C. Verification & Validation (All Tiers)
<table>
<thead>
<tr>
<th><strong>SD</strong></th>
<th><strong>DD</strong></th>
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<tbody>
<tr>
<td>1. Updated Narrative that describing the AV systems functions and configuration for each space type.</td>
<td></td>
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<tr>
<td>2. Product cut Sheets identifying AV system components, and manufacturers.</td>
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<tr>
<td>3. Schematic level single line drawing for each type of AV system.</td>
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</tr>
<tr>
<td>4. Architectural floor plans that clearly indicate: front of room, presenter area and or location in the room, video display and or projection screen locations with notations indicating view area height and width as well as dimension from floor to bottom and top of display and or projection screen.</td>
<td></td>
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<tr>
<td>5. Product cut Sheets identifying AV system components, and manufacturers.</td>
<td></td>
</tr>
<tr>
<td>6. Design Development level single line drawing for each AV system type and space type. The DD level Single line shall show connectivity coordination with the building network, electrical system and lighting system.</td>
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<tr>
<td>7. Architectural floor plans that clearly indicate: front of room, presenter area and or location in the room, video display and or projection screen locations with notations indicating view area height and width as well as dimension from floor to bottom and top of display and or projection screen.</td>
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</tr>
<tr>
<td>8. Lighting studies for classrooms indicating lighting coordination with the video display, projection screen and video projector, the presenter area and presenters face and, the white board areas.</td>
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</tr>
<tr>
<td>9. Lighting studies for conference rooms indicating lighting coordination with the video display, projection screen and video projector, the occupants seated at tables and, the white board areas.</td>
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<tr>
<td>10. A set of Enlarged architectural floor plans, elevations and reflected ceiling plans for each type of huddle, conference and classroom showing AV system device locations coordinated with electrical power, lighting fixture layout as well as mechanical system layout. Two furniture configurations shall be shown for conference rooms</td>
<td></td>
</tr>
</tbody>
</table>
11. Horizontal and vertical viewing studies for each of the enlarged room types demonstrating the ability of the AV system to support small font viewing the occupants seated at tables in the room.

12. A control flow diagram for each AV system indicating the control flow from start of use to completion of use of each AV system type. The control flow diagram shall reference the control screens in the Telehealth Control configuration and the Educations Technology Support control configuration.

13. Product cut Sheets identifying AV system components, and manufacturers.

14. Implementation level single line drawing for each AV system type and space type. The Single line shall show detailed connectivity and individual cabling runs as well as cable types. All device part number shall be indicated in this level of single line diagram. The Cable Identification numbering and device numbering shall be clearly indicated on the implementation level single line drawings.

15. Rack Elevations of AV equipment in all AV Racks.

16. Architectural Elevations of all interior walls for huddle rooms, conference rooms and classrooms indicating all devices and their dimensions and heights form the finished floor.

17. Architectural floor plans that clearly indicate: front of room, presenter area and or location in the room, video display and or projection screen locations with notations indicating view area height and width as well as dimension from floor to bottom and top of display and or projection screen.

18. Architectural Reflected Ceiling plans indicating all ceiling mounted device locations including speakers, microphones and video projectors, projection screens coordinated with mechanical registers and devices, electrical light fixtures and devices.

19. A set of Enlarged architectural floor plans, and reflected ceiling plans for each type of huddle, conference and classroom showing AV
system device locations coordinated with electrical power, lighting fixture layout as well as mechanical system layout. Two furniture configurations shall be shown for each conference room and classroom.

20. Control system functional diagram with each control screen and a narrative that describes the operations and outcomes of each control screen. The movement forward and backward in the control screen sequence shall be clearly described.

21. A Schedule/Table identifying each piece of AV Equipment that has an Ethernet port its part number, manufacturer location in the building by room number. This table will be utilized to identify the IP addresses that the University will need to assign.

<table>
<thead>
<tr>
<th>Construction</th>
<th>22. A complete set of record drawings, submittals and specification in a digital format and a set of all programming files and documentation in digital format</th>
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<tr>
<td></td>
<td>23. AV system training protocols for support staff.</td>
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<td></td>
<td>24. Av System training sessions for support staff.</td>
</tr>
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<td></td>
<td>25. AV system training protocols for end users.</td>
</tr>
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<td>26. AV System training sessions for end users.</td>
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<td>27. AV System testing procedure, parameters and test results.</td>
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</table>

D 6030.50  Electronic Digital Systems

A. Intent

The Integrated Delivery Team (IDT) shall provide digital display systems, located, sized, configured and integrated with the building’s interiors to support digital wayfinding and digital information display requirements. The infrastructure shall:

1. Maximize viewing clarity.
2. Maximize ease of use.
3. Maximize exposure to building users.
4. Be located at points in the users’ navigation journey where they most want/need the
D 6030.50  Electronic Digital Systems

Technical Criteria

5. Be designed for ease of integration with the University’s existing digital information and wayfinding systems.

6. Be designed for ease of supporting change of display and support equipment over the life of the building.

7. Not create direct or indirect glare on any computer monitors, including at reception and security desks.

B. Description & Performance

D 6030.51  General

a. Description: Digital signs are a type of electronic display with the ability to have a variety of different content types displayed, such as video, gifs, pdfs, menus, maps, etc. Digital Signs also allow for the content on the sign to change automatically, on a schedule, or manually, as desired.

b. Performance:

1. Uses for digital signs at UCSF
   a. Wayfinding
   b. Informing
   c. Publicizing

2. Benefits
   a. Remove visual and physical clutter from common spaces
   b. Provide a campus-wide graphic communications system
   c. Cost savings over non digital printed signage design, production and management.

3. Oversight & Governance
   a. UCSF Campus Life Services manages digital display systems throughout the UCSF campus locations.
   b. UCSF Campus Life Services utilizes a Four Winds application to support content on the digital display systems.
   c. Although installation of signs may be initiated by a variety of different UCSF departments or groups, they remain a part of the UCSF brand and identity. While their purpose may vary by location
and primary function, they will provide the greatest value to the 
UCSF institution when leveraged as a platform for collaboration, 
sharing information, and innovation as widely as possible across the 
various locations. UCSF Campus Life Services supports the Digital 
Signage Governance Committee formed from a wide variety of 
campus digital signage users.

d. UCSF Campus Life Services, Digital Signage Recommendations 
V1.11

**D 6030.52 Digital Display System (LE A (8 Yrs))**

a. **Description:** Digital signage display systems shall be provided in high traffic areas of 
UCSF Campus buildings for use by UCSF departments to inform and publicize building 
occupants and visitors of campus events and programs. In addition, the digital signage 
system shall support wayfinding.

1. Digital Signage Display systems shall be located in high pedestrian traffic 
areas of the building.
   
a. Architectural floor plans shall clearly indicate the Digital Signage 
locations throughout the building.
   
b. Top of display shall not exceed 7’-6” AFF.
   
c. Bottom of display shall not be lower than 1’-6” AFF
   
d. Clearance between multiple displays shall be a minimum of 12 
   inches.
   
e. Side clearance to corners shall be a minimum of 24 inches.
   
f. Multiple displays may be located perpendicular to each other.

2. Space shall be allocated at each digital signage display for multiple people to 
stop and utilize the system without blocking the area from other pedestrian 
traffic.

3. A minimum of two displays shall be provided on a building ground floor and 
one on each floor above the ground floor.

b. **Performance:**

1. Digital Display Equipment
   
a. LED LCD 1,920 x 1080 resolution
b. LED full array backlighting

c. 700 cd/m² minimum brightness

d. 4000:1 contrast ratio without local dimming

e. 70 inch minimum diagonal size

f. Maximum display depth 2 inches

g. Professional/Commercial Grade designed for 24/7 operation

h. Response time maximum 6ms

i. Inputs: HDMI and Display port

j. Network: Wired Ethernet 10/100/1000 Mbs

k. Touch screen capability

l. Wall mounted Portrait Installation.

m. VESA mounting

2. Display Mounting

   a. ADA-compliant mounting height and offset to wall partition

   b. Provides portrait oriented mounting

   c. Articulating arm locking display mount that allows the digital display to be pulled away from the wall and rotated for easy access to back side of display, associated cabling large format back box and the networked attached computing device.

3. Back box & Electrical Power

   a. 780 cubic inch large format AV wall boxes designed to support electrical receptacles and data cabling jacks that provide power and network connectivity to the network attached computing device that delivers content to the digital display.

   b. Each display requires one duplex 120volt 20amp receptacle located in the side wall of the large format AV wall box behind the display. Up to two displays may be served by one 120 volt 20 am circuit.

4. Network Attached Computing Device

   a. UCSF Campus Life Services will provide the network attached computing device that will be utilized to deliver content to the digital display.

   b. The IDT shall install and interconnect the University-provided
D 6030.50 Electronic Digital Systems

D 6030.53 Digital Wayfinding (LE 10 Yrs)

a. Description: A Digital Wayfinding system shall be for use by UCSF faculty, staff and visitors to find their way through out the building and the UCSF Campus and shall be integrated with the building’s digital display system.

1. Digital Wayfinding shall be an integrated component of the digital display system and shall be located in high pedestrian traffic areas of the building.

b. Performance:

1. Wayfinding navigation on the digital display system shall be supported through touch screen capability.
2. Wayfinding system shall be linked to the UCSF Campus Directory to provide digital mapping from the wayfinding displays location to faculty and staff located on the campus.
3. The system shall integrate and connect with the UCSF Live 25 scheduling system and provide a classroom schedule as well as wayfinding to the selected classroom on the campus.
4. Graphic mapping shall enable a user to see dynamic paths on how to get to a selected location from their current location at the wayfinding system display
5. Push to mobile device capability that allows selected directions to be sent to the user’s mobile device.
6. At a minimum, Digital Directories/Wayfinding shall be located on each floor of the building and the Lobby. A secondary set of Digital Directories/Wayfinding need to be included for the Clinic portion of the building.

D 6030.54 Video Walls (LE 16 Yrs)

a. Description: A specialty, multi-display configuration that consist of an array on digital displays tiled together continuously to form on large contiguous display. Displays designed for use in video walls shall have narrow to non-existent bezels in order to minimize mullion, the gap between active areas of the displays. Video wall components are design and manufactured with long serviceability in mind. The individual displays are components of an overall hardware system that enables displays to stack and or tile together physically along with an integrated connectivity infrastructure for power video and control signals between display components. The Video Wall shall be a complete...
Technical Criteria

D 6030.50  Electronic Digital Systems

System developed by a single manufacturer.

1. Initial or space for future Video Walls shall be architecturally integrated into a high traffic area of the building on the ground floor, be readily visible to pedestrians outside the building for off-hours marketing, and shall not be a standalone system.

2. Additional initial or space for future Video Walls shall be considered during programming and should be architecturally integrated into high traffic areas near elevator lobbies or department entrances on ground and upper floors.

3. Video Walls shall support all functions of the digital display system.

4. The size and content being displayed on the initial or future Video Walls (electronic scientific posters dictate that viewers stand in front of the wall long enough to consume the content) should inform the IDT as to sizes of the space needed in front of the wall, traffic patterns, wayfinding and highly designed lighting and control of daylighting for best perception of the content.

b. Performance:

1. Minimum video wall diagonal 117 Inches.
2. Minimum video wall resolution, 2,135 x 1289 Pixels (1080HD Capable)
3. Minimum video wall area, 6,030 square inches.
4. Viewable Display Area: 100%
5. Maximum Display Tile to Display Tile Seams 0.02 inches
6. Ideal Viewing Distance 6-40 feet.
7. Individual display tile: Laser Phosphorus Display LPD.

C. Verification & Validation (All Tiers)

SD 1. Product cut Sheets identifying electronic digital systems major components, and manufacturers.
2. Architectural floor plans identifying the location and size of the electronic digital systems throughout the building.
3. Narrative that describes the IDT’s vision of the interaction between the building users and visitors and the electronic digital systems indicated on the architectural floor plans.
4. Architectural floor plans identifying the location and size of the electronic digital systems throughout the building.

5. Architectural elevations detailing the electronic digital systems.

6. Horizontal and vertical viewing studies for each display in the electronic digital system.

7. Product cut sheets identifying all components and details of the electronic digital systems.

8. Architectural floor plans identifying the locations and sizes of the electronic digital systems components.

9. Architectural elevations of all electronic digital systems locations showing complete coordination with the spaces that the electronic digital system devices are located.

10. Detailed single line diagrams showing all devices and wiring associated with the electronic digital systems.

11. Complete list of all electronic digital system devices that will require IP addresses. See (CR D6010.10, Data Communications Network Equipment).

12. A complete set of record drawings, submittals and specification in a digital format and a set of all programming files and documentation in digital format.

13. Configuration set up and testing of the devices that make up each of the electronic digital systems.

14. All licensing associated with the each of the electronic digital systems.

15. Support for the UCSF Campus Life Services staff that will be implementing content on the electronic digital systems.
D 6060.10 Distributed A/V Communications

A. Intent

The Communications Infrastructure of spaces, pathways and structured cabling shall be designed and constructed to support the successful design and implementation of Distributed Communications Systems by the Integrated Delivery Team (IDT). Distributed Communications Systems should be considered a component of the core and shell of any campus building. There are no University furnished components in the Distributed Communications Systems. Distributed Communications Systems shall be IP, infrared and multiband RF based systems and include Distributed Antenna Systems. The IDT shall consider the functional intent of the building and its users and then select Distributed Communications System that, over their expected lifetime, successfully:

1. Meet Regulatory requirements.
2. Meet UCSF and industry standards indicated in this section and other sections of this document.
3. Support connectivity of emergency responders devices, where required.
4. Support connectivity of facility user’s and visitors cellular communications devices.
5. Support IP based Intercom systems utilized by the safety and security staff.
6. Support assistive listening requirements for spaces with audio video systems.
7. Support IP/POE based clock system.

Sound masking is intended to selectively reduce speech intelligibility across open-plan areas and between sensitive adjacencies so as to improve speech privacy. This is accomplished by the purposeful introduction of an engineered background sound to the interior environment. The masking system should:

8. Be capable of shaping the masking spectrum so as to accommodate the base-building spectrum, including time-of-day variability.
9. Address differently-shaped spectra to different locations.
10. Provide a “neutral” and unobtrusive overall sound spectrum without drawing attention to its presence or rendering speaker locations obvious.
11. Provide consistency between adjacent zones and spaces with similar functional uses.
12. Provide zone control to enable users to turn off masking during teleconferences and other conditions in which the sound interferes with room microphone pickup.

B. Description & Performance
a. Description: The University utilizes an IP Ethernet based audio and video Intercom system for communications between the building’s security control desk and the following areas:

1. Exterior of the building entrances into lobbies and pre-function spaces.
2. Exterior of the building at the loading dock man door
3. Inside the loading dock at the secure door utilized to enter the building from the loading dock.
4. A secondary master station shall be located in the Loading dock office area and shall inter connect with the primary master station at the security control desk as well as the exterior unit at the loading dock man door.

b. Performance:

1. The University has standardized on the Commend IP based intercom system

   a. See UCSF Safety and Security Standards Section 13735 Intercom Systems for specific Commend IP intercom units to be used at the required locations.

2. The IP intercom system shall be interconnected to the ACAMS systems
3. The IP intercom system master station units shall be interconnected in a way to allow the units to remotely unlock and open the loading dock roll up door
4. Through the ACAMS system activation of intercom units will activate the Video Surveillance system to activate, record to NVR and Display Loading dock or building entrance video surveillance camera images at the workstation at the Security Control Desk.
5. See UCSF Safety and Security Standard 13735 Intercom for intercom functional and integration requirements with ACAMS and Video Surveillance systems.
6. The Commend Master station shall be architectural coordinated with the security control desk in the building lobby.
7. The Commend exterior IP intercom units shall be flush mounted, coordinated and integrated with the architectural exterior metals and door systems at the building entrances and loading dock man door entrance.

D 6060.12 Assisted Listening System (LE B (10 yrs), except headphones)
a. **Description:** The University requires an Assistive Listening system be integrated with the audio visual system in the following spaces.
   
   1. Classrooms
   2. Auditoriums
   3. Conference rooms
   4. Assistive listening system shall meet the California Building Code (CBC) standards for assistive listening requirements.

b. **Performance:**
   
   1. The assistive listening system shall be a 72 MHz RF based system
   2. System shall include transmitters dedicated to each room with remote RF antennas in each room for optimum communications between transmitters and receivers.
   3. Provide receiver quantities based on CBC requirements.

D 6060.13  **Room Scheduling System (LE B (10 yrs))**

a. **Description:** The University requires a room scheduling LCD Touch Panel display integrated with the Universities 25Live Online Scheduling system at following locations.

   1. Classrooms
   2. Auditoriums
   3. Conference rooms in public locations with the building
   4. Other spaces that are supported by the UCSF Educational Technology Services
   5. Scheduling panels shall be located outside of the spaces immediately adjacent to the primary entrance door to the space

b. **Performance:**
   
   1. The University has standardized on the Crestron Room Scheduling Touch Panel.
      
      a. TFT Active Matrix Color LCD
      b. Minimum 7 inch diagonal viewing area of display
      c. Minimum Brightness 300 nits
      d. Minimum resolution 800 x 400 pixels
      e. Minimum Memory 4GB flash 1 GB LPDDR2 RAM
      f. Proximity Sensor with 3-4 foot range
D 6060.10 Distributed A/V Communications Systems

- Video H.264 MJPEG
- Audio MP3, integrated Mic and speaker SIP Intercom
- Communications IP Ethernet 10/100Mbps, with indicator LEDs
- Power; POE Class 4, 25.5W, IEEE 802.3at POE.

2. Requires 4-11/16 inch square box, 2.5 inches deep with double-gang mud ring.
3. Requires integration with the Universities 25Live Room scheduling application supported by the UCSF Educational Technology Services organization.

D 6060.14 Sound Masking System (LE B (10 yrs))

- Description: Sound masking system for improved speech privacy.

1. Performance:
2. Deliver a uniform sound environment within +/-2dB across treated spaces.
3. Overall noise levels (including masking) not to exceed 48dBA.
4. Generators shall incorporate 1/3 octave band equalization from 100Hz to 10kHz, as well as a dedicated high pass and low pass filter with configurable slope.
5. Overall masking sound levels shall be digitally controllable in 0.5dB increments.
6. The system shall have automatic level control.
7. Provide masking to Open Plan Offices, Private Offices, Huddle Rooms.

D 6060.15 Distributed Antenna System (DAS) (LE B (10 yrs))

- Description: The University requires a Distributed Antenna System (DAS) that will extend the public cellular carrier network into the interior of the building:

1. The system shall be carrier-based and third party-managed to support the major carriers in San Francisco. Some carriers may chose not to participate in the system.
   - AT&T
   - Verizon
   - T-Mobile
   - Sprint
   e. The Buildings BDF and IDF shall be designed and built to support
Technical Criteria

**D 6060.10 Distributed A/V Communications**

- The interconnectivity of the DAS system with the headend.
- Active DAS equipment will be rack mounted in the BDF. A minimum of one floor mounted equipment cabinet will be located in the building BDF.
- Active DAS equipment will be wall mounted in the BDF. A wall area 84 inches tall and 120 inches wide with cable runway above will be required in the BDF.
- Active DAS equipment will be wall mounted in each IDF. A wall area 84 inches tall and 72 inches wide with cable runway above will be required for each floor level that an IDF serves.
- The DAS equipment located in the BDF and IDFs will be powered by the electrical system that is dedicated to the BDF and IDFs.
- The interconnectivity between the headend equipment and the BDF and IDF equipment shall be Single Mode OS2 Fiber Optic Cabling.
- 12 strands are required for each floor an IDF serves.
- 12 Strands are required for the BDF.
- The 12 strand cables shall be fusion spliced to a fiber optic trunk cable in the BDF and routed through new and existing underground communications conduits and vaults to the Mission Bay Medical Center primary MPOE located in the Medical Center Energy Center on 3rd street to the DAS head end space located in the Medical Center.
- See D5010 Site Communications.

2. The DAS system shall be designed around a central headend architecture:
   - UCSF has a DAS head end at the Mission Bay Medical Center. The new campus building on block 33 shall be connected to the existing DAS headend in the Mission Bay Medical Center.
   - UCSF and its DAS service company will review any the headend space for any further growth south of 16th street.

3. The Buildings BDF and IDF shall be designed and built to support the interconnectivity of the DAS system with the headend.
   - Active DAS equipment will be rack mounted in the BDF. A minimum of one floor mounted equipment cabinet will be located...
D 6060.10  Distributed A/V Communications Systems

in the building BDF

b. Active DAS equipment will be wall mounted in the BDF. A wall area 84 inches tall and 120 inches wide with cable runway above will be required in the BDF.

c. Active DAS equipment will be wall mounted in each IDF. A wall area 84 inches tall and 72 inches wide with cable runway above will be required for each floor level that an IDF serves.

4. The DAS equipment located in the BDF and IDFs will be powered by the electrical system that is dedicated to the BDF and IDFs.

   a. Track Busway electrical distribution system in the BDF and IDFs is utilized to provide power to rack and cabinet mounted devices
   b. Wall mounted DAS equipment in the BDF and IDFs shall be powered from the dedicated electrical panel in the BDF and IDFs through either dedicated receptacles and or hardwired junction boxes.

5. The interconnectivity between the headend equipment and the BDF and IDF equipment shall be Single Mode OS2 Fiber Optic Cabling.

   a. 12 strands are required for each floor an IDF serves.
   b. 12 Strands are required for the BDF
   c. The 12 strand cables shall be fusion spliced to a fiber optic trunk cable in the BDF and routed through new and existing underground communications conduits and vaults to the Mission Bay Medical Center primary MPOE located in the Medical Center Energy Center on 3rd street to the DAS head end space located in the Medical Center.
   d. See (CR G5010, Site Communications).

6. Antennas will be located on each floor of the building and interconnected to the wall mounted DAS equipment cabinets located in the IDFs.

   a. Cabling between the antennas and the equipment cabinets will be a plenum rated hybrid fiber optic and copper cable that provides both power and signal to the Antenna Unit.
   b. The Horizontal Cable Pathways shall be sized and configure to
D 6060.10 Distributed A/V Communications

support the antenna cabling.

• Pathway design purposes the IDT should plan on a DAS antenna Density of 1 Antenna per 8,000 GSF of floor space.

b. Performance:

1. The IDT shall coordinate closely with the University’s DAS Management Company for:

a. Equipment sizes as well as mechanical and electrical loads in the BDF and IDF.

b. Horizontal cable routing

c. Vertical Backbone cable routing

d. See G5010.10 Site Communications Structures for site infrastructure to route outside plant cabling

e. See G5010.10 Site Communications Distribution for Outside Plant fiber optic cabling.

f. Development of a 400 square foot space immediately adjacent to the building BDF to support one Cellular Service Provider’s Active Equipment.

• Electrical and Mechanical Services including Standby electrical power and a metered electrical service.

• Interior buildout with cable runway and equipment racks to the specifications of the DAS Management Company.

2. The Universities DAS Management Company will be responsible for the design of the active DAS system and its active components that are located in the:

a. Headend

b. BDF

c. IDF

d. Antenna locations

3. The IDT shall be responsible for the design and construction of the pathways, enclosures and cabling that interconnects the active DAS components within the building and within the overall Mission Bay Campus. See D6090
SERVICES

Block 33

May 28, 2016 Mission Bay East Campus Phase 1 (Block 33)

University of California, San Francisco, Project No: M4603

D 6060.10 Distributed A/V Communications Systems

4. The DAS system shall provide a signal Level between -60dBm and -80dBm throughout the entire building with the exception of radio sensitive areas that RF signals may be limited for proper operation of instruments and equipment.

5. The University shall work with the Cellular Carriers to contract with them locate equipment in the existing Medical Center headend space.
   a. AT&T is a service provider that currently has equipment in the existing DAS Headend.
   b. Verizon is expected to have equipment in the existing DAS headend by the time this project is ready for service.

D 6060.16 Emergency Responder Radio Coverage (LE B (10 yrs))

a. Description: The University requires all new buildings to have approved radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communication systems of the jurisdiction at the exterior of the building. The system shall meet all requirements set forth in the California Fire Code (CFC).

1. The Emergency Responder Radio Coverage system may be integrated with the DAS system if the DAS service providers system supports the Emergency Responder Radio Frequencies
   a. Active and passive Emergency Radio Responder equipment shall be located within the buildings BDF, CPF IDF communication Support spaces and communications backbone riser system.
   b. Active and passive Emergency Radio Responder equipment shall no interfere with any systems in the building.

2. The Emergency Responder Radio Coverage system located in the BDF and IDF's will be powered by the standby electrical system that is dedicated to the BDF and IDF's.
   a. Wall mounted Emergency Responder Radio Coverage equipment in The BDF and IDF's shall be powered from the dedicated electrical panel in the BDF and IDF's through hardwired junction boxes.

3. The Emergency Responder Radio Coverage system shall obtain its signal from
Technical Criteria

D 6060.10 Distributed A/V Communications

an antenna that shall be located on the roof of the building if it is a stand-alone system.

a. If the emergency Responder Radio Coverage system is integrated with the DAS system it may obtain its signal through the DAS head end.

4. Antennas will be located on each floor of the building and interconnected to the wall mounted Emergency Responder Radio Coverage equipment cabinet located in one IDF.

a. Cabling between the antennas and the equipment cabinets will be rated for the most severe environment that it routes through. If any portion of the cable routes through a plenum environment then the entire length of cable shall be plenum-rated.

b. The Horizontal Cable Pathways shall be sized and configure to support the antenna cabling.
   • For Pathway design purposes the IDT should plan on one Emergency Responder Radio Coverage antenna Density of 1 Antenna per 8,000 GSF of floor space.

b. Performance:

1. The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95 percent of all areas on each floor of the building meet the signal strength requirements:
   a. A minimum signal strength of -95 dBm shall be receivable within the building.
   b. A minimum signal strength of -95 dBm shall be received by the agency’s radio system when transmitted from within the building.

2. Buildings that will achieve radio coverage without amplification are exempt.
   Where it is determined by a radio signal strength and clarity study that the radio coverage system is not needed.

3. The Emergency Responder Radio Coverage system shall be designed in accordance with:
   a. Buildings which cannot support the required level of radio coverage
shall be equipped with a distributed antenna system with Federal Communications Commission (FCC)-certified signal boosters.

b. The City of San Francisco Fire Department shall maintain a document providing the specific technical information and requirements for the emergency responder radio coverage system. This document shall contain, but not be limited to, the various frequencies required, the location of radio sites, effective radiated power of radio sites, and other supporting technical information.

c. The Emergency Responder Radio Coverage system shall be capable of modification or expansion in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC.

d. Emergency Responder Radio Coverage systems shall be provided electrical power from the buildings standby power system. The secondary power supply shall be capable of operating the emergency responder radio coverage system for a period of at least 24 hours. When primary power is lost, the power supply to the emergency responder radio coverage system shall automatically transfer to the secondary power supply.

4. Signal boosters shall meet the following requirements
   
a. All signal booster components shall be contained in a National Electrical Manufacturer’s Association (NEMA) 4-type waterproof cabinet.
   
b. Battery systems used for the emergency power source shall be contained in a NEMA 4-type waterproof cabinet.
   
c. The signal booster system and battery system shall be electrically supervised and monitored by a supervisory service.
   
d. Equipment shall have FCC certification prior to installation.

5. Amplification systems capable of operating on frequencies licensed to the City and County of San Francisco Fire Department by the FCC shall not be installed without prior coordination and approval of the City of San Francisco Fire Department.

6. The minimum qualifications of the system designer and lead installation
Technical Criteria  
D 6060.10  Distributed A/V Communications

personnel shall include:

a. A valid FCC-issued general radio operators license
b. Certification of in-building system training issued by a nationally recognized organization

7. When an emergency responder radio coverage system is required, and upon completion of installation, the IDT shall have the radio system tested to ensure that two-way coverage on each floor of the building is a minimum of 90 percent. The test procedure shall be conducted as follows:

a. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.

b. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency’s radio communications system.

c. Failure of a maximum of two nonadjacent test areas shall not result in failure of the test.

d. In the event that three of the test areas fail the test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. Failure of a maximum of four nonadjacent test areas shall not result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 90 percent coverage requirement.

e. A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public agency’s radio communications system. Once the test location has been selected, that location shall represent the entire test area. Failure in the selected test location shall be considered failure of that test area. Additional test locations shall not be permitted.

f. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the University so that the measurements can be verified during annual tests.

g. As part of the installation a spectrum analyzer or other suitable test
equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster. This test shall be conducted at time of installation and subsequent annual inspections.

8. The emergency responder radio coverage system installation and components shall also comply with all applicable federal regulations including, but not limited to, FCC 47 CFR Part 90.219.

### C. Verification & Validation (All Tiers)

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<table>
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<th></th>
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<td>7.</td>
<td>Architectural floor plans identifying the locations inside and on the exterior of the building of the Distributed AV Communications Systems components.</td>
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<td>8.</td>
<td>Architectural elevations locations of the Intercom system and room scheduling system showing complete coordination with the entrances to the rooms and spaces that these devices are located as well as with other devices such as card readers, door panels and architectural metals at these locations.</td>
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9. Architectural casework drawings showing coordination with intercom devices at the building security desk.

10. Detailed single line diagrams showing all devices and wiring associated with the intercom system, the sound masking system and the assistive listening system. Integration of the intercom system with the ACAMS system shall be clearly shown. Integration of the assistive listening system with the AV Systems in conference rooms and classrooms shall be clearly shown.

11. All locations and details of the signage associated with the assistive listening system shall be provided.

12. Complete list of all Distributed AV Communication devices that will require IP addresses. See Section (CR D6010.10, Data Communications Network Equipment).

13. See UCSF Safety and Security Standard 13735 Intercom for submittal requirements.

Construction

14. A complete set of record drawings, submittals and specification in a digital format and a set of all programming files and documentation in digital format

15. Configuration set up and testing of the devices that make up each of the Distributed AV Communications Systems.

16. All licensing associated with the each of the Distributed AV communications systems.

Startup

17. Support staff onsite to make adjustments and to perform trouble shooting of the Distributed AV communications systems.


D 6090  Communications Supplementary Components

A. Intent
The Integrated Delivery Team (IDT) shall provide a communications infrastructure of spaces, pathways and cabling, located, sized and configured to support the project's low voltage connectivity requirements for the life of the building. Ease of access and use with minimal interruption to building occupants and services is paramount. The infrastructure shall be designed for ease of:

1. Meeting UCSF and industry standards indicated in this section and other sections of this document.
2. Replacing, renewing and augmenting active equipment and or structured cabling while first generation systems remain operational.

Supporting change and growth of both equipment and cabling systems over the life of the building.

Identify all Communications, Security and AV Equipment Racks, Cabinets and Enclosures.

B. Description & Performance

**D 6090.11 Communications Identification (LE D (20 yrs))**

a. Communications Equipment Racks

1. Identification shall consist of 1-inch-tall adhesive backed self-spacing characters white or yellow on black background. 3M Scotchcal 5003 or equal.
2. Locations:
   a. On equipment racks at the left hand side of the top angle bar.
   b. On equipment cabinets at the top left on the cabinet frame.
   c. On enclosures at the top left of the front door or access panel of the enclosure.

3. Identification Scheme:
   a. Room Type ‘BDF’ ‘IDF’, ‘AV’.
   b. Room Number assigned by the University with the IDT.
   c. Sequential number that resets to 001 with each room.

4. Submit numbering scheme and labeling material for review by the University prior to labeling.

b. Communications Horizontal Station Cabling

1. Identify all horizontal station cabling used to support telephone and network services between the telecom rooms and the termination points throughout
2. Identification shall consist of:
   a. Wrap around machine printed self-adhesive labels within 6 inches of the both ends of the cable sheath.
   b. Machine printed labels behind plastic covers on faceplates and cover plates
   c. Machine printed labels on the Visipatch 360 terminal blocks

3. Locations:
   a. Within 6 inches of the end of all cable sheaths.
   b. Front of the Systimax Visipatch 360 terminal blocks.
   c. Front of all faceplates, cover plates, system furniture plates. Under removable clear plastic covers that are integrated with the faceplates.
   d. Within 6 inches of the ends of all workplace extension cables utilized to extend network services into table top or lectern top enclosures.

4. Identification Scheme:
   a. Building CAAN number assigned by University to all Campus Buildings.
   b. IDF room number where Visipatch 360 terminal blocks are located
   c. Room Number where termination jack is located
   d. Faceplate or cover plate number starting at 01 and increasing by 1 for each location in the room.
   e. Cable sheath number within the faceplate, D1, D2, D3, D4 for data and V1 for telephone.

5. Submit a sample of each type of faceplate, device plate and or cover plate to be utilized in the building fully labeled for review by the University prior to labeling

Communications Backbone Cabling

1. Identify all backbone cabling used to support telephone and network services between the BDF and IDF telecom rooms throughout the building.
2. Identification shall consist of:
   b. Machine printed ID cards inside of the front access panel of fiber optic termination shelves.
   c. Machine printed labels on the Visipatch 360 terminal blocks

3. Locations:
   a. Within 12 inches of the pair or strand breakout point of all cable sheaths.
   b. At all enclosure and or rooms that the backbone cable routes through between the BDF and the IDF that it is terminated.
   c. At service loops of backbone fiber optic cabling
   d. Front of the Systimax Visipatch 360 terminal blocks.
   e. Front of all fiber optic shelves and or wall mounted enclosures
   f. Inside the access panel of all fiber optic shelves and wall mounted enclosures.
   g. Within 6 inches of the ends of all workplace extension cables utilized to extend network services into table top or lectern top enclosures.

4. Identification Scheme:
   a. Building CAAN number assigned by University to all Campus Buildings.
   b. BDF room number
   c. IDF room number
   d. Copper pair count or fiber strand count
   e. Fiber optic sheath and glass type ie OFNR-OS2
   f. Copper sheath type IE ARMM.

5. Submit a sample of each type of backbone cabling label for review by the University prior to labeling.

d. Communications Visipatch 360 Network Equipment Patch Cords

1. Identify all Visipatch 360 to network equipment cabling within each IDF and BDF
2. Identification shall consist of:
   a. Wrap around machine printed self-adhesive labels.
   b. Machine printed labels self-adhesive labels on the Visipatch 360 connector end of the patch cord

3. Locations:
   a. Network equipment end of the patch cord within 6-12 inches of the cable end between the BDF and the IDF that it is terminated.
   b. Front of the Systimax Visipatch 360 connector.

4. Identification Scheme:
   a. Horizontal Cable Number
   b. Network Switch Number
   c. Network Port number.

5. Submit a sample of the Visipatch 360 patch cord label for review by the University prior to labeling.

   e. Grounding System Cabling

1. Identify all Grounding system cabling used to interconnect the ground bar inside of telecom rooms with the components in the telecom room.

2. Identify all grounding system cabling used to interconnect the Main Building ground with the BDF ground bar and the BDF ground bar with the IDF ground bar.

3. Identification shall consist of:
   a. Wrap around machine printed self-adhesive labels within 6 inches of the ends of the cable sheath.

4. Locations:
   a. Within 6 inches of the end of all cable sheaths.

5. Identification Scheme:
   a. Building CAAN number assigned by University to all Campus Buildings.
   b. Room Number for cables that stay within a room.
   c. From and To room numbers for cables that route between rooms.
d. Cable Gauge

6. Submit a sample of each type of faceplate, device plate and/or coverplate to
be utilized in the building fully labeled review by the University prior to
labeling.

e. Sequential Cable Number

f. Communications Outside Plant Cabling

1. Identify all outside plant cabling used to support telephone and network
services between the campus MDC and the Building BDF.

2. Identification shall consist of:

   b. Machine printed ID cards for fiber optic termination shelves and or
      enclosures.
   c. Machine printed labels on the output 110 terminal blocks of the
      Building Entrance protector.
   d. Machine printed ID cards for the Campus feeder cross connect
      enclosure.

3. Locations:

   a. Within 12 inches of the pair or strand breakout point of all cable
      sheaths.
   b. At all enclosures and or rooms that the outside plant cable routes
      through between the campus MDC and the BDF that it is
      terminated.
   c. At service loops of backbone fiber optic cabling.
   d. At splice closures of the backbone copper cabling
   e. On splice connectors of the backbone copper cabling
   f. At the cable entrance and exit of all underground vaults, hand holes
      and enclosures.
   g. Front of the 110 terminal blocks on the building entrance protector
   h. Inside the access panel of the campus cross connect enclosures.
   i. Front of all fiber optic shelves and or wall mounted enclosures
   j. Inside the access panel of all fiber optic shelves and wall mounted
      enclosures.
4. Identification Scheme:
   a. Building CAAN number to the MDC
   b. Cross Connect Enclosure assigned to the project for copper cable service.
   c. Building CAAN number assigned by University to all campus Buildings
   d. Copper pair count or fiber strand count
   e. Fiber optic sheath and glass type ie MDPE-OS2
   f. Copper sheath type ie AFMW.

5. Submit a sample of each type of OSP cabling label for review by the University prior to labeling.

g. AV System Cabling
   1. Identify all AV system cabling used to interconnect AV system components throughout the building
   2. Identification shall consist of:
      a. Wrap around machine printed self-adhesive labels within 6 inches of the ends of the cable sheath.

3. Locations:
   a. Within 6 inches of the end of all cable sheaths.
   b. Cable connection side of all AV system components.

4. Identification Scheme:
   a. Building CAAN number assigned by University to all campus Buildings.
   b. From and to Room Numbers
   c. Device Name
   d. Cable Service Type, ie HDMI, MIC, SPKR, CNTRL
   e. Sequential Cable Number by Service type

5. Submit a sample of each type of faceplate, device plate and or cover plate to be utilized in the building fully labeled review by the University prior to labeling.
h. Wireless Access Points

1. Identify all Wireless Access Points placed throughout the building.
2. Identification shall consist of:
   a. Machine printed adhesive backed labels
3. Locations:
   a. On the front side of the Wireless Access Point Unit.
4. Identification Scheme:
   a. To be provided by the University.
5. Submit a sample of each type of faceplate, device plate and or cover plate to be utilized in the building fully labeled review by the University prior to labeling.

D 6090.20 Data Communications Support Spaces

A. Intent

The Integrated Delivery Team (IDT) shall provide telecom rooms, located, sized and configured to support the networking, access control and video surveillance connectivity for the life of the building. The rooms shall be designed for ease of:

1. Meeting UCSF and industry standards indicated in this section and other sections of this document.
2. Installing and connecting network and access control equipment.
3. Renewing or augmenting network equipment and or structured cabling while first generation equipment remains operational.

B. Description & Performance

D 6090.21 General:

a. Telecom Rooms shall be provided in each campus building for the termination of the campus outside plant cabling and buildings horizontal and vertical structured cabling systems.
b. The Telecom Rooms shall support of the buildings IP networking devices, access control system, video surveillance devices, intercom devices, emergency responder system, distributed antenna system, central clock system and other systems requiring IP network connectivity.

c. The telecom rooms shall be referred to as:
   1. Building Distribution Facility (BDF) – one per campus building, may perform as a Minimum Point of Entry, MPOE, for buildings with leased space or non UCSF occupants. Shall not function as an IDF.
   2. Intermediate Distribution Facilities (IDF) - Multiple per building based on building size and configuration.
   3. Cable Pass through Facilities (CPFs) – Used for cable routing only no active equipment or cable terminations.

d. The BDF in a UCSF Mission Bay Campus building requires two physical separate pathways to the campus underground infrastructure. Each BDF is interconnected to the two Main Distribution Centers (MDC) on the Mission Bay Campus through physically diverse cable routes. MDC1 is located in Genentech Hall 500 16th street and MDC2 is located in the Helen Diller Family Cancer Research Building, 1450 3rd street.

e. In reference to the ANSI/TIA/EIA 568-C.1 Standard, the BDF is the Intermediate Cross-Connect Point (Distributor B in the 568-C.0), and Distributor A is the Campus MDC1 and MDC2.

f. There shall be a minimum of (1) IDF per group of 3 stacked floor plates 18,999 GSF per individual floor plate and 56,999 GSF for a set of three vertically stacked floor plates. CPFs shall be located on floors without IDFs.

g. In reference to the ANSI/TIA/EIA 568-C.1 Standard, the IDF is the Horizontal Cross Connect Point (Distributor C in the 568-C.0), and Distributor B is the building BDF.
b. See Table D6090.20-A Physical Environment: Equipment Racks Cabinets and Cable Management.

c. See Table D6090.20-A Physical Environment: Cable Runway

d. See Table D6090.20-A Physical Environment: Architectural Requirements

e. See Table D6090.20-A Physical Environment: Structural Requirements.

f. See Table D6090.20-A Physical Environment: Active Equipment Allowed IN Telecom Rooms.

g. See Table D6090.20-A Physical Environment: Equipment Not Allowed IN Telecom Rooms.

h. See Table D6090.20-A Physical Environment: Campus Standards For Equipment.

i. Life expectancy for the Copper Cable Termination Blocks is 25 years.

j. Life Expectancy for the Owner-Provided Contractor Installed Local Area Network Hardware is 10 years.

D 6090.24 Telecom Room Electrical (LE F (40yrs) Exclusive of UPS)

a. See Table D6090.20-A Physical Environment: Electrical System

b. A complete grounding and bonding system that extends from the building’s main electrical ground bar to the BDF’s Telecommunications Main Ground Bar (TMGB) and from the TMGB to the telecom grounding bus bar in each IDF and CPF shall be provided. All equipment racks and metal cable management segments in the IDF shall be ground and bonded to the TGB within the room.

D 6090.25 Telecom Room Mechanical

a. See Table D6090.20-A Physical Environment: Mechanical System

D 6090.26 Telecom Room Standards Reference

a. See Table D6090.20-A Physical Environment: Standards

D 6090.27 Telecom Room Mockup


C. Verification & Validation (All Tiers)

| SD | 1. Product cut Sheets identifying Telecom BDF, IDF and CPF major components, and manufacturers. |
2. Telecom floor plan drawing based on architectural drawings at 1/8 inch equals 1 foot scale for each floor identifying the BDF, IDF and CPF locations and the maximum horizontal cable length for each IDF and CPF on each floor plate.

3. Product cut Sheets identifying BDF, IDF and CPF major telecom, electrical and mechanical components, and manufacturers.

4. A set of Enlarged Floor Plans for the BDF, IDFs and CPFs at 1/8 inch equals 1 foot with the following plan views:

5. Plan view of Equipment racks, vertical cable managers, floor sleeves, wall mounted terminal block, wall mounted security panels and any unscheduled wall mounted devices that the IDT proposes to locate in the BDF, IDFs or CPFs.

6. Plan view of Electrical system layout including track busway and plug-in modules coordinated with the equipment rack layout.

7. Plan view of light fixture Layout coordinated with the equipment rack layout.

8. Plan view of mechanical system diffusers, fire dampers and registers that connect the BDF, and IDF to the mechanical system located outside and adjacent to the telecom rooms. Mechanical system shall not be located within the Telecom room space.

9. A single line electrical diagram for the complete electrical distribution system that will support the BDF and IDFs including UPS, distribution panels, line panels, track busways and plugin breaker modules for track busways.

10. Telecom floor plan drawing based on architectural drawings at 1/8 inch equals 1 foot scale for each floor identifying the BDF, IDF and CPF locations as well as the horizontal cable trays, j-hook lines and conduit pathways. The maximum horizontal cable length for each IDF and CPF on each floor plate shall be included.

11. Product cut Sheets identifying BDF, IDF and CPF major telecom, electrical and mechanical components, and manufacturers.

12. A set of Telecom Enlarged Floor Plans for the BDF, IDFs and CPFs at 1/8
inch equals 1 foot with the following plan views:

13. Plan view of Equipment racks, vertical cable managers, floor sleeves, wall mounted terminal block, wall mounted security panels and any unscheduled wall mounted devices that the IDT proposes to locate in the BDF, IDFs or CPFs.

14. Plan View of lower level of cable runway for equipment interconnect cabling.

15. Plan view of fiber optic cable management troughs.

16. Plan view of upper level cable ladder for station cable and riser cable including wall sleeves and fire stopping systems for horizontal station cabling.

17. A set of Electrical Enlarged Floor Plans for the BDF, IDFs and CPFs at ½ inch equals 1 foot with the following plan views:

18. Plan view of Electrical system layout including track busway and plug-in modules.


20. A single line electrical diagram for the complete electrical distribution system that will support the BDF and IDFs including UPS, distribution panels, line panels, track busways and plug in breaker modules for track busways.

21. A complete set of panel schedules and Starline track busway plug in breaker modules as well as load calculations for the complete electrical system that provides service to the telecom rooms.

22. Product cut Sheets identifying electrical components to be utilized in the BDF, IDF and CPF electrical and lighting system.

23. A set of Mechanical Enlarged Floor Plans for the BDF, IDFs and CPFs at ½ inch equals 1 foot with the following plan views:

24. Plan view of mechanical system diffusers, fire dampers and registers that connect the BDF, and IDF to the mechanical system located outside and adjacent to the telecom rooms. Mechanical system shall not be located within the Telecom room spaces.

25. Product cut Sheets identifying components to be utilized in the BDF,
D 6090.30  Communications Pathways – Intra-Building

A. Intent

The Integral Delivery Team (IDT) shall provide building entrance and intra-building pathways sized and configured to support the building’s backbone cabling system installed between the BDF and IDFs and the BDF and the Campus underground infrastructure. Ease of access and use without interruption to campus/building occupants and services are paramount. The building backbone pathways shall be designed for ease of:

1. Meeting UCSF and industry standards indicated in this section and other sections of this
D 6090.30 Communications Pathways – Intra-

2. Minimizing fire stopping systems.
3. Placing unrated outside plant cable sheaths into the building distribution facility.
4. Augmenting and replacing the building cabling systems without interruption to building occupant’s network and telephone services.
5. Supporting change and growth of cabling systems over the life of the building.

B. Description & Performance

D 6090.31 General

a. Description:

1. Communications Pathways shall be provided in each campus building for the routing of the buildings horizontal and vertical structured cabling systems between the:
   a. BDF and IDFs
   b. BDF and CPFs
   c. BDF and AV Support rooms
   d. BDF and Safety and Security System Spaces
   e. BDF and communications enclosures and devices on the building site. See sections G5010.50, Wireless Communications Distribution.
   f. IDFs and CPFs
   g. IDFs, AV systems and support spaces
   h. IDFs and horizontal cabling termination locations
   i. IDFs and Voice Communications, Data Communications and Wireless System devices.
   j. IDFs and Safety and Security System devices
   k. IDFs and Distributed Communications System devices

b. Performance

1. The Communications Pathways shall support the structured cabling systems that support of the buildings IP networking devices, access control system, video surveillance devices, intercom devices, emergency responder system, central clock system, DAS system, AV systems and other systems requiring IP network connectivity.
2. The Communications Pathways shall support the structured cabling systems that support the buildings Voice Communications Systems and devices.

3. The Communications Pathways shall be designed to support the complete replacement of the building’s first generation structured cabling system while that system remains operational. This shall be considered and clearly indicated in the IDT’s sizing calculations for:
   a. Back boxes and mud rings
   b. Floor Boxes
   c. Conduits from back boxes and floor boxes to ceiling and or under floor spaces.
   d. Conduits from back boxes and floor boxes to cable trays
   e. Intermediate pull box sizing.
   f. "J" Hook lines
   g. Cable trays
   h. Cable tray to conduit and or engineered fire stopping sleeve systems
   i. Floor Slots between IDFs and CPFs

4. The Communications Pathway system shall support 25 percent growth in the structured cabling system over the life of the first generation structured cabling system. This shall be considered and clearly indicated in the IDT’s sizing calculations for:
   a. Faceplate and device cover plate capacity
   b. Back box and mud ring sizing
   c. Floor box sizing
   d. Conduit diameter
   e. Intermediate pull box sizing.
   f. “J” Hook configuration, quantity and sizing
   g. Cable trays
   h. Cable tray to conduit and or engineered fire stopping sleeve systems
   i. Floor Slots between IDFs and CPFs
   j. Engineered Fire Stopping Sleeves.

   c. Reference
SERVICES

May 28, 2016
Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4603

D 6090.30 Communications Pathways – Intra-

1. Communications Pathways conduits, fittings, back boxes, pull boxes and cable trays shall conform to UL Standard 514. All fittings shall have nylon insulated throats.

2. ANSI
   a. ANSI/TIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces.
   b. ANSI/TIA 606-B Administration Standard for Telecommunications Infrastructure.
   c. ANSI/TIA 607-B Generic Telecommunications Bonding and Grounding.

3. NEMA
   a. NEMA VE 1 Metal Cable Tray Systems.
   b. NEMA VE 2 Cable tray Installation Guidelines.

4. NFPA
   a. NFPA 70B Recommended Practice for Electrical Equipment Maintenance.

5. Underwriters Laboratories (UL)
   a. UL 467 Grounding and Bonding Equipment.

D 6090.32 Backbone Riser Pathways (LE F (40 yrs))

a. Description:

   1. Backbone Riser Communications Pathways shall be provided in each campus building for the routing of the buildings horizontal and vertical structured cabling systems between the:
      a. BDF and IDFs
      b. BDF and CPFs
      c. IDFs and CPFs

b. Performance

   1. The Communications Backbone pathways shall support the structured cabling systems that support of the buildings IP networking devices, access control system, video surveillance devices, intercom devices, emergency responder
Technical Criteria

D 6090.30 Communications Pathways –

2. The Communications Pathways shall support the structured cabling systems that support of the building’s Voice Communications Systems and devices.

3. Building Backbone riser shall be a vertically stacked and rated shaft of the BDF, IDFs and CPFs

   a. The BDF may be offset from the vertical stack in interconnected using 4 inch conduits as the pathway.
      • The minimum quantity of 4 inch conduits between the BDF and a single stack of IDFs and CPFs is (3) 4 inch conduits per stack of (2) IDFs and (4) CPFs.

   b. A vertically rated stack of Communications Support spaces is preferred as it reduces the quantity of fire stopping systems as there will be no fire stopping systems required floor to floor if the vertical stack of Communications Spaces is accomplished with a rated shaft configuration.

   c. A floor slot shall be provided in the floors of the rated shaft between Communications Spaces, BDF, IDFs and CPFs.
      • The floor slot shall be sized to support the backbone cabling system as well as the horizontal cabling system and shall take into consideration the use of an IDF to service multiple floors. See section (CR D6090.20). The maximum depth of a floor slot shall be 8 inches. The minimum width shall be 30 inches.
      • Floor slots shall be curbed to prevent materials and or tools from rolling into the slot and falling.

   d. Floor slots and sleeves shall be located adjacent to the entry door of Communications Spaces to facilitate the placement and routing of cabling over the life of the communications space and replacement of multiple generations of structured cabling.

   e. In a stacked vertical rated riser shaft with floor slots the vertical pathway should consist of cable runway that routes continuously through the IDFs and CPFs that make up the shaft. See Section D6090.20.

4. Backbone Riser conduits utilized when in a stack of IDFs and CPFs is offset
from the BDF are not to be utilized or Station Cable routing but are intended only for the routing of backbone copper and fiber optic cabling systems.

5. Backbone riser conduits:
   a. Minimum diameter: 4 inches
   b. Minimum bend radius: 48 inches
   c. Maximum degrees of bends between spaces and or enclosures: 225 degrees
   d. EMT Conduit shall be joined with high quality set screw fittings, manufactured in the U.S.

6. Pull boxes shall be utilized in backbone conduit segments that have more than 225 degrees of direction change and exceed 200 feet in length.

7. Pull boxes in backbone conduits are not utilized for directional changes.

8. Backbone Pull box Sizing for 4 inch diameter backbone conduit:
   a. Minimum pull box length conduit end to conduit end, 12 times the diameter of the conduit. (4 inches x 12 = 48 inches).
   b. Minimum pull box depth for 4 inch Conduits 2 times the diameter of the conduit. (4 inches x 2 = 8 inches).
   c. Minimum pull box width Conduit Diameter time Conduit quantity times 1.75.


   c. Reference

1. Inside Building Backbone conduits, fittings, back boxes and pull boxes shall conform to UL Standard 514. All fittings shall have nylon insulated throats.

2. ANSI
   a. ANSI/TIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces.
   b. ANSI/TIA 606-B Administration Standard for Telecommunications Infrastructure.
   c. ANSI/TIA 607-B Generic Telecommunications Bonding and Grounding

3. NEMA
Technical Criteria

D 6090.30 Communications Pathways –

a. NEMA VE 1 Metal Cable Tray Systems
b. NEMA VE 2 Cable tray Installation Guidelines

4. NFPA
   a. NFPA 70B Recommended Practice for Electrical Equipment Maintenance

5. Underwriters Laboratories (UL)
   a. UL 467 Grounding and Bonding Equipment

D 6090.33 Horizontal Station Cable Pathways (LE D (20 yrs))

a. Description

1. Horizontal Station Communications Pathways shall be provided in each campus building for the routing of the buildings horizontal structured cabling systems between the:
   a. **BDF and communications enclosures and devices on the building site** See sections G5010.50.
   b. IDFs and CPFs
   c. IDFs and AV systems faceplate back box and floor box locations
   d. AV Support rooms and AV systems faceplate back box and floor box locations.
   e. IDFs and horizontal cabling termination locations in walls, ceilings, floors and casework
   f. IDFs and Voice Communications, Data Communications and Wireless System devices.
   g. IDFs and Safety and Security System devices
   h. IDFs and Distributed Communications System devices

b. Performance

1. The horizontal station communications pathways shall support the horizontal station cabling systems that support of the buildings IP networking devices, access control system, video surveillance devices, intercom devices, AV systems, Electronic Digital Systems, Distributed AV Communications Systems and emergency responder system.

2. The horizontal station communications pathways shall support the structured...
cabling systems that support of the buildings Voice Communications Systems and devices.

3. Building horizontal station communications pathways shall consist of:
   a. Back boxes, mud rings
   b. Concrete boxes
   c. Recessed floor boxes and enclosures with covers
   d. Conduits and conduit fittings
   e. Ladder style cable trays
   f. J-hooks
   g. Modular fire stopping sleeves with UL system numbers.

4. In wall partitions without insulation and or acoustical treatment and where the partition framing extends above the ceiling a mud ring, pull string and insulated bushing above the ceiling may be utilized in lieu of a back box and a conduit. Only one mud ring may be installed per stud bay. Mud rings may not be installed back to back.

5. Mud rings without back boxes may not be utilized to feed down into a raised floor environment.

6. Poke Thru Fixtures may be utilized in floors as cable feed through points, but not as termination points. Minimum conduit size at a poke thru fixture is 1.25 inch routed to nearest cable tray or IDF.

7. In hardpan Ceilings the back boxes/mud rings shall be flush mounted in the ceilings.

8. Above suspended ceiling back boxes to support cable terminations to suspended ceiling mounted wireless access points shall be 4-11/16 square 2-1/8 inch deep with Single gang mud ring for a single gang faceplate.

9. In exposed concrete deck areas the ceiling box shall be a double gang 3 inch deep masonry box cast in place. If space above is under a raised floor the conduit to the box shall stub up and route to the closest cable tray.

10. Horizontal station conduits:
    a. Minimum diameter: See (CR Table D6090.33-A, Communications Conduit Station Cable Fill (located at the end of this section)).
    b. Minimum bend radius: 16 inches
    c. Maximum degrees of bends between back box and cable tray: 180
d. Maximum length between back box and cable tray or intermediate pull box: 60 feet.

e. EMT Conduit shall be joined with high quality set screw fittings, manufactured in the U.S.

f. EMT conduits that do not end in a back box shall be provided with a threaded bushing. Threaded bushings shall be bonded to metallic cable trays.

g. EMT conduits shall be bonded to cable trays.

h. EMT conduits shall provide a continuous cable pathway between the backbox, furniture feed point, pull box and or device enclosure and the cable tray.

11. Pull boxes shall be utilized in horizontal station conduit segments that have more than 180 degrees of direction change and exceed 60 feet in length.

12. Pull boxes shall not be utilized for directional changes.

13. Horizontal station pull box sizing for 1.25 inch diameter horizontal station conduit:

   a. Minimum pull box length conduit end to conduit end, 10 times the diameter of the conduit. (1.25 inches x 12=13 inches).

   b. Minimum pull box depth for 4 inch Conduits 1.5 times the diameter of the conduit. (1.25 inches x 1.5=2 inches).

   c. Minimum pull box width Conduit Diameter time Conduit quantity times 1.75.

   d. In single 1.25 inch diameter conduit runs a straight conduit body may be utilized as a pull box.

14. Back boxes:

   a. Minimum back box shall be 4-11/16 square 2-1/8 inch deep:
      • Mud ring configuration to be determined by cable termination quantity and growth factor as well as and device to be supported at the back box.

   b. Minimum AV back box to be located behind flat panel displays shall be 14.5 tall, 14.5 inches wide and 3.5 inches in depth. See (CR D6030.10, AV Systems).
c. At AV display locations with articulating arm mounts the AV Back boxes shall be 30.5 inches wide, 16.5 inches tall and 3.5 inches deep. See (CR D6030.10, AV Systems).

15. Floor Boxes
   a. Floor Boxes shall be recessed style with communications faceplates below a cover that can be closed when the faceplate/jacks are in use.
   b. Floor boxes must be support single gang communications faceplates with clear plastic label covers.
   c. Floor Boxes with Duplex Knock outs for use with 104 style communication jack frames shall not be utilized.
   d. Floor boxes with communications plates that cannot support faceplates with clear plastic label covers shall not be utilized.

16. Cable Trays
   a. A horizontal cable tray system shall be designed to provide a horizontal station cable pathway between the IDF\'s, the CPF\'s and the Telecom faceplates/coverplates/devices throughout a floor plate. The cable tray system shall route above or below corridors, and walkways for easy access and shall not cross over/under individual offices, class rooms, conference rooms or individual office cubicles.
   b. The cable tray design shall have a maximum fill rate of 40\% for any of the individual separate areas of the tray.
      • The Cable tray design documents shall indicate cable fills calculations at all cable tray size changes, transitions to conduits and at 50 foot intervals.
      • Cable tray fill rates for Category 6 cables shall be separate from non-Category 6 security system cabling, non-category 6 AV Cabling and DAS cabling.
   c. Rung Spacing in the cable tray system shall be a maximum of 9 inches.
   d. Side wall height for the cable tray above the rungs shall be a minimum of 4 inches.
D 6090.30 Communications Pathways –

e. The Cable tray system when located in above ceilings and or in open areas not below a raised floor shall route to within 48 feet horizontally of the faceplate locations throughout a floor plate.

f. The Cable tray system when located under a raised floor shall route to within 28 feet horizontally of the faceplate locations throughout a floor plate.

g. The Cable tray system shall be provided with a continuous metallic dividers to separate:
   - Category 6 cabling
   - Non Category 6 Security cabling
   - Non Category 6 AV Cabling
   - DAS Cabling.

h. Factory made fittings with a minimum radius of 12 inches shall be utilized and any horizontal or vertical transitions, bends or change in dimension of the cable tray.

i. The cable tray system shall be supported from the building structure at a maximum 8 foot spacing. The designer may choose to coordinate a combined MEPT support system for the cable tray, duct work and piping systems. The cable tray should be closest to the accessible ceiling system or accessible floor system and shall be provided with continuous access on one side and continuous clearance of 18 inches from the top of the cable tray system above ceilings and 6 inches below raised floor systems.

j. The cable tray system shall not be routed over or under inaccessible areas of a floor. The cable tray shall transition to conduit before an inaccessible ceiling or floor space.

k. 40 percent of the area of the conduit shall equal the area of the Cable tray. As an example a 5 x 24 inch cable tray has a cross section of 4 x 24 or 96 inches. A 4 inch conduit has an area of 12.5 inches. Eleven 4 inch conduits are required to transition from the cable tray to conduit.

l. If the building design utilizes a raised floor system to support HVAC the cable tray may be designed to route under the raised floor.

17. J-Hooks
D 6090.30 Communications Pathways – Intra-

a. Where mud rings without back boxes are utilized in partitions, radiused J-hooks specifically designed to support ANSI/TIA/EIA 568-C Category 6 cables may be utilized over a maximum distance of 48 feet between the insulated wall bushing above the ceiling and the edge of the cable tray system.

b. J-hooks shall not be utilized over gypsum board ceiling areas.

c. J-hooks shall not be utilized over wood or metal panel ceiling systems.

d. J-hooks may be utilized to support AV system speaker cables and/or microphone cables in accessible ceiling spaces only within the room that the speakers and microphones are located.

e. J-hooks shall be spaced at a maximum of 48 inches and shall utilize a minimum 3/16 inch threaded rod anchored to the structure with a California Building Code (CBC)-designated anchoring system designed for the maximum fill of the J-hooks on the threaded rod.

f. J-Hooks shall not be utilized under raised floors

c. Reference

1. Horizontal Station conduits, fittings, back boxes and pull boxes shall conform to UL Standard 514. All fittings shall have nylon insulated throats.

2. ANSI

a. ANSI/TIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces.
b. ANSI/TIA 606-B Administration Standard for Telecommunications Infrastructure.
c. ANSI/TIA 607-B Generic Telecommunications Bonding and Grounding

3. NEMA

a. NEMA VE 1 Metal Cable Tray Systems
b. NEMA VE 2 Cable tray Installation Guidelines

4. NFPA

a. NFPA 70B Recommended Practice for Electrical Equipment Maintenance
5. Underwriters Laboratories (UL)
   a. UL 467 Grounding and Bonding Equipment
### Table D6090.33-A: Communications Conduit Station Cable Fill

<table>
<thead>
<tr>
<th>EMT Conduit Trade Size</th>
<th>Inside Conduit Diameter</th>
<th>Inside Conduit Area</th>
<th>Maximum Allowable Cable Fill</th>
<th>Nominal Cable Diameter 0.30 Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inches</td>
<td>Square Inches</td>
<td>1 Cable Sheath</td>
<td>2 Cable Sheaths</td>
</tr>
<tr>
<td>3/4</td>
<td>0.82</td>
<td>0.53</td>
<td>0.281</td>
<td>0.164</td>
</tr>
<tr>
<td>1</td>
<td>1.05</td>
<td>0.87</td>
<td>0.461</td>
<td>0.270</td>
</tr>
<tr>
<td>1-1/4</td>
<td>1.38</td>
<td>1.51</td>
<td>0.800</td>
<td>0.468</td>
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<tr>
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<td>1.61</td>
<td>2.05</td>
<td>1.087</td>
<td>0.636</td>
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<td>2.07</td>
<td>3.39</td>
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<td>5.279</td>
<td>3.088</td>
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<tr>
<td>4</td>
<td>4.03</td>
<td>12.83</td>
<td>6.800</td>
<td>3.977</td>
</tr>
</tbody>
</table>

Note: Nominal station cable diameter of 0.30 Inches provides for future change to Category 6A station cable.

### C. Verification & Validation (All Tiers)

1. Narrative that describes the Communications Pathways quantity, size and configuration.
2. Product cut Sheets identifying all communications pathway components, and manufacturers.
3. A set of Floor Plans at 1/8 inch equals 1 foot with the clearly defined symbols that designate the different wall box, mud ring and floor box configurations, furniture feed points, conduit, versus ring and string, cable tray sizes and cable tray pathways to IDF, CPF and BDF.
4. A set of Floor Plans at 1/8 inch equals 1 foot with horizontal backbone conduits and associated back boxes and floor boxes.
5. Telecom floor plan drawing based on architectural drawings at 1/8 inch equals 1 foot scale for each floor identifying the BDF, IDF and CPF locations and the maximum horizontal cable length for each IDF and CPF on each floor plate.
6. Product cut sheets identifying Communications Pathway components, and manufacturers.

7. A single line backbone Riser diagram for the complete horizontal and vertical distribution system between BDF, IDF’s and CPF’s including rated shafts.

8. A set of Floor Plans at 1/8 inch equals 1 foot with the clearly defined symbols that designate the different wall box, mud ring and floor box configurations, furniture feed points, conduit, versus ring and string, cable tray sizes and cable tray pathways to IDF, CPF and BDF. Cable tray fill rates shall be provided at 50 foot intervals along the cable tray routes. Floor plans shall clearly show all fire stopping systems and quantity of cabling routing through the fire stopping systems.

9. A set of Reflected ceiling plans at 1/8 inch equals 1 foot with the clearly defined symbols that designate the flush ceiling and above ceiling box configurations.

10. A set of Floor Plans at 1/8 inch equals 1 foot with horizontal backbone conduits and associated back boxes and floor boxes

11. Product cut sheets identifying backbone and horizontal station components, and manufacturers.

12. UL system numbers and system descriptions for fire stopping systems associated with the horizontal and vertical low voltage cabling systems to support all systems in sections D60 and D70.

A. Intent
The Integral Delivery Team (IDT) shall provide intra-building copper and fiber optic cabling sized and configured to support the building’s Voice Communications and Data Communications systems. The building intra-building cabling systems shall be designed for ease of:

1. Meeting UCSF and industry standards indicated in this section and other sections of this document.
2. Supporting, augmenting and replacing the building voice and network communications systems.
3. Supporting change and growth of cabling systems over the life of the building.

B. Description & Performance

a. Description:

1. Communications copper twisted pair backbone cabling shall be provided in each campus building to support the distribution of analog voice communications circuits between the:
   a. BDF and IDFs
   b. BDF and AV Support rooms
   c. BDF and Safety and Security System Spaces
   d. BDF and communications enclosures and devices on the building site. See sections G5010.50

2. Communications Fiber Optic backbone cabling shall be provided in each campus building to support the distribution of data communications circuits between the:
   a. BDF and IDFs
   b. BDF and DAS Service Provider Equipment Room
   c. DAS Service Provider Equipment Room and IDFs
   d. BDF and communications enclosures and devices on the building site. See sections G5010.50

3. Communications copper twisted pair horizontal station cabling shall be provided in each campus building to support the distribution of analog voice communications circuits and IP Ethernet data communications services between the:
Mission Bay East Campus Phase 1 (Block 33)

May 28, 2016

University of California, San Francisco, Project No: M4603

580

Technical Criteria

D 6090.40 Communications Cabling – Intra-

4. BDF and communications enclosures and devices on the building site. See (CR G5010.50, Wireless Communications Distribution)

b. Performance

   a. The Copper and fiber optic Intra-building cabling system shall be Commscope Systimax to match the existing Mission Bay Campus Buildings and the UCSF ITS Standards.

D 6090.42 Backbone Riser Copper Cabling (LE D (20 yrs))

a. Description:

   1. Communications copper twisted pair backbone cabling shall be provided in each Campus building to support the distribution of analog voice communications circuits between the:

      a. BDF and IDFs
      b. BDF and AV Support rooms
      c. BDF and Safety and Security System Spaces

   2. Telephone services that are currently not supported by VoIP and are supported on the copper twisted pair backbone riser cabling systems are:

      a. The elevator telephones,
      b. The telephone lines for the Fire Alarm panel dialers,
      c. The telephone lines for the security alarm panel backup dialers
      d. The telephone and or data service over copper lines to Non-UCSF Devices within the building.
      e. Analog devices such as fax machines and point of sale devices that are supported from gateway devices in the BDF. See (CR D6020.10, Voice Communications Terminal Devices).

b. Performance:

   1. The copper pair count between the BDF and each IDF within the building shall be 25 pairs per floor serviced by the IDF.
   2. The copper backbone cable shall be 24-Gauge ANSI/TIA/EIA Category 3. The
D 6090.40 Communications Cabling – Intra-

cable sheath shall be listed CM, CMR or CMP compliant depending on the design and construction of the inside building backbone pathway.

3. All Copper Cable Pairs shall be punched down on Commscope Systimax Visipatch 360 wall mounted terminal blocks. The terminal block location of the riser cables shall be coordinated with the location of the voice station cable and network station cable terminations in the overall Visipatch 360 terminal block field.

4. The building Copper backbone cables shall be identified with embossed stainless steel tags attached to the cable sheath with stainless steel tie wraps at the entrance and exit of each structure and enclosure including BDF, IDFs, splice enclosures and termination enclosures.

5. The copper backbone cabling shall be assembled from Commscope Systimax components and provided with a Commscope Systimax performance warranty.

6. Cable Testing

   a. The Copper backbone riser cable shall be tested for Attenuation, Continuity, Shorts, Opens and Crosses with test results labeled with the cable ID and provided to the University.

   c. Reference

      1. ANSI/TIA-568-C.0, “Generic Telecommunications Cabling for Customer Premises
      4. NEC Article 800
      5. ANSI/TIA 607-B Generic Telecommunications Bonding and Grounding
      6. UL 444, Communications Cables
      7. Telcordia - GR-111, Generic Requirements for Thermoplastic Insulated Riser Cable

D 6090.43 Backbone Riser Fiber Optic Cabling (LE D (20 yrs))

   a. Description:

      1. Communications Fiber Optic backbone cabling shall be provided in each
Technical Criteria

D 6090.40 Communications Cabling – Intra-

campus building to support the distribution of data communications circuits between the:

a. BDF and IDFs
b. BDF and DAS Service Provider Equipment Room
c. DAS Service Provider Equipment Room and IDFs

b. Performance:

1. The fiber optic strand count between each BDF and each IDF within the building for interconnection of network equipment shall be (24) single mode fibers per floor served by the IDF.
2. The fiber optic strand count between each BDF and each IDF within the building for interconnection of DAS equipment shall be (12) single mode fibers per floor served by the IDF.
3. The single mode fiber optic glass for the network interconnections shall be OS2 Compliant Single mode. The Single mode glass performance for the DAS system interconnect shall be determined by the DAS Service Provider. The cable sheath shall be a tight buffered construction and shall be OFN, OFNR or OFNP compliant depending on the design and construction of the inside building backbone pathway.
4. The Fiber Optic cabling shall be fusion splice terminated to LC-UPC Ceramic Ferrule Connectors factory manufactured and tested single mode pigtails.
5. Coupler shall be duplex ceramic for coupling single mode LC Connectors.
6. In the BDFs and IDFs the fiber optic backbone cabling to support network services shall terminate at rack mount combination splice and termination shelves. Each combination splice and termination shelf shall not exceed 4 rack units.
7. In the IDFs the fiber optic backbone cabling to support DAS services shall terminate at wall mount combination splice and termination shelves, and be coordinated with the configuration of the wall mount DAS hardware in the IDFs.
8. In the BDFs the fiber optic backbone cabling to support DAS services shall be fusion spliced directly to subunits of the outside plant fiber optic cable that is brought to the building from the campus DAS head end. The fusion splice closure shall be wall mounted in the BDF. See (CR G5010, Site...
9. The optical fiber building backbone cables shall be identified with embossed stainless steel tags attached to the cable sheath with stainless steel tie wraps at the entrance and exit of each structure and enclosure including BDF, CPFs, IDFs, splice enclosures and termination enclosures.

10. The fiber optic backbone cabling shall be assembled from Commscope Systimax components and provided with a Commscope Systimax performance warranty.

11. Cable Testing.

   a. The single mode Building Backbone fiber optic system shall be tested with a Light Source and Power Meter at 1550nm and 1300nm for single mode that provides the optical attenuation from mated Pair to mated pair end to end BDF to IDF. The attenuation reporting shall be a budget variance style report with the attenuation budget for connectors and cable shown individually. The system shall provide an attenuation margin 50 percent under the operating attenuation for 1000BaseLX and 1000BaseSX Cisco transceivers. See UCSF ITS Fiber Standards –v1-10 9

   c. Reference

   1. NEC Article 770
   2. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises
   3. ANSI/TIA-568-C.3, Optical Fiber Cabling Components
   4. ANSI/TIA/EIA-598-B, Optical Fiber Cable Color Coding
   5. ANSI/TIA 606-B Administration Standard for Telecommunications Infrastructure.
   6. UL 1651, Optical Fiber Cable
   7. GR-409-CORE, Issue 2, Generic Requirements for Indoor Fiber Optic Cable
   8. UCSF ITS Fiber Standards –v1-10 9

D 6090.44 Horizontal Station Cable (LE D (20 yrs))

   a. Description

   1. University buildings at the Mission Bay Campus require a 4 pair ANSI/TIA/EIA
Category 6 horizontal copper cabling system inside the Building between the IDFs and each of the faceplate locations in ceilings, walls, floor boxes, system furniture partitions, Back boxes and enclosures. To support the campus Ethernet network and VOIP telephone services and analog telephone service to devices throughout the building.

2. The Universities standard for horizontal copper 4 pair cable is the Commscope Systimax Gigaspeed XL solution Category 6 cable, jacks, terminal blocks, patch cords, device cords and zone extension cords.

   a. The 8 pin 8 position jacks at faceplate, cover plates and devices shall be configured T568A.

   b. Rack mounted patch panels configured T568A shall be utilized for horizontal cable terminations in AV equipment cabinets and video surveillance system network video storage cabinets.

   c. Visipatch 360 terminal blocks and cable management components shall be wall mounted in IDF for horizontal station cable terminations.

   d. Horizontal station cables shall segregated in the visipatch 360 terminal block field by cable sheath color.

   e. See (CR Table D6090.43-A, Horizontal Station Cable: General Minimum Quantities) for horizontal cable sheath colors.

   f. See (CR Table D6090.20-A Telecom Space Buildout, Critical Dimensions and Statistics for maximum horizontal station cable lengths. Horizontal length limitations account for the longer visipatch patch cords used between the wall mount Visipatch 360 terminal blocks and the Ethernet switches located in the bottom of the equipment racks in IDFs.

   g. BDFs shall not be utilized for termination of horizontal station cabling.

   b. Performance

   1. The horizontal station communications cabling system shall be Commscope Systimax Category 6 4-pair plenum grade cabling and shall support the buildings IP networking devices, including but not limited to wireless LAN components, AV system components, digital display systems, alarm panels,
access control system panels, video surveillance devices, intercom devices, emergency responder system, central clock.

a. See (CR D6010.12 Data Communications Network Equipment)
b. See (CR Table D6090.42-A, Horizontal Station Cable: General Minimum Quantities).
c. See (CR Table D6090.42-B, Horizontal Station Cable: Huddle and Conference rooms).
d. See (CR Table D6090.42-C, Horizontal Station Cable: Classrooms).
e. See (CR Table D6090.42-D, Horizontal Station Cable:
Ophthalmology).

f. See (CR Table D6030.12-A Conference Room Av Systems).
g. See (CR Table D6030.12-A Classroom Av Systems).

2. The horizontal station communications cabling system shall be Commscope Systimax Category 6 4-pair plenum grade cabling and shall support the buildings Voice communications devices.

a. See (CR D6020.20 Voice Communications Terminal Equipment)
b. See (CR Table D6090.42-A, Horizontal Station Cable: General Minimum Quantities).
c. See (CR Table D6090.42-B, Horizontal Station Cable: Huddle and Conference rooms).
d. See (CR Table D6090.42-C, Horizontal Station Cable: Classrooms).
e. See (CR Table D6090.42-D, Horizontal Station Cable:

f. See (CR Table D6030.12-A Classroom Av Systems).

3. All Network Category 6 horizontal station cables installed shall be provided with a Category 6 Gigaspeed XL Visiptach to GS8E 4pr hybrid Patch Cord for interconnection of the horizontal station cable to the network switch hardware.

a. Hybrid cord lengths for wall mount terminal block to rack mount equipment configurations range from 20 feet to 32 and shall be field verified by the IDT.
b. Hybrid cords not installed shall be provided in each IDF.
c. See CR D6010.12 Data Communications Network Equipment for IDT requirement for installation and labeling of patch cords.

4. Category 6 Gigaspeed XL Modular Patch Cords shall be provided for the device end of the following horizontal station cable colors and devices.
   a. All green colored horizontal station cables to security devices. IDT to coordinate patch cord lengths with various IP security devices such as Video Surveillance Cameras, Access Control Panels, alarm Panels and Intercoms. Many of these devices attach directly to the back box or enclosure and utilize a patch cord that is not greater than 2 feet in length.
   b. All yellow colored horizontal station cables to wireless access point devices
   c. IDT to coordinate patch cord lengths with wireless access points. Patch cords length will vary from less than 2 feet to greater than 8 feet depending on the mounting configuration of the WAPS. All WAPS require to patch cords. See (CR D6010.12, Data Communications Network Equipment).
   d. All blue colored horizontal station cables to IP devices and or devices with IP ports in (CR D6030.10, AV systems; D6060.10 Distributed AV Communications Systems and D8010; Integrated Automation Facility Controls).
   e. IDT to coordinate patch cord lengths device types and mounting configurations.

5. Category 6 Gigaspeed XL Zone Extension Cords shall be provided between all floor box termination locations and table top cable termination locations. All Zone extension cords shall be factory manufactured and shall be a Systimax cord assembly. IDT to coordinate zone extension cord lengths with the table and lectern designs and configurations.

6. Category 6 Gigaspeed XL horizontal station cable labeling and identification:
   a. All horizontal station cables shall be labeled in the cable sheath within 4 inches of termination point as well as on the faceplate, cover plates and the visipatch 360 terminal block field
b. All Visipatch to GS8E Hybrid patch cords shall be at each end.
c. All zone extension cords shall be labeled at the jack end in a faceplate or device plate at the table top boxes in the furniture.
d. See D6090.11 for labeling and identification requirements
e. Category 6 Gigaspeed XL horizontal station cable shall be tested using the ANSI/TIA-568-C.2 Permanent Link test configuration.
f. Test results shall be provided in an Electronic format that is agreed to between the Owner and the IDT. Any software application required to read and or view the test results by the owner shall be provided by the IDT.
g. Cable ID number shall be on all test results.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Narrative that describes the Communications Cabling quantity, size and configuration.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Product cut Sheets identifying all communications cabling components, and manufacturers</td>
</tr>
<tr>
<td></td>
<td>3. A set of Floor Plans at 1/8 inch equals 1 foot with the clearly defined symbols that designate each faceplate, cover plate device termination with the cable type and cable count at the location. Maximum horizontal cable lengths shall be indicated on this drawing.</td>
</tr>
<tr>
<td></td>
<td>4. A set of Floor Plans at 1/8 inch equals 1 foot with horizontal backbone cables and termination enclosures.</td>
</tr>
<tr>
<td></td>
<td>5. Product cut Sheets identifying all communications cabling</td>
</tr>
</tbody>
</table>

References

1. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises.
2. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements.
3. ANSI/TIA-568-C.2, Balanced Twisted Pair Telecommunications Cabling and Components
4. ANSI/TIA 607-B Generic Telecommunications Bonding and Grounding
6. UL Fire stopping System data sheets for fire stopping systems that the IDT plans to use with the communications cabling system.

7. A single line backbone Riser diagram for the complete horizontal and vertical copper and fiber backbone riser cable system between BDF, IDF's and CPF's with all copper pair counts and fiber optic strand counts as well as termination connector configurations and identification numbering schemes.

8. A detail for each faceplate, cover plate and jack type and combination showing all of the components that make up the faceplate termination assembly and how the assembly attached and integrates with the back box, floor box, ceiling box, enclosure or device at its location. Details should include the labeling and identification scheme.

9. A set of Floor Plans at 1/8 inch equals 1 foot with the clearly defined symbols that designate each faceplate, cover plate device termination with the cable type and cable count at the location. Maximum horizontal cable lengths shall be indicated on this drawing. UL listed fire stopping systems shall be indicated by the UL system Number and the quantity of cables passing through the fire stopping system shall be indicated.

10. A set of Reflected ceiling plans at 1/8 inch equals 1 foot with the clearly defined faceplate, cover plate device termination symbols that designate the flush ceiling and above ceiling Cable terminations. UL listed fire stopping systems shall be indicated by the UL system Number and the quantity of cables passing through the fire stopping system shall be indicated.

11. A single line backbone Riser diagram for the complete horizontal and vertical copper and fiber backbone riser cable system between BDF, IDF's and CPF's with all copper pair counts and fiber optic strand counts as well as termination connector configurations and identification numbering schemes.

12. Product cut Sheets identifying backbone and horizontal station components, and manufacturers.
D 70  Electronic Safety & Security

A. Intent

The selection of appropriate security systems for the function of the overall building is paramount. The Integrated Delivery Team (IDT) shall consider the functional intent of the building and its users and then select video surveillance, access control, alarm monitoring and intrusion detection systems that, over their expected lifetime, successfully:

1. Meet UCSF and industry standards indicated in this section and other sections of this document.
2. Restrict access to specific areas of the building based on programmatic use and cardholder privileges.
3. Restrict access after-hours by cardholder privileges
5. Provide comprehensive video surveillance of the entire building exterior perimeter, interior building entrance areas, elevator lobbies and other specialty spaces to monitor the flow of employees and visitors.
6. Integrate seamlessly with the existing University security system infrastructure.
7. Integrate seamlessly with the Fire/Life Safety system.
8. Promote a secure and safe environment for the buildings users and visitors.

13. UL system numbers and system descriptions for fire stopping systems associated with the horizontal and vertical low voltage cabling systems.

14. A complete set of record drawings, submittals and specification in a digital format and a set of all programming files and documentation in digital format.

15. Test results for all cabling installed. Test results shall be provided for review prior to any placement of patch cords between the horizontal station cable and equipment.

May 28, 2016
Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4603
The Integrated Delivery Team (IDT) shall provide an Access Control and Monitoring System (ACAMS) located, sized and configured to support the access restriction requirements of the building. The selection of appropriate ACAMS for the function of the overall building is paramount. The IDT shall consider the functional intent of the building and its users and then select access control, alarm monitoring systems that, over their expected lifetime, successfully:

1. Restricts access based on programmatic use and cardholder privileges:
   a. At all exterior doors and entrances of the building.
   b. At all loading dock roll up doors both inside and outside of these doors.
   c. At ground floor staircase entrances and elevator cars.
   d. Out of staircases on to building floors.
   e. To teaching and non-departmental meeting areas of the building.
   f. To communications support spaces.
   g. At departmental entrances.
   h. To other specific spaces of the building.
   i. After-hours.


3. Integrate seamlessly with the:
   a. Door locking systems utilized in the building.
   b. Existing University access control and monitoring system infrastructure.
   c. Room and Facility scheduling systems.
   d. Intrusion detection, intercom, and video surveillance systems.
   e. Fire/Life Safety system.
Access Control

control panels located in IDFs Connected to a Central Server and Client workstations through the campus IP Ethernet system.

b. ACAMS consists of:

1. Two Monitoring and control workstations to be located in the building at the Security control desk (typically the Building Lobby).
2. One management workstation to be located in the building either at the Security control desk or another designated location within the building.
3. Access control panels located in the building IDFs and BDF.
4. Central Server running the Honeywell ProWatch application located at a secure location at 654 Minnesota Street in San Francisco.
5. Card readers, request to exit sensors, door position sensors and tamper sensors and alarm sounders located at exterior doors, interior doors and elevator cars.
6. Electrically locked fail secure door hardware and thru wire hinges see (CR B2050.90, Exterior Door Supplementary Components; and C1030.90, Interior Door Supplementary Components) for door hardware.
7. Interface to elevator control system from elevator cars see (CR D1010.10, Elevators).
8. Door position sensors in door frames.
9. Doors and door frames prepared by the door and door frame manufacturer to accept low voltage wiring, electrified thru wire hinges, door position sensors and electrified door latching hardware.
10. Interface and integration with the building’s Intercom, Intrusion Alarm, Video Surveillance and Fire Alarm systems. See (CR D6060.11, Intercom System; D7020.10, Intrusion Detection; D7030.10, Video Surveillance; and D7050.10, Fire Detection and Alarm).
11. Interface with the Data Communications Network. See (CR D6010.10, Data Communications Network Equipment).
12. Conduit, Junction Boxes and cable trays See (CR D6090, Communications Supplementary Components).
13. 120 VAC emergency electrical power at all ground floor exterior entrance doors for power to electrified door hardware.
14. 120 VAC electrical power at all exiting doors for power to electrified door hardware power supplies.
15. 120 VAC electrical power at Access Control Panels for power to all ACAMS Power Supplies and electrified hardware throughout the building.
16. System Programming
17. System testing and certification

D 7010.12 Standards for Access Control and Alarm System

a. UCSF utilizes the Honeywell ProWatch ACAMS throughout the campus.
b. UCSF Safety And Security Standard Specifications
   1. 13700 Basic Security Requirements
   2. 13710 Access Control and Alarm Monitoring
   3. 13740 Intrusion Detection System
   4. 13770 Security System Cabling
   5. 13780 Security System Labeling
   6. 13790 Security System Commissioning

D 7010.13 Interfaces and Integration

a. The ACAMS interfaces with;
   1. The IP Intercom system for unlocking of building entrance and loading dock doors thru the IP intercom panel.
   2. The VSS for video Surveillance of ACAMS generated events.
   3. The intrusion alarm system.
   4. The Electrified door hardware, request to exit sensors in the electrified door hardware, gate operators, roll-up door operators and auto operators.
   5. Door position sensors located in the door frames.
   6. Power supplies to provide power to electrified locks, card readers, operators, relays and controllers.
   7. Room scheduling systems.

D 7010.14 Keywatcher System

a. Description: Provide Morse Watchman KW-96 System.
b. Location: Locate in Maintenance/Custodial Huddle/Break room.
c. Surveillance: Provide video surveillance of system.

D 7010.15 ACAMS controlled doors
a. Building Exterior:

1. All building entrances.
   a. Note that ground floor emergency exits obviously do not require card access but do require monitoring of door position and request to exit sensors.
2. All exterior doors at the ground floor of the building.
3. Exterior roll up doors at the loading dock require ACAMS card readers at both the exterior and interior of the doors.
4. One door group in a set of multiple doors immediately adjacent to each other a lobby entrances may be designated as the card reader controlled door. The other doors in the group will require electrified locking and monitoring.
5. Emergency exits to the outside of the building from interior staircases shall not be utilized to enter the building and shall not have card reader access. The doors shall be monitored and the exit shall have an alarm sounder. The exit hardware shall have latch position monitored.

b. Building Interior:

1. All doors into staircases from the ground floor
2. All exits from staircases onto building floors above the ground floor
3. All elevator cars
4. Elevator equipment rooms
5. Pathway from elevator and or stair case on the elevator equipment room floor level to the elevator equipment room
6. Entrances from leased space into the building
7. All Classrooms
8. Learning centers and study areas
9. Libraries
10. Conference rooms, huddle rooms and interview rooms located in public areas of the building, outside of secured department areas.
11. Entrances to departmental spaces on each building floor
12. Storage rooms
13. File rooms
14. Bicycle storage rooms
15. Locker and shower room areas outside of secured building areas
16. Telecommunications BDFs, IDF's and CPFs
17. Audio-visual equipment support rooms
18. Educational Technology Services building support space
19. Loading dock and loading dock storage/office space

C. Verification & Validation (All Tiers)

SD

1. Product cut sheets identifying ACAMS System major components, and manufacturers.
2. Architectural floor plans identifying the locations inside and on the exterior of the building of the ACAMS System components.
3. Narrative that describes the Integration of the ACAMS System with the building as well as the Video Surveillance System, Intrusion detection system, Intercom system and data networking system.

DD

4. Product cut sheets identifying all components of each ACAMS System and where these components are to be located in the building.
5. Architectural floor plans identifying the locations inside and on the exterior of the building of the ACAMS System components.
6. Single line diagrams of each of the ACAMS System.

CD

7. Architectural floor plans identifying the locations inside and on the exterior of the building of the ACAMS System components.
8. Elevations locations of the ACAMS system panels in the BDF and IDF's.
9. Architectural casework drawings showing coordination with ACAMS workstations at the building security desk.
10. Detailed single line diagrams showing all devices and wiring associated with the ACAMS System as well as its integration with the Video Surveillance System, Intrusion detection system, Intercom system and data networking system.
11. All locations and details of the signage associated with the assistive listening system shall be provided.
D 7020.10 Intrusion Detection

A. Intent

The Integrated Delivery Team (IDT) shall provide an Intrusion Detection System located, sized and configured to support the monitoring of unauthorized access to the building. The selection of appropriate Intrusion Detection System for the safety and security of the building occupants, users, visitors and contents is paramount. The IDT shall consider the functional intent of the building and its users and then select the Intrusion Detection systems that, over their expected lifetime, successfully:

1. Monitors intrusion into armed areas of the building:
3. Integrate seamlessly with the:
   a. Door locking systems utilized in the building.
   b. Existing University Intrusion Detection system infrastructure.
   c. ACAMS and video surveillance systems.

12. Complete list of all ACAMS System devices that will require IP addresses. See (CR D6010.10, Data Communications Network Equipment).

13. See UCSF Safety and Security Standard 13710 ACAMS system for submittal requirements.

14. A complete set of record drawings, submittals and specification in a digital format and a set of all programming files and documentation in digital format.

15. Configuration set up and testing of the devices that make up each of the ACAMS System.

16. All licensing associated with the each of the ACAMS System devices.

17. Support staff onsite to make adjustments and to perform trouble shooting of the ACAMS System.

Technical Criteria

SERVICES

D 7020.10 Intrusion Detection

B. Description & Performance

D 7020.11 General

a. The Intrusion Detection System is a separate system from the ACAMS. The Intrusion Detection system is comprised of door position sensors in door frames, tamper switches on enclosures, panic buttons, LCD control panels and programming to zones throughout the building that can be independently armed and unarmed.

b. Intrusion Detection System consists of:

1. Intrusion Detection System consists of:
2. LCD Control Panels for arming, unarming and monitoring.
3. Bosch Intrusion Detection System Control Panel and system components to match campus standard.
4. An existing Radionics 6600 Receiver Central station at the UCSF Police department headquarters interconnected to the Building intrusion detection system.
5. Door position sensors, tamper sensors and panic buttons are interconnected to the system to monitor for intrusion when the system is armed.
6. Door hardware with request to exit monitoring and thru wire hinges see (CR B2050.90, Exterior Door Supplementary Components; and C1030.90, Interior Door Supplementary Components) for door hardware
7. Door position sensors in door frames.
8. Doors and door frames prepared by the door and door frame manufacturer to accept low voltage wiring, electrified thru wire hinges, door position sensors and electrified door latching hardware.
9. Interface and integration with the buildings ACAMS and Video Surveillance. See (CR D7010.10, Access Control; and D7030.10, Video Surveillance).
10. Interface with the Data Communications Network. See (CR D6010.10, Data Communications Network Equipment) for communications between building and existing Central alarm system.
11. Interface with the AT&T Dial tone. See (CR D6020.20, Voice Communications Terminal Equipment).
12. Conduit, Junction Boxes and cable trays. See (CR D6090, Communications Supplementary Components).
13. 120 VAC electrical power to power 12 VDC power supplies that support the LCD control Panels and motion detectors.

14. Battery backup power for the 12VDC power system to support the operation of the Intrusion Detection system for a minimum of 8 hours during a power failure.

15. System Programming

16. System testing and certification

D 7020.12 Standards for Access Control and Alarm System:

a. UCSF utilizes the Honeywell ProWatch ACAMS throughout the campus.

b. UCSF Safety And Security Standard Specifications

1. 13700 Basic Security Requirements
2. 13710 Access Control and Alarm Monitoring
3. 13720 Video Surveillance System
4. 13740 Intrusion Detection System
5. 13770 Security System Cabling
6. 13780 Security System Labeling
7. 13790 Security System Commissioning

D 7020.13 Interfaces and Integration:

a. The Intrusion Detection System interfaces with;
   1. The VSS for video Surveillance of Intrusion Detection generated events.
   2. The door hardware door position sensors, and position sensors at gates, roll-up doors and other door systems without conventional latch bolts
   3. 12VDC Power system

D 7020.14 Intrusion Detection Monitored Doors:

a. Building Exterior;
   1. All exterior doors at the ground floor of the building

b. Building Interior
   1. Elevator equipment rooms
   2. Entrances from leased space into the building
   3. All Classrooms
D 7030.10  Video Surveillance

4. Conference rooms, huddle rooms and interview rooms located in public areas of the building, outside of secured department areas.
5. Telecommunications BDFs, IDF and CPFs
6. Audio visual equipment support rooms
7. Fire pump rooms
8. Fire control center room

D 7020.15  Panic Buttons

a. Building Interior
   1. Security Desk
   2. Cash Handling locations in the building

D 7030.10  Video Surveillance

A. Intent

The Integrated Delivery Team (IDT) shall provide a video surveillance system located, sized and configured to support the video surveillance requirements of the building. The video surveillance system shall be integrated with the exterior and interior architectural elements of the building to optimize the quality of the video imaging. The selection of appropriate video surveillance system for the function of the overall building is paramount. The IDT shall consider the functional intent of the building and its users and then design and implement a video surveillance system that, over their expected lifetime, successfully:

1. Maximizes video surveillance image clarity and the ability to clearly recognize employees and visitors.
2. Support the utilization of video analytics.
3. Provide video surveillance of:
   a. Employees and visitors moving towards and away from the building.
   b. Employees and visitors moving through the public areas on the building.
   c. The entire building exterior perimeter at street level.
   d. All building entrances from the interior looking out from the building.
   e. All elevators at each elevator lobby throughout the building.
f. The key watcher key safekeeping cabinet.
g. Other specialty spaces to monitor the flow of employees and visitors.

4. Provide video surveillance in Clinical Areas:
   a. At all entrances and exits at the clinical department perimeter within the building.

5. Integrate seamlessly with the:
   a. Existing University access control and monitoring system infrastructure.
   b. Intrusion detection systems.

6. Provides a surveillance station with good ergonomics for Security staff monitoring the systems.

B. Description & Performance

B 7030.10 Video Surveillance

a. The Video Surveillance System VSS consists of a Client Workstation, Network Video Recorder (NVR), Power Over Ethernet Switches (POE), Uninterruptible Power Supplies (UPS), Software, and a combination of Fixed Dome, Surround Video Cameras and power supplies. The NVRs utilize the UCSF Campus LAN/WAN for connectivity and remote viewing.

b. The entire base of the building exterior require 24/7 Video Surveillance.

c. The building lobby, elevator lobbies, loading dock and all entrances and exits to the building require 24/7 Video Surveillance.

d. Specialty areas of the building such as bicycle storage spaces require 24/7 Video Surveillance.

e. VSS Cameras should be located between 8 and 10 feet above finished floors and grade to optimize facial viewing and recognition.

f. New Campus buildings shall have a security officer station in the lobby of the building that monitors the VSS locally via a client workstation. The ACAMS workstation in the building lobby shall be utilized to support the NVR Client Workstation Software for monitoring and viewing capabilities.

g. ExacqVision NVR Client workstation software shall be loaded and configured on the ACAMS workstation at the security desk in the building Lobby.
D 7030.12 Standards for Video Surveillance System:

a. UCSF utilizes the ExacqVision Enterprise VMS for Network Video Recording (NVS) and Arecont fixed dome and surround video camera (SVC) dome camera hardware in the Campus VSS.

b. UCSF Safety And Security Standard Specifications
   1. 13700 Basic Security Requirements
   2. 13720 Video Surveillance System
   3. 13770 Security System Cabling
   4. 13780 Security System Labeling
   5. 13790 Security System Commissioning

D 7030.13 Network Video Recorder:

a. Provide Network Video Recorder, NVR, platform that encompasses recording video, viewing, reviewing recorded video and storing video simultaneously for indefinite periods of time. Rack mount TCP/IP Networked ExacqVision 2U IP server with minimum 4 terabyte storage per unit.

b. The system shall have the ability to utilize a variety of network storage devices such as external disk arrays, RAID arrays, NAS devices and external disk drives for exporting, sharing and backing up images.

c. Provide Digital Video Recorder storage sizing based on recording full time on all cameras for 24/7 365 days per year with 120 days of rolling retention.

d. NVR system build out will include a keyboard, flat screen monitor and mouse along with a KVM switch to access multiple NVRs located in the BDF room. Unit shall incorporate a 1x8 KVM Switch, Rose Electronics.

e. NVR system shall be interconnected to the Campus Local Area Network (LAN) and Wide Area Network (WAN). LAN interface shall be 10/100/1000 Mbs Ethernet

D 7030.14 Video Cameras:

a. Surround Video Dome Cameras shall be Integrated Color H.264 20 Megapixel Day Night Camera Lens and Dome Housing. Min Light level 0.3 lux, 180 Panoramic IP camera Arecont Omni to match existing campus VSS Standard.

   1. The maximum acceptable viewing radius for this type of camera is 45 feet.
   2. The minimum overlap of adjacent video cameras is 5 feet
b. Fixed Dome Cameras shall be Integrated Color H.264 1 Megapixel Camera Lens and Dome Housing. Min Light level 0.3 lux, 84 degree horizontal with WDR, Axis to match existing campus VSS Standard

1. The maximum acceptable viewing radius for this type of camera is 18 feet.
2. The minimum overlap of adjacent video cameras is 2 feet

D 7030.15 Interfaces and Integration:

a. The VSS interfaces with the IP Intercom system for video surveillance of Intercom activation events
b. The VSS interfaces with the ACAMS system for video surveillance of ACAMS generated events.
c. The VSS interfaces with the Intrusion Alarm system for Video Surveillance of Intrusion events

C. Verification & Validation (All Tiers)

SD
1. Product cut Sheets identifying video surveillance System major components, and manufacturers.
2. Graphic symbols for each video surveillance camera that shows the view area and coverage of the camera. The symbol shall indicate the radius of the coverage area and shall show areas that are blocks by building columns and partitions.
3. Building floor plans identifying the locations inside and on the exterior of the building of the video surveillance cameras. The floor plans shall utilize the graphic symbols that shows the camera viewing area and coverage for all cameras.
4. Narrative that describes the Integration of the video surveillance System with the building as well as the ACAMS, Intrusion detection system, Intercom system and data networking system.

DD
5. Product cut Sheets identifying all components of each video surveillance System and where these components are to be located in the building.
6. Architectural floor plans identifying the locations inside and on the exterior of the building of the video surveillance System components.
The floor plans shall utilize the graphic symbols that shows the camera viewing area and coverage for all cameras.

7. Exterior elevations indicating the locations of all exterior video surveillance cameras.

8. Single Line diagrams of each of the complete video surveillance system.

9. Architectural floor plans identifying the locations inside and on the exterior of the building of the video surveillance System components. The floor plans shall utilize the graphic symbols that shows the camera viewing area and coverage for all cameras.

10. Elevations and details of the floor standing server cabinet to be located in the BDF that supports the Video Surveillance network video recorders and management workstation. See (CR D6090.20, Data Communications Support Spaces).

11. Architectural casework drawings showing coordination with video surveillance workstations at the building security desk.

12. Detailed single line diagrams showing all devices and wiring associated with the video surveillance System as well as its integration with the ACAMS, Intrusion detection system, Intercom system and data networking system.

13. Complete list of all video surveillance System devices that will require IP addresses. See (CR D6010.10, Data Communications Network Equipment).

14. See UCSF Safety and Security Standard 13720 video surveillance system for submittal requirements.

15. A complete set of record drawings, submittals and specification in a digital format and a set of all programming files and documentation in digital format.

16. Configuration set up and testing of the devices that make up each of the video surveillance System.

17. All licensing associated with the each of the video surveillance System devices.
D 7050.10 Fire Detection and Alarm

A. Intent

Fire alarm system shall be designed to detect the presence of a fire and to notify the building occupants and reporting station. Items to be included in the design and analysis of these systems are: structure alarm requirements, location and audibility, types of alarms and initiation devices, notification requirements, installation requirements and backup power requirements. The system shall have capacity to expand to facilitate the addition of future fire alarm devices and the capability to expand for future mass notification.

To enhance performance for near-deaf users, fire alarm horn/speaker strobes shall be located more frequently than typical buildings, allowing each horn/speaker strobe to operate at a lower sound level, and therefore provide a more uniform sound level.

B. Description & Performance

a. Description: Fire alarm system in the building shall be capable of detecting and notifying building occupants in case of a fire emergency.

b. Performance Requirements:

1. Tie into the campus Fire Alarm system loop.
2. Meet UCSF Campus standards, section 16720 Fire Alarm System.
3. Coordinate design with the Fire Life Safety Report, see Contract.
4. Edward System Technology EST3 shall be used as the basis-of-design.
5. Devices installed in environmental air spaces shall be suitable for the location to be installed.
6. Conductors shall be either:
D 7090  Electronic Safety & Security

Technical Criteria

a.  MC cable, except in laboratories, clinical or other spaces anticipated to have future changes.
b.  In conduit or approved raceway.

C.  Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Conduct workshop with Fire Marshal to review design approach/intent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Conduct workshop with Fire Marshal to review design intent.</td>
</tr>
<tr>
<td>CD</td>
<td>3. Submit layout documentation in accordance with NFPA 72 documentation requirements.</td>
</tr>
<tr>
<td></td>
<td>4. Submit installation documentation in accordance with NFPA 72 show drawing requirements. Fire Marshal approval will be required prior to start of construction.</td>
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<tr>
<td></td>
<td>5. Submit completion documentation in accordance with NFPA 72 requirements.</td>
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<tr>
<td></td>
<td>6. Submit Inspecting, Testing, and Maintenance Documentation in accordance with NFPA 72 requirements.</td>
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<tr>
<td></td>
<td>7. Provide training to building facility staff per UCSF Campus Standards, section 16720 Fire Alarm System requirements.</td>
</tr>
</tbody>
</table>

D 7090  Electronic Safety & Security Supplementary Components

A.  Intent

Identify all Access control and intrusion detection devices and cabling throughout the building.

B.  Description & Performance

D 7090.11  Electronic Safety & Security Identification (LE D (20 yrs))

a.  Access Control and Intrusion Detection System Cabling and Devices
1. Identification shall consist of:
   a. Wrap around machine printed self-adhesive labels within 6 inches of the ends of the cable sheath.
   b. Machine printed adhesive backed labels

2. Locations:
   a. Within 6 inches of the end of all cable sheaths.
   b. Cable connection side of all system components.

3. Identification Scheme:
   a. See UCSF Safety and Security Standards - 13780 Security System Labeling

4. Submit a sample of each type label for review by the University prior to labeling

D 8010 Integrated Automation Facility Controls

A. Intent

The University intends to change the way its buildings are maintained, operated and managed through the utilization of Skyspark building analytic software. Software analytic rules shall be designed to improve the overall management of the building’s energy efficiency, building systems, warranty period and maintenance practices. It is expected that commissioning and construction programming, energy benchmarking, and automatic fault detection will persist into building operations and provide the fundamental foundation of a Smart Building.

Integrated Automation Facility Controls for Plumbing, HVAC, Electrical/Lighting, and Irrigation systems shall be provided that allow for the continuous automated operation, management by facility staff, and metering of all MEP equipment energy and water use. The Automation system shall also allow for integration with, and direct management of, a separate lighting control system. Automation Controls system shall automatically operate and manage all systems in a way that achieves the comfort, health, and sustainable goals of the project.

It is paramount that the Integrated Delivery Team (IDT) integrate control system design early in the overall design process in order to ensure holistic coordination between the designers’ intent for
B. Description & Performance

D 8010.00 General

a. Guidelines & References:
   1. See (CR Z1040.35, UCSF Control Systems Standards) for detailed description of additional requirements.
   2. See (CR D6010.10, Data Communications Network Equipment) and (CR D6090, Communications Supplementary Components) for the interconnection of the BAS to the Campus/University Ethernet LAN.

b. Performance:
   1. All communication with the BAS shall be through BACnet MS/TP protocol.
   2. Provide integrated control systems to achieve all specified performance requirements of the Plumbing, HVAC, Electrical/Lighting and Irrigation systems and equipment.
   3. Provide automatic controls on all plumbing pumps and equipment. Connect to building and campus BAS for monitoring, logging, trending.
   4. HVAC and Lighting control zoning shall be coordinated to permit further integration and controls between the systems in a logical and common manner. Use common sensors as much as possible to control devices within the same space or control zone (i.e. one occupancy sensor to control lighting and HVAC systems in same conference room).

c. Meters:
   1. All meters shall trend and log data into the BAS on 15 minute intervals. If requested, provide duplicate trends at 5 minute intervals.
   2. See (CR D.05, Services-Meters) for additional requirements.

D 8010.10 Integrated Automation Control of Equipment

a. Description: To be identified.

D 8010.40 Integrated Automation Control of Plumbing Systems

a. Performance Requirements:
1. See (CR D8010.00 Integration Automation Facilities Controls General)

**D 8010.41 Integrated Automation Control of Irrigation Systems**

a. Performance Requirements:

1. See (CR D8010.00 Integration Automation Facilities Controls General)

**D 8010.50 Integrated Automation Control of HVAC Systems**

a. Performance Requirements:

1. See (CR D8010.00, Integration Automation Facilities Controls General)
2. Provide leak detection of Liquid Facility Fuel. Tie detection into BAS.
3. Provide position feedback on all damper actuators.
4. TIER 2: All control valves in chilled, heating and condenser water systems shall be pressure independent type. See (CR Z1040.30.A, Facilities Design Guidelines (Excerpted)).

**D 8010.60 Integrated Automation Control of Electrical Systems**

a. Description: Lighting control technologies implemented to provide the most efficient and effective electric lighting control system for the building occupants.

b. Performance Requirements:

1. See (CR D8010.00, Integration Automation Facilities Controls General)
2. Lighting controls shall be designed to implement daylight penetrations into the space.
3. Provide the ability for individual lighting controls, as permitted by functional requirements of the space.
4. Lighting controls shall integrate into the BAS using BACnet communication protocol.
5. Use of proprietary lighting control systems is not allowed. Open protocol systems are required.
6. Lighting fixtures, including emergency fixtures, located within daylight zones shall be controlled via daylight controls, but shall be designed to activate to full brightness under loss of normal power.
7. TIER2: Lighting controls system shall allow for each fixture to be individually addressable, to permit maximum control and flexibility for future re-zoning with minimal impact to existing conditions.
### D 8010 Integrated Automation Supplementary Components

**a.** Description: To be developed by the IDT.

#### C. Verification & Validation (All Tiers)

| SD | 1. Controls intent narrative. |
|    | 2. Equipment cutsheets and Graphical User Diagrams. |
|    | 3. Identify the implementation schedule for the BAS as required to startup and test aspects of the building during construction. |

| DD | 4. Sequences of Operation, controls graphics package, programming protocol and details of integration with lighting controls and campus controls. |
|    | 5. Narrative shall include equipment cutsheets and Graphical User Diagrams proposed to be used on this project. |
|    | 6. One-line diagrams indicating sensor locations. |

| CD | 7. Final Controls Narrative. |
|    | 8. Equipment cutsheets of controllers, sensors, meters, electrical panels and other equipment in the control system. |
|    | 9. Final detailed Sequences of Operation |
|    | 10. Final controls graphics package |
|    | 12. Details of integration with plumbing controls. |
|    | 13. Details of integration with lighting controls |
|    | 14. Details of integration with campus controls. |
|    | 15. Provide submittal with the following. |

| Construction | 16. Updates to controls submittal (if required due to design or installation changes). |
|             | 17. Provide training to UCSF Staff, Operation Manuals in coordination with Commissioning Agent manuals. |
E  Equipment & Furnishings

E 1010.50  Loading Dock Equipment 611
E 1030.40  Maintenance Equipment 612
E 1030.75  Office Equipment 613
E 1040.10  Educational & Scientific Equipment 614
E 1040.20  Healthcare Equipment 615
E 1090.10  Solid Waste Handling Equipment 617
E 20  Furnishings 618
E 2010.20  Window Treatments 619
E 2010.30  Casework 620
E 2050.30  Furniture 625
**Guiding Principles**

Ergonomic furnishings shall complement the building interiors to support spatial requirements, easily accommodate all users, changing uses and technology, and create an interior environment that promotes occupant safety, productivity, comfort and well-being. The Integrated Delivery Team is expected to fully understand, and design support for, all equipment and furnishing requirements, including those purchased by the University.
E10  Equipment

A. Intent

Regardless of whether the Integrated Delivery Team (IDT) or owner is responsible for procurement and/or installation of equipment, it is expected that the IDT will work with the University to understand the equipment requirements for space, access clearances, utilities, environmental control, seismic protection, and proper lighting.

1. See (CR Z1060.30, Owner-Furnished Equipment) for responsibilities of procurement and installation.

B. Description & Performance

E 1010.50  Loading Dock Equipment

A. Intent

Easy and safe movement of goods and equipment within the facility.

Allow movement of goods and goods-handling equipment from the interior of trucks to loading dock surface and vice versa without manual lifting or traversing a slope greater than 1:20.

Interview University Facilities Services and Environmental Health and Safety for safe and efficient handling of loading dock materials with appropriate space, circulation, and equipment at the loading dock. Reconfirm requirements after every program change that affects material movement through the loading dock.

B. Description & Performance

E 1010.51  Dock Levelers (at raised Loading Docks) (LE C (15 yrs))

a. Provide levelers that accommodated pick-up trucks, step vans and tractor-trailers (sems).

b. Provide levelers with capacity not less than 40,000 lbs.


C. Verification & Validation (All Tiers)

SD  1. Interview University Facilities Services and Environmental Health and Safety for safe and efficient handling of loading dock materials with
E 1030.40  Maintenance Equipment

A. Inten

The Integrated Delivery Team (IDT) shall propose the maintenance methods for the project, whether deviating from, or merely complying with, the University’s standard practices in Maximo. Maintenance equipment shall support these methods by providing for safe, efficient, intuitive and easily accessible maintenance of the building.

B. Description & Performance

E 1030.41  Window Washing Systems

a. Description: The University performs window washing infrequently. As a result, the University prefers to invest in roof-mounted davits that University sub-contractors (after this project) would fasten exterior vertical enclosure maintenance equipment (such as, but not limited to, window washing scaffolding) to.

b. Requirements:

1. Roof-mounted davits that neither compromise the integrity nor robustness of the roofing system, and are designed in coordination with the roof structure to support all anticipated loads.

2. The IDT shall create and procure the Operating Procedures Outline Sheet (OPOS) per CCR Title 8, Subchapter 7, Group 1, Article 5.

3. Ensure that at least one davit is included in all roof/roofing mockups and tests.
## E 1030.75 Office Equipment

### C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Narrative description of the proposed methods for full exterior vertical enclosure maintenance (including window washing).</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Provide roof plans with davit locations to validate entire coverage of exterior vertical enclosure system, coordinated with anticipated locations of roof mounted solar panels.</td>
</tr>
<tr>
<td></td>
<td>3. Draft of OPOS.</td>
</tr>
<tr>
<td>CD</td>
<td>4. Procurement of OPOS.</td>
</tr>
</tbody>
</table>

### A. Intent

**Office Equipment shall be Owner-Furnished and Installed.** It is expected that the Integrated Delivery Team (IDT) will work with the University to understand the equipment requirements for space, access clearances, ergonomics, utilities, environmental control, and proper lighting.

### E 1030.76 General

a. See (CR Z1060.30, Owner-Furnished Equipment) for responsibility of furnishing and installation.

### C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Develop a table of University Office Equipment, locations and utility needs, including room numbers, for quality control checking at a later date.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Update the table of University Office Equipment.</td>
</tr>
<tr>
<td>CD &amp; Construction</td>
<td>3. Update the table of University Office Equipment, and ensure all utility outlets accommodate equipment plus convenience needs.</td>
</tr>
</tbody>
</table>
E 1040.10  Educational & Scientific Equipment

A. Intent

Regardless of whether the Integrated Delivery Team (IDT), the University, or a University’s preferred vendor is providing particular equipment, it is expected that the IDT will work with the University to understand the equipment requirements for space, access clearances, ergonomics, utilities, environmental control, and proper lighting in time for all coordination and installation to take place without impacting the project.

Educational Equipment is typically defined as that which supports an individual lab and is to be purchased by the University (Principal Investigator). Scientific Equipment is typically defined as that which supports multiple labs and is therefore purchased as part of the Project.

B. Description & Performance

E 1040.11  General

a. See (CR Z1060.30, Owner-Furnished Equipment) for responsibility of furnishing and installation.

E1040.12  Laboratory Service Fittings

a. Mechanical service fixtures shall comply with SEFA 7, “Laboratory and Hospital Fixtures-Recommended Practices. Fixtures for liquids and gaseous mixtures shall have lettered and colored indexes for each service.

b. Handles shall be black, with color-coded index tabs identifying utility.

c. Serrated hose ends shall have seven (7) serrations. Fixtures for gas, air and vacuum shall be needle valve, large type.

d. Water fixtures shall be compression type. Drain fittings shall be polypropylene unless otherwise noted.

e. All other fixtures for special gases and instrument air shall be lubricated, cleaned, capped protected, and delivered certified for “Oxygen” service. Provide fittings complete with washers, locknuts, nipples and other installation accessories. Include the deck flanges, escutcheons, handle extension rods and similar items.

E 1040.13  Laboratory Fume Hoods: (LE D (20yrs)) (Currently no fume hoods in the project; IDT to reconfirm during the Design Phase.)
E 1040.20 Healthcare Equipment

a. Description: To Be Developed
b. Performance: To Be Developed

E 1040.14 Biological Safety Cabinets (LE D (20 yrs)) (Currently only relocation of existing cabinets in project. IDT to reconfirm during the Design Phase.)

a. Description: To Be Developed
b. Performance: To Be Developed

E 1040.15 Lab Waste Sterilization Equipment (LE D (20yrs)) (Currently none identified in the project. IDT to reconfirm during the Design Phase.)

a. Description: To Be Developed
b. Performance:
   1. 2 year comprehensive warranty on the equipment.
   2. 10 year warranty on the chamber.
   3. Guarantee 98% up time for 5 years.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Reconfirm with the users the need for Education and Scientific Equipment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. See Contract.</td>
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<td>Startup</td>
<td>5. See Contract.</td>
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</table>

E 1040.20 Healthcare Equipment

A. Intent

Healthcare equipment covers a wide range of needs from large to small, expensive to inexpensive, as well as delicate to disposable. The intent at this stage is not to list or specify every item needed to operate a functioning clinic, rather consider key equipment items and the parameters that will ensure technical adaptability and a supportive infrastructure once the final items are selected.
Key medical equipment for Ophthalmology generally falls into two major categories: mobile and fixed; furthermore, fixed items may be floor-mounted, wall-mounted, or ceiling mounted. For either category, the spatial needs must consider use of the equipment as well as access to the equipment for maintenance throughout its life. The technical and infrastructure support for these items will have an impact on all utilities specific to running equipment from plumbing, electrical, and air to data.

Related criteria considers room functionality as well as security. As an example, laser procedures may need warning, in-use lights as well as process water for cooling.

Regardless of whether the Integrated Delivery Team (IDT), the University, or a University’s preferred vendor is providing particular equipment, it is expected that the IDT will work with the University to understand the equipment requirements for space, access clearances, ergonomics, utilities, environmental control, and proper lighting in time for all coordination and installation to take place without impacting the project.

B. Description & Performance

E 1040.21 General

a. See (CR Z1060.30, Owner-Furnished Equipment) for responsibility of furnishing and installation.

E 1040.22 Medical Sterilization Equipment (LE D (20 yrs)) (Currently none identified in the project. IDT to reconfirm during the Design Phase.)

a. Description:
   1. Medical Waste Sterilization Equipment
   2. Medical Equipment Sterilization Equipment

b. Performance:
   1. 2 year comprehensive warranty on the equipment.
   2. 10 year warranty on the chamber.
   3. Guarantee 98% up time for 5 years.

C. Verification & Validation (All Tiers)

SD  1. Reconfirm with the users the need for Healthcare Equipment.

DD  2. See Contract.
E 1090.10  Solid Waste Handling Equipment

A. Intent

Provide for efficient removal of waste from the building while minimizing both the amount of labor required to do so and the cost of disposal. Provide for recycling of waste material. Placement of containers should carefully consider their potential to create pedestrian traffic obstacles, in particular for Low Vision users.

B. Description & Performance

E1090.11  Solid Waste Handling Equipment (LE B (10 yrs))

a. Description: Three sets of Compactors, Tippers and Dumpsters for Garbage, Recycling and Compost.

b. Performance:

1. Work with the University to determine the capacity of the three systems.
2. Equipment should perform as expected over the systems’ life expectancy taking into account exposure to the Marine environment, and the very significant wear and tear imposed by waste handling operations, equipment and vehicles.

E1090.12  Solid Waste Handling Bins (LE B (10 yrs))

a. Description:

1. In restrooms: Plastic compost bins provided by the University (contact University for specifications and dimensions). Space for accommodation of bins to be included by the Integrated Delivery Team (IDT). See (CR
C1090.40.B, Toilet, Bath, and Laundry Accessories).

2. For "back of house" spaces (not normally seen by visitors or regular building occupants): Sets of three plastic bins provided by the University (contact University for specifications and dimensions). Space for accommodation of bins throughout the building to be included by the IDT.

3. For remainder of interior spaces: Three bins per set to be provided and installed by the IDT (contact University for specifications and dimensions).


C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Show proposed solid waste handling bins on schematic floor plans indicating adequate clearances for pedestrian, vehicular and material traffic. Provide large scale, coordinated plans of toilet rooms showing adequate recessed space for bins that do not present an obstacle for low-vision users.</th>
</tr>
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<tbody>
<tr>
<td>DD</td>
<td>2. See Contract.</td>
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<td>Startup</td>
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<td>5. See Contract.</td>
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</table>

E 20 Furnishings

A. Intent

Regardless of whether the Integrated Delivery Team (IDT) or owner is responsible for procurement and/or installation of furnishings, it is expected that the IDT will work with the University to understand the furnishings requirements for space, access clearances, ergonomics, utilities, environmental control, and proper lighting.

1. See (CR Z1060.30, Owner-Furnished Products) for procurement and installation responsibilities.
A. Intent

Provide window treatments attached to interior construction that enhance the control of light, glare, privacy, and views for spaces with interior and exterior windows. Window treatments should:

1. Enhance interior thermal comfort.
2. Be an integral component of the building’s energy efficiency.
3. Enhance the architectural design intent.
4. Be easily cleaned and maintained.
5. Be easy for users to operate without damaging.

B. Description & Performance

E 2010.21  General  (LE B (10 yrs))

a. Light and Glare Control: Provide window treatment that will allow control of light transmitted through window assembly.

1. Full Open Position: Maximum reduction of light level of 10 percent.
2. Full Closed Position: Minimum reduction of light level of 50 percent.
3. Gaps between window treatment sections should not transmit light different from the field of the window treatments.

b. Types:

1. Shades preferred for durability and janitorial concerns.
2. Louvered Blinds are discouraged.

c. Convenience: Provide window treatment with controls that are conveniently located and easily operated.

2. Horizontal Movement by Manual Controls: Maximum weight of window treatment of 60 lb (27.2 kg).

d. Combustibility: Provide window treatments that are made of totally incombustible or
fire-retardant treated materials.

e. Flammability: Provide window treatments made of materials with flame spread index of 25 or less and smoke developed index of 450 or less when tested in accordance with ASTM E 84 at all locations throughout the project.

f. Colorfastness: Provide window treatment that is resistant to degradation from exposure to ultraviolet light.

1. Painted Aluminum: Maximum of 5 Delta E units (Hunter) color change as calculated in accordance with ASTM D 2244 after 5 years of exposure in accordance with AAMA 2604.

2. Fabric: No less than Grade 4 after 200 hours, per AATCC 16, Option A.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Discuss with Users how proposed window treatment will effect space.</th>
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</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Demonstrate ergonomic reach requirements to operate all aspects of window treatments.</td>
</tr>
<tr>
<td>Completion</td>
<td>4. See Contract.</td>
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<td></td>
<td>5. See Contract.</td>
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</table>

**E 2010.30 Casework**

**A. Intent**

Casework should be selected that can be configured as a “kit of parts” whereby a minimum number of cabinetry pieces are chosen for a broad array of needs and applications. Structure needs to be provided in partitions to support cabinet support, both for initially identified locations and for potential future locations.

Casework shall support the integration of existing technology systems and provide convenient pathways and grommets for future technologies.

Laboratory Casework shall accommodate changes to research, teaching, services and technology. Casework should be built-in to the laboratories as little as possible, allowing for changes to shelving,
work surfaces and cabinets over time. Utilities shall be provided overhead through service panels with quick disconnect connections to the casework system.

Lighting design shall consider casework, and the need to adequately identify items worked upon a countertop without detrimental shadowing, especially in laboratory and clinical environments.

Reception Casework (Reception desk, Nurse Station, Information Desk, etc.) should:

1. Have corners and edges with radiused, rounded, or at least eased corners to avoid uncomfortable discovery by those with low vision conditions and those that are severely visually impaired.
2. Have designs that avoid round and non-rectilinear forms as they confuse orthogonal references used by those that are severely visually impaired.

B. Description & Performance

E 2010.31 General Built-In Cabinetry and Casework (LE B (10 yrs))

a. Use one of the following:
   1. At Restrooms, Break Rooms, and General Use Functions: Custom-made wood cabinets with plastic laminate finish and solid surfacing countertops.
   2. Custom-made wood cabinets with wood veneer finish and solid surfacing or quartz counter tops at office and reception areas.

b. Quality Standard: Comply with the "Architectural Woodwork Standards" Premium grade for construction, finishes, installation, and other requirements.

c. The construction will not use:
   1. Wood products from old growth forests.
   2. Wood composite products using added urea formaldehyde.

d. Countertops at Breakroom, Kitchen and Restrooms:
   1. Design so water does not puddle on counter or drip on floor. (Trough type has been successful)
   2. Solid, seamless preferred for maintenance and lifetime.

E 2010.32 Laboratory Casework (LE B (10 yrs))

a. General:
   1. The Work Surface Support, Work Surface, Base and Wall Cabinets, Ceiling
Service Panels, and Adjustable Shelving shall all be from the same vendor.

b. Work Surface Support

1. A moveable and adjustable, table-supported, wood (species TBD) modular system that supports the work surface and adjustable shelving above and may suspend or have movable base cabinets below. The system shall meet the project’s non-structural seismic criteria (CR F1030.35, Protection of Nonstructural Components) without the need for additional hardware. The system shall allow for rearrangement by users without special tools.

c. Work Surface

1. Material:
   a. TIER 1 Trespa/Phenolic Resin.
   b. TIER 2 Epoxy-Resin

2. Color: Coordinate work surface color with functional work taking place on the surface. In general surfaces should be as light as the research will bear.

3. Grommets: Provide coordinated systems that do not require holes through the work surface for running services.

d. Base Cabinets

1. Material:
   a. TIER 1: All-powder coated metal tables & base cabinets.
   b. TIER 2: Powder Coated Metal tables & base cabinets with wood fronts.
   c. TIER 3: All-wood tables and base cabinets.

2. Support:
   a. Provide a system coordinated with the Work Surface Support.
   b. TIER 1: Floor Supported
   c. TIER 2: Suspended from the Work Surface

3. Features:
   a. Lockable: No

e. Wall Cabinets
1. Material:
   a. TIER 1: All-powder coated metal wall cabinets.
   b. TIER 2: Powder Coated Metal wall cabinets with wood fronts.
   c. TIER 3: All-wood wall cabinets.

2. Support:
   a. TIER 1: Provide adequate backing in partitions for wall cabinets and anticipated loads.
   b. TIER 2: Provide adequate backing, as described above, in all lab partitions where wall cabinets are possible.

3. Features:
   a. Lockable: No

f. Adjustable Shelving
   1. General:
      a. Adjustable shelves shall be mounted to surface type steel standards (wall condition) or uprights (above laboratory benches).
      b. Adjustable shelves shall be supported by steel shelf brackets. Shelf brackets shall not exceed a span of 48” on center. Brackets shall be cold rolled steel with epoxy powder coated finish.

   2. Material:
      a. TIER 1 All-wood.
      b. TIER 2 Powder Coated Metal or Plastic Laminate.

   3. Support: Provide support continuous from work surface support below. Supports to incorporate pathway for utilities with integral outlets below the lowest shelf.

   4. Shelf Lighting:
      a. TIER 1: None.
      b. TIER 2: Integral task lighting below the lowest shelf. Be careful that reflections and glare do not interfere with researchers or their work.

   g. Overhead Ceiling-Mounted Service Panel Plates (headwall):
      1. Material:
EQUIPMENT & FURNISHINGS

Mission Bay East Campus Phase 1 (Block 33)  
University of California, San Francisco, Project No: M4603

E 2010.30  Casework

2. Utility Connections:
   a. Provide quick disconnects for all utilities.
   b. Each service panel shall be provided with cut-outs and devices as required for electrical, data, plumbed services and future plumbed service (spares) for each panel type.

h. Sinks:
   1. General: Sinks shall be molded 1 piece with radiused corners, and bottom sloped to outlet with integral side mounted overflows; 1/2” (12.7 mm) minimum thickness producing a smooth finish, the same color as the surrounding counter top. All laboratory sinks shall have the overflow drain connection located on the left hand side of the sink bowl.
      a. Provide with polypropylene strainers and tailpieces.
      b. Provide integral sinks in epoxy countertops, bonded to countertops with the joint line no greater than 1/32”.

j. Drying Racks/Pegboards:
   1. Stainless steel pegboards shall be furnished with removable rounded-tip black polypropylene pegs for the open labs. Epoxy resin pegboards will be supplied for the lab support rooms.
   2. All surfaces to be polished, edges radiused 1/8”.
   3. Stainless steel drip trough, 1/4” diameter drip trough outlet and flexible black, white or gray rubber tubing between drip trough outlet and sink (cut as required).
   4. Provide continuous silicone sealant at intersection between pegboard and trough.

k. Flammable Storage Cabinets:
   1. Unventilated. (Needs to be confirmed with EH&S)
   2. Conform to OSHA Regulations and the requirements of NFPA 30-2003 Chapter 6-3, National Fire Protection Association, Flammable and
Combustible Liquids Code. Cabinets shall be Factory Mutual (FM) approved and Underwriters Laboratories (UL) listed. Cabinets shall limit the internal temperature at the center, 1” (25.4 mm) from the top to not more than 325 degrees Fahrenheit (162.8 degrees Celsius) when subjected to a ten-minute fire test that simulates the fire exposure of the standard time-temperature curve specified in NFPA 251.

3. Self-Closing Models - Doors automatically close if temperature reaches 165°F. Required in CA.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th></th>
<th>1. Plan layouts for all proposed casework.</th>
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</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Plans and elevations for all proposed casework.</td>
</tr>
<tr>
<td></td>
<td>3. Cut-sheets of all casework hardware.</td>
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<td>CD</td>
<td>4. See Contract.</td>
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<td>5. See Contract.</td>
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E 2050.30 Furniture

A. Intent

Furniture procurement from the University’s preferred vendor needs to occur at an appropriate time so that furniture is placed and accepted by the University prior to completion of the building. This will be required in order to meet the requirements of substantial completion. See (CR Z1060.30, Owner-Furnished Products) for procurement and installation responsibilities.

Regardless of who is procuring and installing furniture, as part of the Base Bid, the Integrated Delivery Team (IDT) is expected to fully coordinate the anticipated furniture with the building design, and therefore must select furniture and understand its requirements in time for coordination to take place without impacting the project.

The furniture design should be considered as a holistic and integrated component of the overall interior design. Furniture will be evaluated based on its quality, function, support and integration with
mechanical, electrical and AV/IT systems and design for long-term solutions, both in terms of durability and adaptability.

The IDT shall assess the ergonomic performance of all furniture pieces, particularly as it relates to the design of the workplace, to promote health and wellness, support functions and tasks more efficiently and avoid muscle and eye strain.

The IDT shall select furniture that can be configured as a “kit of parts” whereby a minimum number of furniture pieces are chosen for a broad array of needs and applications. Provide parts that can be moved from one space to another, creating flexibility and easy changing of environments.

Furniture should also not contribute to an unhealthy work environment, and therefore should be free from flame retardants.

Furniture should also be easily maintained and cleaned without special procedures (in particular furniture should be easily moved to clean underneath). Factors that contribute to ease of movement are light weight and good quality casters.

Furniture should also be foldable where possible to create flexibility in use of space.

B. Description & Performance

E 2050.31 General

a. Flame retardant-free: All furniture to be labeled CAL TB117-2013.
b. Manufacturers: UCSF selected preferred vendors.
c. Alternates: Provide schedule of alternates as necessary to fully integrate into project.
d. Substitutions: Submit requests for substitutions for consideration by UCSF.
e. Submittals: Prepare submittals in advance to allow sufficient time for review and approval so installation will not be delayed.
f. Reference Standards and Definitions: Industry standard abbreviations and acronyms are used in Contract Documents and Specifications as reference.
g. Closeout Procedures / Operation and Maintenance Data: At the time of project closeout, provide the UCSF Project Manager with 3 copies of a binder containing all furnishing specifications to include:
   1. Vendor name and contact information
   2. Model number with description
   3. Warranty information
   4. All pertinent information required for future orders
6. Printed operation and maintenance manuals and cleaning instructions.
7. Other pertinent information.

E 2050.38 Accessories

a. Description: Personal Task Lights, Systems Furniture Task Lights.
b. Requirements:

1. General:
   a. The solution should offer LED energy-efficient task lighting with occupancy sensor control for both general work surface lighting and user controlled task specific lighting.

2. Provide mounted understorage LED lighting, with occupancy sensor control, for any book or binder size storage above the worksurface.

3. Provide three options for individual workstation task LED light. Individual users will each select one form the three options during the design/delivery process, resulting in up to 3 types of task lighting upon completion.
   a. Must be able to be located per the user’s preference.
   b. Must be easily adjustable for user while working.
   c. Must be available as standard with a 9-foot power cord.

4. Provide layout that minimizes window and overhead light glare on screen in worker’s direct gaze when looking at screen.

C. Verification & Validation (All Tiers)

SD
1. Schematic furniture floor plans for the building.
2. Isometric views of Typical Open Plan workstation. Include documentation for minimum and maximum storage for proposed workstations to provide a range of options.
3. Cut sheets furniture being proposed. NOTE: All furniture cut sheets are to provide enough information for UCSF to sufficiently benchmark the proposed manufacturer’s quality and design for all furniture products being considered for the project. Future furniture selections...
4. Furniture Budget: Provide a comprehensive Furniture Budget of ALL furniture required to meet the requirements as outlined in the Planning & Design Criteria identified in this document. The Furniture Budget is to be based on actual product costs being proposed. The Furniture Budget is to include a Manufacturer List price, Dealer Net Price, Dollar value of discounts, Estimated Dealer Markup for Services, Shipping, Installation and applicable Sales Tax.

5. Open plan workstation: Provide an itemized cost for ALL products utilized to create the “kit of parts” of the workstation. Include all product options for user customization of their work space.

6. Mock up: A minimum of one mockup each for a “typical” workstation and a “typical” focus and huddle room is required for review, evaluation and approval by the University. All product to be priced within the Furniture Budget as established in the Proposal Phase.

7. Samples: Samples of key recommended product(s) e.g. Conference Chair; Stacking chairs, Classroom Chair etc. are to be provided by the selected furniture manufacturer for review, evaluation and approval by the University.

8. Task Chair: UCSF requires that each occupant of an open plan workstation be provided “Individual Accommodation”. Each occupant will be provided the opportunity to select their personal task chair from a pre-set number of options. Provide minimum of 5 sample task chairs for evaluation.

9. Cut Sheets: Must provide cut sheets of all products being provided by the selected furniture manufacturer for review, evaluation and approval by the University.

10. Finish Palette: Select materials and finishes and then prepare color palettes with outline specifications for review with the University. The reviewed and approved workstation solutions and color pallet shall have sufficient detail and general specification information for furniture and finishes so the workstation designs may be ordered by
the Furniture Manufacturer.

11. See Manufacturing and Dealer Qualification and Financial Strength Requirements (CR TBD WHERE DO WE GET THIS?)

| CD | 12. Provide documentation of occupant evaluation and selection of Task Chairs from DD Phase. |
| Construction | 13. Provide all required furniture placement plans, coded to the FF&E list and furnishings specifications required for the project. Final plans and selections are to be reviewed and approved with the University prior to actual order. |
| Completion | 14. See Contract |

15. Demonstration:

16. Engage a factory-authorized service representative to demonstrate how to operate adjustable furniture.

17. Schedule demonstration with University with at least seven days’ advance notice.
F Special Construction

F 1030.10 Sound and Vibration Control 632
F 1030.30 Seismic Control 647
Guiding Principles

The building structure and non-structural components of the project shall be able to withstand major seismic events with minimal or no operational downtime. Sound and vibration shall be controlled for occupant comfort, acoustic fidelity and privacy, clinical procedures, technical equipment stability and minimal impact on neighbors.
F 1030.10  Sound and Vibration Control

A.  Intent

Appropriate control of sound and vibration is critical for occupant comfort and communication, and for an equipment environment free from significant environmental interference. Note that due to the special requirements imposed by research and clinical functions, in some cases the required controls can be considerably more demanding than in typical commercial construction. The overall goal of sound and vibration control is to deliver spaces that are safe, comfortable, and productive for the human, animal, and/or instrument occupants. The Integrated Delivery Team (IDT) shall consider acoustical and vibration issues starting with the conceptual phase and provide designs, hardware, and systems that, over their expected lifetimes:

1. Maximize use of passive sound and vibration isolation via space planning and physical separation of sources from sensitive receivers.
2. Strategically organize interior plan so as to interrupt line of sight between occupants in open work areas and congregation spaces (break areas, collaboration areas, conference rooms and classrooms, auditorium pre-function spaces, and similar areas where congregation is likely to occur). Orient entrances to congregation spaces so that they do not directly face open work areas.
3. Accommodate the ways that occupants realistically use and misuse spaces, including behavior adjacent to intended activities (such as entering / leaving conference rooms).
4. Provide configurations and visual cues that nudge occupants to naturally limit their own sound and vibration emissions.
5. Deliver structural and foundation systems that meet project vibration criteria as required by programmatic and equipment requirements.
6. Provide noise and vibration environments that do not interfere with instrument / equipment performance; animal welfare; or human comfort and concentration.
7. Resist sound intrusion from exterior sources in the current condition as well as in the face of future development.
8. Utilize isolation and attenuation hardware consistent with the University’s lifecycle and maintainability goals.
9. Resist sound intrusion from congregation and activated areas into high-privacy private and open plan work spaces; and provide normal speech privacy for enclosed rooms against open areas and confidential speech privacy between enclosed rooms.
11. Provide reduced speech intelligibility across open-plan areas to improve privacy.
12. Provide base-building noise levels consistent with the functional uses of spaces.
13. Provide sufficiently low background noise levels from HVAC and exterior sources so as to allow design headroom for purposely-introduced masking noise.
14. Achieve HVAC sound requirements with quieter fans and minimize the use of duct-based sound attenuators that contribute to pressure drop.
15. When considering occupants in open work areas, ergonomics may dictate that some occupants stand and their workstations rise. A universal acoustic solution to address these standing individuals may conflict with the desire for visual continuity and daylight penetration. Consequently, the IDT should consider some aspects of the acoustical solution to be attached to workstations such that they rise together locally, rather than establishing higher-height barriers throughout the open work areas.

Environmental noise and vibration issues extend beyond impacts to the project under bid. The IDT shall also consider impacts generated by the project upon adjacent structure and properties, including:

17. Construction noise and vibration.
18. Location and vibration isolation of exterior sources like emergency generators and docks.

B. Description & Requirements

F 1030.11 General

a. Regardless of specified sound levels, indoor and outdoor base-building systems may not create disturbing and annoying sounds from such as whistles, whines, tones, buzzes, and hums. These sounds shall not rise to the level of “prominent discrete tones” as defined by ANSI/ASA S1.13.

b. Where utilized, raised access floors shall not exhibit poor sound quality such as “hollowness” under footfalls, or squeaks, pops, or rattles due to the movement of people and materials.

c. Noise and vibration criteria shall be the more restrictive of the general room classification or its equipment criteria.

d. In clinical and patient areas, sound transmission must meet speech privacy parameters as required by HIPAA.

e. Refer to appropriate sections of this document for additional restrictions regarding
Technical Criteria

**F 1030.10 Sound and Vibration Control**

**f.** Overall noise levels in any room shall be limited to a maximum of 75dBA from all sources.

**g.** Floor vibration design shall utilize the “Generic Vibration Criterion” system (VC Curves) described in IEST RP-CC012.3 Section 5.12.5. This applies to both human-centric as well as instrument-centric vibration criteria. Where criteria are expressed in terms of velocity with units of micro-inches/second, this figure is an RMS magnitude per worst-case 1/3 octave band consistent with the language of RP-CC012.3.

**h.** Floor vibration requirements shall be satisfied without the use of isolation tables or similar devices, except where environmental vibrations exceed criteria and where explicitly agreed to by the University. In those cases, third-party isolation shall be coordinated with and approved by the vendor of the isolated equipment.

**i.** Support floor-mounted vibration-sensitive equipment on independent pedestals (concrete or steel-framed “foundations”) in areas with raised-access floors. Tabletop-mounted sensitive equipment may be placed on tables on raised floors only if acceptable vibration performance can be demonstrated.

**j.** For standard slabs-on-grade in vibration-sensitive equipment areas with criteria of VC-C or tighter, use minimum 8” slabs and protect slabs from uplift at construction joints during curing. Utilize isolation breaks only to the extent required to prevent separation from underlying soil. See (CR A4010 Standard Slabs-on-Grade).

**k.** Vibration sources to be considered include foreseeable local (mechanical equipment and footfall impacts) sources as well as environmental sources including, but not limited to:

1. Vehicle traffic
2. Rail cars
3. Low altitude helicopters

**F 1030.12 Exterior Façade Noise Design**

**a.** Description: Façade design to control exterior noise intrusion to occupied interior spaces.

**b.** Performance Requirements:

1. Exterior noise intrusion into interior spaces shall meet the following limits in any single hour of operation:
   
   a. For uses without special acoustic considerations, such as General
Laboratories; Laboratory Support; Storage; General Circulation; Breakout; and Retail: refer to the requirements listed in Section 5.507 “Environmental Comfort” in the 2013 California Green Building Standards Code. The prescriptive method (Section 5.507.4.1) or the performance method (Section 5.507.4.2) may be used to determine compliance.

b. Classrooms and Conference Rooms: refer to the requirements listed in Section 5.4.1 “Outdoor-to-indoor attenuation of airborne sound” in ANSI/ASA S12.60-2010. Use Classroom requirements for Conference Rooms.

c. Open Plan Offices; Reception; Waiting Rooms; and Multi-Occupant Patient Care Areas: 45dBA

d. Private Offices; Libraries; Exam Rooms: 40dBA

e. Operating Rooms; Procedure Rooms; Testing Rooms; Patient Consultation Rooms: 35dBA

f. Vivariums: create appropriate criteria for types of animals and research being conducted.

g. Spaces with sensitive equipment: refer to vendor criteria.

h. Spaces with sensitive environments, including but not limited to audio/video production: create appropriate criteria for use.

2. Design shall be based on measurement data from the site, at project-relevant elevations, with modifications provided for future development of the neighborhood as well as anticipated outdoor noise sources serving the building itself.

3. Onsite measurements shall be conducted for a minimum two (2)-day period to determine ambient noise levels. The measurements shall include noise levels during the hours of operation of the building. The noise data collected shall be 1-hour Leq spectra as well as overall levels in dBA.

4. The design shall be executed using spectral data; however, exterior systems may be specified using the OITC method if desired.

F 1030.13 Interior Adjacencies Noise Control

a. Description: Interior construction to control noise intrusion between adjacencies.

b. Partition Performance Requirements:
1. General interior separations shall meet adjacency-specific STC (Sound Transmission Class) requirements as per Table F1030.10-A.

2. The adjacency isolation requirements presume that the program can avoid awkward door placements, and that all doors open to corridors and other routine circulation areas. Refer to Table F1030.10-B for STC requirements for partitions with doors. Special circumstances in which other door placement is necessary will require special consideration.

3. Where visibility is desirable and confidential privacy to the corridor is not required: utilize a glass partition system rated at STC-40 or better.

4. For any given adjacency, the requirement shall be met in totality, exclusive of doors, but inclusive of sidelights, clerestories, and above-ceiling and below-floor flanking paths.

5. The field-tested NIIC as per ASTM E336-15 must be within 7 points of the STC from Table F1030.10-A. For partitions with doors, use partitions with ratings meeting Table F1030.10-B.

6. Use a plumbing wall incorporating isolation features for restroom and shower room walls with significant plumbing. Do not locate toilets on walls shared with enclosed occupied rooms.

7. For rooms adjacent to Mechanical Rooms and Elevator Shafts, specify partitions, doors, windows, penetrations, opening and other elements of the partition system as needed to control noise to meet the room background HVAC noise requirements (CR F1030.15 HVAC Noise Control) minus 10dB.

c. Floor/Ceiling Isolation Performance Requirements:

1. Adjacency-specific STC ratings apply to both vertical as well as horizontal adjacencies.

2. Limit impact noise intrusion between vertical adjacencies with the minimum IIC (Impact Isolation Class)
   a. Open Plan Offices and similar areas: IIC-55.
   b. Waiting Rooms; Multi-Occupant Patient Care Areas: IIC-55.
   c. Private Offices; Conference Rooms; Classrooms; Libraries; Focus Rooms; Huddle Rooms: IIC-65.

d. Door Performance Requirements in acoustically-rated partitions:
1. Generally locate doorways so as to minimize the impact of noise intrusion through doors.

2. Doors in acoustically-rated partitions must be solid-core with perimeter seals and have STC ratings no more than 15 points below the main partition rating. Do not rely on door undercuts for return air pathways except in locations where speech privacy to the corridor is not required and glass partitions are used.

3. The STC rating of the door shall be met in totality, including any vision panels, accommodations for hardware and technology, and the door frame inclusive of seals and interface with partition.

4. Where doors in high-sensitivity areas (such as Lecture Halls or Executive Conference Rooms) open into high-noise areas, use acoustically-rated doors to preserve the partition performance, as well as strategies to control noise when doors are open (vestibule, jogs, acoustical panels, etc.).

e. Operable Partition Requirements:

   1. Operable partitions must meet the requirements in Table F1030.10-A.
   2. Acoustical consultant to provide details for overhead track and floor interface so as to maintain field-measured NIC to within 7 points of the requirements. Refer to ASTM E557 for recommended practices.

F 1030.14 Interior Acoustical Design

a. Description: Interior acoustical quality, especially for speech intelligibility.

b. Performance Requirements:

   1. Acoustic Panels (LE B (10 yrs)):
      a. Panels consist of rigid mineral fiber or fiberglass insulation wrapped in fabric, vinyl, or protected behind a perforated solid surface.
      b. Surface materials in wrapped systems shall be bonded so as to prevent delamination in typical use.
      c. Panels shall meet ASTM E84 Class A for flame spread and smoke developed.
      d. Diffusive elements may be incorporated into panels where needed.
      e. Select appropriate panel thickness and mounting condition to achieve reverberation requirements.
f. Base calculations on vendor data obtained via ASTM C423.
g. Panels shall not be installed until all wet work has been completed.

2. Acoustic Wall Panels (LE B (10 yrs)):
   a. See Acoustic Panels above.
   b. Wall acoustical panels must be maintenance-free and located and/or protected so as to guard from damage under typical use.

3. Acoustic Ceiling Panels (LE D (20 yrs)):
   a. See Acoustic Panels above.

4. Room reverberation times (T60), defined as the average of the mid-frequency (500~2000Hz) times for a signal to decay by 60dB, shall be limited to the following maximum values:
   a. Assembly Rooms and Lecture Halls: 0.7 seconds
   b. Focus/Huddle Rooms and Open Plan Offices: 0.6 seconds
   c. Rooms dedicated to Videoconference Technology: 0.4 seconds
   d. Classrooms and Conference Rooms: 0.6 seconds. Refer to ANSI/ASA S12.60-2010 and use Classroom standards for Conference Rooms; however, do not relax the requirement for rooms greater than 10,000 cubic feet in volume.

5. Reverberation time spectra shall be flat. The T60 at any one octave band in the low-frequency (63~250Hz) or middle-frequency (500~2000Hz) ranges may not deviate more than +/-25% from the reported T60 defined above.

6. Utilize diffusive elements or combined diffusion/absorption panels in Conference Rooms and Classrooms greater than 400sqft.

7. Rooms with well-defined, separated speaking and listening areas (such as Classrooms) should utilize strategically implemented acoustical surfaces and room shapes. Control flutter echo, and preferentially locate absorptive surfaces towards the back of the room and harder surfaces around the speaker area.

8. To enhance speech intelligibility between users, Conference Rooms with perimeter seating patterns should preferentially locate absorptive surfaces to an upper-wall band or soffit, with a hard ceiling (or hard ceiling with acoustical diffusor elements) implemented over the table.
9. With the use of Huddle Rooms and Focus Rooms, privacy is of reduced priority in Open Plan Offices; however, some control is still necessary. In Open Plan settings, use carpeted floors and ceilings with NRC of 0.90 or higher. Where no ceilings exist, utilize absorptive treatments (average of NRC 0.65 or better) applied to the underside of the structure above.

10. Pay special attention to transition zones between activated areas and Open Plan Office areas, and strategically implement full-height partitions to control sound transmission between these. Utilize acoustically significant barriers to interrupt line-of-sight between seating areas and main circulation pathways.

F 1030.15 HVAC Noise Control

a. Description: Noise control for air movement systems, including pressurized as well as passive ducting.

b. Performance Requirements:

1. HVAC systems shall not exhibit time-varying sounds or noise levels due to aerodynamic instability or turbulence.

2. Design supply, return and exhaust systems to not exceed the lesser values of:
   a. The Noise Criterion (NC) limits defined in (CR Table F1030.10-C, Noise Criteria)
   b. The NC limits listed on the individual Room Data Sheets, where applicable.
   c. Manufacturer’s noise limits for sensitive equipment.

3. HVAC noise performance requirements are inclusive of all system parameters, including flow-generated noise due to duct turbulence; silencer self-generated noise; terminal or valve noise; diffuser noise; duct breakout and terminal/valve radiated noise; and other non-fan-related noise sources.

4. In laboratory settings, noise levels generated by fume hoods shall not exceed 60dBA at 6” from the plane of the sash.

5. Select diffusers with NC ratings 5 points below the room rating. Limit branch duct velocities so that diffuser / grille noise does not control.

6. Organize ductwork layout to minimize use of transfer ducts. Carry ductwork over corridors in HIPAA-regulated areas and in clusters of Private Offices and Huddle and Focus Rooms; design ductwork so that crosstalk between
adjacencies does not control sound isolation.

7. Refer to (CR D 3050.50.b.22, HVAC Air Distribution - Sound Attenuators and CR D3060.00.b.3, Ventilation – Sound Attenuators) for additional limitations on sound attenuation materials and systems.

F 1030.16  M/E/P Vibration Controls

a. Description: Control of vibrations generated by machinery supporting building systems.

b. Machine Balance Requirements:

1. Fans and other rotating machinery shall operate at no more than 80% of their critical speed.

2. Balance machinery in accordance with the following vertical vibration limits, measured at the machine when supported by vibration isolation mounts:
   a. Under 600 RPM: 4 mils, peak-to-peak
   b. 600-1,000 RPM: 3 mils, peak-to-peak
   c. 1,000-2,000 RPM: 2 mils, peak-to-peak
   d. Over 2,000 RPM: 1 mil, peak-to-peak

3. After installation, field-balance machinery in realistic installation and loading conditions. All fans and pumps greater than 25HP shall meet the following maximum velocity levels:
   a. Fans: 0.10in/sec RMS
   b. Pumps, less than 40HP: 0.16in/sec RMS
   c. Pumps, larger than 40HP: 0.20in/sec RMS

4. For machinery on concrete inertia bases, the mass of the base reduces motion at the machine; however, the unbalanced force is unchanged; the machine vibration limits must be adjusted downward accordingly. Multiply the limit by the ratio of the equipment weight alone to the equipment weight plus inertia base weight.

c. Vibration Isolation Hardware Requirements: (LE: Match LE of Supported Equipment)

1. Specify vibration isolation hardware on a per-machine basis.

2. In OSHPD-regulated projects, utilize isolators and seismic controls that meet appropriate OSHPD requirements.

3. When specifying springs or neoprene pads/mounts, specify the minimum-
allowable deflection.

4. Do not select isolators for which the rated maximum deflection matches the specified minimum deflection. Instead, generate calculations based on the operating mass of the isolated machine, and choose isolators that achieve the minimum-allowable deflection. Include additional mass provided by attached piping, ducting, conduit, and fluid weights.

5. Use flexible connection for services to isolated machinery, including electrical conduits.

6. Piping and ducting on isolated systems shall be resiliently mounted for the first 50 linear feet. Additionally, isolate large piping and ducting supported below vibration-sensitive floors as needed to meet vibration and acoustical criteria.

7. Use resilient penetration sleeves or seals where piping and ducting pass through structural elements.

8. The following apply to steel spring isolators:
   a. In general, use single-spring (rather than ganged multi-spring) isolators. For very heavy machinery, such as plant-sized chillers, multiple parallel springs may be used when suitable single-coil springs do not exist. Do not use nested springs.
   b. Do not specify any steel spring system with less than 1” minimum static deflection.
   c. Springs shall be laterally stable without housing; with lateral stiffness at least 80% of axial stiffness; diameter not less than 80% of the compressed height; and additional travel-to-solid of at least 50% of actual deflection.
   d. The spring element shall be seated in a neoprene cup or incorporate a permanently-adhered double neoprene pad to control high frequency transmissibility.
   e. For spring hangers, provide sufficient frame diameter to allow a minimum of 30-degree arc swing in the hanger rod.

9. The following apply to neoprene isolators:
   a. Specify double neoprene pad unless the supported system is too lightweight to fully engage a multi-layer neoprene isolator.
b. If specifying neoprene mounts, use double-deflection systems.
c. Do not specify neoprene systems in any instance where machine
   operational speeds (including VFD range) fall below 1,700RPM.
d. Detail independent restraints; do not bolt through neoprene pad
   systems for seismic control.

10. The following apply to machine bases:
   a. When isolating machinery, size machine bases to also support
      heavy piping, suction/discharge elbows, and similar items.
   b. Do not employ structural rail isolation.
   c. Size concrete inertia bases so that the base thickness is 1/12 of the
      longest base dimension, not to exceed 12”.

11. Specify and install independent isolation for all rotating machinery 1HP or
    greater in power. For fractional horsepower equipment, utilize neoprene pad
    or neoprene-in-shear mounts as provided by the machine vendor.

12. For machinery greater than 5HP, use steel springs unless specifically
    disallowed by the manufacturer.

13. All metal parts shall be hot-dip galvanized as per ASTM A-123 or protected by
    powder or neoprene coating, or meet or exceed the corrosive-resistant criteria
    of the equipment it supports, whichever is more stringent.

14. Elastomeric components, including neoprene, must be oil- and water-
    resistant.

15. All isolation hardware must allow visual access to the isolating element.
    Consequently, telescoping mounts, housed springs, and other systems in
    which the isolating element is hidden are not allowed.

16. Seismic controls must be achieved by snubbers and cabling as appropriate,
    separate from spring systems.

F 1030.17  Floor Vibration Design

a. Campus-wide floor vibration limits for occupant comfort and equipment performance:
   1. Office and other occupied spaces not requiring special vibration criteria:
      a. TIER 1: Meet the “ISO-Office” criterion, with a modified velocity
         of 12,000 micro-inches/sec under 200-lb walkers moving at 90
         paces-per-minute.
b. **TIER 2**: Same criteria as TIER 1, except with a modified velocity of 8,000 micro-inches/sec.

c. **TIER 3**: Same criteria as TIER 2, except at walking pace of 110 paces-per-minute.

2. Inpatient and residential spaces:
   a. **TIER 1**: Meet the “ISO-Residential” criterion of 8,000 micro-inches/sec under 200-lb walkers moving at walking pace of 110 paces-per-minute.
   b. **TIER 2**: Same criteria as TIER 1, except at walking pace of 120 paces-per-minute.

3. Routine Laboratory spaces with no special vibration requirements and optical microscopy at 100x or less: 4,000 micro-inches/sec (ISO-Operating Theater) with 200-lb walkers at 100 paces-per-minute.

4. Research laboratories with modest vibration requirements, such as optical microscopy between 100x and 400x; micro-balances; optical balances; conventional spectrophotometry; typical mass spectroscopy: 2,000 micro-inches/sec (VC-A) with 200-lb walkers at 100 paces-per-minute.

5. Medical imaging suites, including MRI, and research laboratories with high-power optical microscopy; specialized cell culture; lithography; electron microscopy; NMR; and other high-end imaging techniques: Refer to IEST RP-CC012.3, Section 5.12.5, unless vendor-supplied criteria exists.

6. Vivariums: create appropriate criteria for types of animals and research being conducted.

7. Unoccupied spaces (mechanical, electrical and other typically unoccupied rooms) shall be designed to exhibit a fundamental floor resonance greater than 6Hz.

8. Where equipment vendor-supplied vibration criteria is more stringent than the criteria listed in this section, inform the University for direction.

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b. **Project-specific floor vibration limits for occupant comfort and equipment performance:**

1. For the purposes of this section, the following portions of the Ophthalmology and Proctor program (ASF) should meet the Routine Laboratory Space criteria above.
F 1030.10  Sound and Vibration Control

a. TIER 1: 50%
   b. TIER 2: 100%

2. The remainder of the Ophthalmology and Proctor program should meet the Office criteria.

3. Remainder of building: Use Campus-wide Office or Unoccupied space criteria above.

F 1030.18  Environmental Noise and Vibration

a. Description: Outdoor noise and vibration impacts due to the project’s routine operations.
   b. Performance Requirements:

   1. Coordinate locations of exterior noise sources with façade design. Interior noise level requirements in F1030.12 apply to the project’s noise sources whether indoors or outdoors.

   2. Equipment shall not create noise levels exceeding 65dBA at the building façade, except where special consideration is given to façade noise isolation and interior occupancy.

   3. Noise levels at outdoor assembly or patient sitting areas at the building shall be limited to 50dBA.

   4. The project as a whole must comply with applicable noise ordinances, including Article 29 of the San Francisco Police Code (SFPC 29, Section 2909, 2014 or later).

   5. For other UCSF outdoor areas, apply Article 29 of the SF Police Code at the property line, if one exists, otherwise midway between buildings.

   6. The new project shall not generate noise or vibration levels that create exceedances at sensitive equipment in adjacent buildings.

C. Verification & Validation (All Tiers)

SD 1. Provide a report including drawings, sketches, and narratives addressing:

   a. Site noise data, with proposed modifications to address future neighborhood development, to be used in façade design.

   b. Floorplans highlighted to show vibration criterion.
F 1030.10  Sound and Vibration Control

Technical Criteria

DD 2. Provide a report, including drawings, sketches, and narratives addressing:
   a. Elevation drawings with façade OITC requirements.
   b. Details of partition types to be deployed on the project.
   c. Calculations of reverberation times in enclosed rooms.
   d. Details of proposed acoustical absorption and diffusion panel types.
   e. Details of proposed floor and ceiling systems.
   f. Calculations of HVAC noise impacts and NC levels.
   g. If raised access floors are used, indicate locations of vibration-sensitive equipment requiring independent pedestals.

CD 3. Provide a report including drawings, sketches, and narratives addressing:
   a. Façade details, with OITC ratings.
   b. Drawings indicating partition selections, with acoustically-rated partitions highlighted and STC ratings noted.
   c. Door schedule, including notes regarding acoustical seals where used.
   d. Machine-specific schedule of vibration isolation requirements for M/E/P systems.
   e. Cut sheets for proposed vibration isolation hardware.
   f. If raised access floors are used: designs for floor pedestals supporting vibration-sensitive equipment.
Technical Criteria

F 1030.10  Sound and Vibration Control

Construction
4. Laboratory test data for façade OITC performance.
5. Submittals for vibration isolation hardware.
6. Submittals for wall acoustical panels and ceiling systems.
7. Submittals for HVAC noise control silencers and ductwork.
8. Results of mock-up testing described in Z1040.41.

Startup
9. Acoustical testing by IDT to demonstrate compliance:
   a. Perform testing of representative sampling (at least five examples of each type) of spaces for HVAC noise (NC) limits; test after system balancing is complete, and without sound masking system operating.
   b. For spaces along the exterior of the building, perform testing of exterior noise intrusion. Test one example of each type of space. Test without HVAC and sound masking operating, unless room HVAC NC levels are sufficiently low to allow demonstration of compliance.
   c. Perform testing at property line(s) and at outdoor gathering areas.
10. Vibration testing and inspection by IDT to demonstrate compliance:
    a. Test using instrumentation consistent with Section 5 and report data consistent with Section 6.4 of IEST RP-CC024.1.
    b. On suspended floors, execute walker tests at three examples of each type of structural bay per each vibration zone. For walker tests, report the peak-hold walker spectrum developed from true 1/3 octave band instrumentation.
    c. Perform walk-through of machine rooms and inspect rotating equipment vibration isolation; identify shorted or misaligned systems to be remedied.
F 1030.30  Seismic Control

A. Intent

The University requires its buildings to provide a safe environment for occupants and the public when an earthquake occurs. In addition, UCSF recognizes that earthquake damage to its facilities could interrupt its function, displace students and staff, cause loss of research, and diminish its standing as a world-class institution. Therefore, UCSF requires its buildings:

1. **To achieve predictable performance that sustains operations in an acceptable manner when earthquakes occur.**

UCSF requires the Integrated Delivery Team (IDT) to present options for the seismic design that can achieve the following Tiers of increasing seismic performance:

**TIER 1.** Base Requirements in which minimum CBC requirements are satisfied with expanded attention to design and installation of nonstructural components. The building shall provide safety and damage control consistent with meeting the intent of the California Building Code for a Risk Category III building with vigorous technical peer review of the design development and construction. This is expected to achieve a building whose seismic performance provides safety for its occupants and limits damage in the Design Earthquake, and is life-safe in the in the Maximum Considered Earthquake, each defined in the CBC.

**TIER 2.** The building structure and nonstructural components are explicitly designed for enhanced seismic performance. The building shall be capable of being restored to its intended use and function within a few days or weeks of a magnitude 7.0 earthquake on the San Andreas fault “Moderate Scenario Event”.

**TIER 3.** The building shall be capable of being restored to its intended use and function within a few days or weeks of a magnitude 8.0 earthquake on the San Andreas fault, that is, a repetition of the 1906 event “Major Scenario Earthquake”.

For all three Tiers, the design shall as a minimum meet building code requirements for the applicable Risk Category assigned by the CBC for the building’s use. However, simply meeting the CBC does not typically meet UCSF’s objectives for earthquake resilience and recovery, because the focus of the CBC is to provide minimum acceptable standards for life safety, whereas the seismic requirements of the UCSF are to provide seismic performance that is more demanding than achieving minimum CBC.
compliance, because they focus on rapid recovery of research, clinical, and support functions.

The University intends to select a building design option that remains fully operational in a magnitude 6.0 earthquake on the Hayward North segment of the Hayward fault “Minor Scenario Event”. The Tier selected by the University for the project will be based on the additional consideration of building performance and the costs and benefits of enhanced performance. Enhanced structural performance achieved through thoughtful design integrated into functional and aesthetic design solutions is desired. Accordingly, the IDT is expected to explicitly consider and assess seismic performance at every stage in the design and construction process.

The University will conduct rigorous technical Peer Review during all stages of design and construction, as well as independent construction monitoring. Peer Review will be performed by the UCSF Seismic Review Committee (SRC) whose charge is to review the design and construction and recommend actions to achieve UCSF’s goals for the project. It is the responsibility of the SRC to confirm that the design provides predictable and reliable earthquake performance verified by analysis to meet CBC and UCSF requirements.
B. Description & Performance

F 1030.31 Seismic Performance Objectives

The three seismic performance Tiers for the project are described below. Illustrations of these performance Tiers follow in Table F1030.31-A and Figure F1030.31-B.

a. Tier 1, Base Requirements:
   1. The building structure and nonstructural components shall satisfy 2013 CBC and ASCE 7-10 requirements for Risk Category III.
   2. Particular attention shall be paid to the protection of nonstructural components and systems. In evaluating the CBC and ASCE 7 seismic performance requirements of the design, the more specific evaluation requirements of ASCE 41-13 shall be used to evaluate the proposed design: At the Design Earthquake level, nonstructural components shall satisfy nonstructural performance level N-B (Position Retention) as described in ASCE 41-13. Non-structural elements that are defined as Designated Seismic Systems in ASCE 7-10 shall satisfy nonstructural performance level N-A (Operational) as described in ASCE 41-13.

b. TIER 2:
   1. The seismic design shall meet the Tier 1, Base Requirements plus the additional criteria below.
   2. In the Moderate Scenario Earthquake, the structure shall satisfy structural performance level S-2 (Damage Control) as described in ASCE 41-13.
   3. In the Moderate Scenario Earthquake, nonstructural components shall satisfy nonstructural performance level N-A (Operational) as described in ASCE 41-13.
   4. In the Moderate Scenario earthquake the building shall satisfy the MINOR DISRUPTION PERFORMANCE STATE or be at the lower end of the MODERATE DISRUPTION PERFORMANCE STATE.

c. TIER 3:
   1. The seismic design shall meet Tier 2 requirements plus the additional criteria below.
   2. In the Major Scenario Earthquake, the structure shall satisfy structural performance level S-2 (Damage Control as described in ASCE 41-13).
3. In the Major Scenario Earthquake, nonstructural components shall satisfy nonstructural performance level N-B (Position retention as described in ASCE 41-13).

4. In the Major Scenario Earthquake the building shall satisfy the MODERATE DISRUPTION PERFORMANCE STATE.

<table>
<thead>
<tr>
<th>Hazard Description</th>
<th>TIER 1</th>
<th>TIER 2</th>
<th>TIER 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnitude 6.0 on the Hayward Fault</td>
<td>Minor Disruption</td>
<td>Fully Operational</td>
<td>Fully Operational</td>
</tr>
<tr>
<td>CBC Design Earthquake</td>
<td>Moderate Disruption</td>
<td>Minor or Low Moderate Disruption</td>
<td>Minor Disruption</td>
</tr>
<tr>
<td>Magnitude 7.0 on the San Andreas Fault</td>
<td>Moderate Disruption</td>
<td>Minor or Low Moderate Disruption</td>
<td>Minor Disruption</td>
</tr>
<tr>
<td>Magnitude 8.0 on the San Andreas Fault</td>
<td>Major Disruption</td>
<td>Moderate Disruption</td>
<td>Moderate Disruption</td>
</tr>
</tbody>
</table>

Table F1030.31-A: Expected Seismic Performance
F 1030.32 Seismic Hazard

a. There are five earthquake characterizations for performance evaluation used in the three Tiers described in Section 1030.31. Illustrations of these hazards follow in Figure F1030.32-A:

1. The DESIGN EARTHQUAKE (DE) is defined by the CBC and ASCE 7. Site-specific seismic parameters are to be determined by the IDT’s Geotechnical Engineer with Peer Review by UCSF’s consultants.

2. The MAXIMUM CONSIDERED EARTHQUAKE (MCE) is defined by the CBC and ASCE 7. Site-specific seismic parameters are to be determined by the IDT’s Geotechnical Engineer with Peer Review by UCSF’s consultants.

3. The MINOR SCENARIO EARTHQUAKE is used to define a realistic earthquake situation that the building site is likely to experience several times during the service life of the building. It is defined as a moment magnitude (MW) 6.0 earthquake on the Hayward North segment of the Hayward fault. The MW 6.0 Scenario Event shall be determined by the IDT’s Geotechnical Engineer with Peer Review by UCSF’s consultants. UCSF will provide a response spectrum
for the Mw 6.0 Scenario Event for use during the Proposal Phase. (See figure F1030.32-A, Seismic Hazards)

4. The MODERATE SCENARIO EARTHQUAKE is used to define a realistic earthquake situation that the building site is reasonably likely to experience in an intermediate timeframe or at least once during the service life of the building. The Moderate Scenario Earthquake is defined as a moment magnitude M\text{\textsubscript{w}} 7.0 earthquake on the San Andreas fault. The Moderate Scenario Earthquake shall be determined by the IDT’s Geotechnical Engineer with Peer Review by UCSF’s consultants. UCSF will provide a response spectrum for the Moderate Scenario Earthquake for use during the Proposal Phase. (See figure F1030.32-A, Seismic Hazards)

5. The MAJOR SCENARIO EARTHQUAKE is used to define a realistic earthquake situation that the building site is likely to experience in a long term time frame and may experience during the service life of the building. The Major Scenario Earthquake is defined as a moment magnitude M\text{\textsubscript{w}} 8.0 on the San Andreas fault (i.e., essentially a repeat of the 1906 earthquake) UCSF will provide a response spectrum for the appropriate Major Scenario Earthquake for use during the Proposal Phase. (See figure F1030.32-A, Seismic Hazards)
F 1030.33 Seismic Performance Levels

a. Four earthquake performance levels are used to characterize post-earthquake damage states described in Section 1030.31. Only three of these are used for design of new buildings.

I. FULLY OPERATIONAL PERFORMANCE STATE: A building in the Fully Operational performance state following an earthquake would experience only incidental disruptions to building or supporting nonstructural element functions. This performance state is characterized by the following properties:
   a. All building uses continue unabated;
   b. No loss of power or other systems;
   c. Minor cleanup of some fallen items;
   d. Building is safe to continue to occupy.

II. MINOR DISRUPTION PERFORMANCE STATE: A building in the Minor Disruption performance state following an earthquake would experience only minor disruptions to building or supporting nonstructural element functions. This performance state is characterized by the following properties:
   a. The building may be closed for hours or days for clean-up and/or
F 1030.30  Seismic Control

SPECIAL CONSTRUCTION

Mission Bay East Campus Phase 1 (Block 33)
May 28, 2016
University of California, San Francisco, Project No: M4603

654

Technical Criteria

III. MODERATE DISRUPTION PERFORMANCE STATE: A building in the Moderate Disruption performance state would experience some damage or loss of use to the structure and its nonstructural elements, systems, or contents that affects the ability of the building to perform its functions. This performance state is characterized by the following properties:

a. Essential research and/or clinical activities resumes in days;

b. Full research and/or clinical productivity resumes in weeks;

c. Potential interruptions in power for hours;

d. Potential interruptions to other building systems repaired in weeks;

e. Significant cleanup of fallen items;

f. Some experiments need to be re-set or re-run because of building seismic response;

g. No (or very few) irreplaceable samples lost because of building seismic response;

h. Building is acceptably safe to allow immediate emergency access for clean-up and restoration of essential research or sample protection (yellow tag). Possible visible damage includes cracking of gypsum wallboard ceilings and partitions, dislodged ceiling tiles, broken exterior window glazing, unrestrained equipment fallen from shelves and counters, concrete cracking, and pipe leaks. There may be significant structural repairs requiring building closure for an extended period.

i. The period for return to service may be from a few days to weeks, depending on the functions to be performed, or months for a few
There may be small sections of the building that will require longer to restore than indicated.

IV. MAJOR DISRUPTION PERFORMANCE STATE: The Major Disruption performance state describes a building that experiences significant damage or loss of use in an earthquake, from which some activities are severely disrupted. This performance state may be characterized by any of the following:

a. Failure of power or other building systems and their back-up;
b. Major disruption and damage to laboratory contents;
c. Hazardous chemical release;
d. Serious fire or water damage following the earthquake resulting in loss of irreplaceable assets;
e. Serious casualties or death;
f. Failure of structural elements that pose a safety concern and prevent access to the building (red tag);
g. Closure of the building for an extended time period for repair.

F 1030.34 Structural System Selection

a. The lateral force resisting system and nonstructural elements shall be selected to provide predictable and reliable earthquake performance that can be verified by analysis or testing. Conventional structural and non-structural systems with demonstrated good earthquake performance are preferred, but innovative systems can be approved by the SRC with adequate documentation of expected performance.
b. For all Tiers of design, horizontal irregularities in the structural system, as defined in ASCE 7-10 Table 12.3-1, of Type 1b or 4, and vertical irregularities, and Table 12.3-2, of Type 1a, 1b, 5a or 5b, are prohibited. The Peer Reviewer will consider exceptions if the Engineer of Record demonstrates that the irregularity does not compromise seismic performance.

F 1030.35 Protection of Nonstructural Components

a. Seismic protection of nonstructural components shall be under the responsible charge of one licensed, registered Professional Engineer or Structural Engineer that serves as the Engineer of Record (EOR) for the structural and nonstructural design of the project. The EOR shall design or review and approve seismic restraint for nonstructural
component designs by others.

b. For Tier 1, nonstructural components include all nonstructural components identified in Tables 13.5-1 and 13.6-1 of ASCE 7-10. This also includes the requirement to restrain furnishings or equipment provided as part of this contract that have a height to least width ratio of 3:1 or greater or that could otherwise pose a safety risk to occupants. To provide for equipment subsequently installed on provided counters, the countertops shall have the ability to seismically restrain equipment weighing over 200 pounds from sliding or toppling off the counter. In addition, for Tiers 2 and 3, any component required for continued operations following an earthquake, and those important to UCSF’s mission that are not practically replaceable (within one month), shall be protected.

c. The EOR shall develop a testing and inspection program for nonstructural components to demonstrate acceptable seismic performance. The program shall include observation by the EOR of all installed nonstructural components. Testing shall include a mock-up of the exterior wall system (see CR Z1040.42.a, Mock-Ups, Exterior Closure) subjected to anticipated seismic deformations and demonstrating acceptable performance as follows:

1. When subjected to deformations associated with the Minor Scenario Earthquake, no damage, no loss of function, no need for repairs, and no loss of weather tightness.

2. When subjected to deformations associated with the Moderate Scenario Earthquake, no damage or disengagement of trim or snap on members/glazing gaskets, no breakage of precast or glass panels, sealant integrity maintained.

3. When subjected to deformations associated with the Major Scenario Earthquake, no catastrophic failure and no fall-out of broken materials. Sealants are permitted to split or tear, water integrity may be compromised, and deformation of framing and/or breakage of glass is acceptable.

d. The University shall review all proposed testing protocols, and approve the results for application to the design before they are implemented.

e. Equipment and components required to function for life-safety purposes after an earthquake, including but not limited to egress stairways, fire protection sprinkler systems, elevator controls, components containing hazardous materials and all emergency power system components, shall be designed using an Importance factor of
1.5 as specified in ASCE 7-10 Chapter 13. Special Certification shall be provided for Designated Seismic Systems in accordance with ASCE 7-10 Section 13.2.2 and as required to satisfy the performance and resiliency objectives for the project.

### C. Verification & Validation (All Tiers)

**SD, DD & CD**

1. See contract requirements. Drawings, calculations, response predictions and damage estimations will be regularly peer reviewed by the SRC to assure good practice and that the technical issues to achieve the Tier performance levels are likely to be achieved.

**Construction**

2. Special Inspection per CBC Chapter 17
3. Material testing per CBC Chapter 17
4. Structural Observation reports per Testing and Inspection program including observation by the EOR of all installed nonstructural components.
5. Exterior wall systems shall be tested under anticipated seismic deformations to demonstrate acceptable performance.
6. Review and approval of changed conditions and deferred approval items before construction first by SEOR and next by UCSF including SRC.

**Startup**

7. Engineer of Record (EOR) for the structural and nonstructural design of the project shall walk the site after furnishings and contents are installed to verify compliance with project requirements for seismic protection of nonstructural components. Issue final report stamped and signed indicating project compliance.
8. Issuance of Occupancy permit when all design professionals indicate there are no open or unresolved construction technical issues.
# G  Sitework

<table>
<thead>
<tr>
<th>Technical Criteria</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 10 Site Preparation</td>
<td>660</td>
</tr>
<tr>
<td>G 1010 Site Clearing</td>
<td>660</td>
</tr>
<tr>
<td>G 1020 Site Elements Demolition</td>
<td>662</td>
</tr>
<tr>
<td>G 1070 Site Earthwork</td>
<td>664</td>
</tr>
<tr>
<td>G 20 Site Improvements</td>
<td>666</td>
</tr>
<tr>
<td>G 2010 Roadways</td>
<td>666</td>
</tr>
<tr>
<td>G 2030 Pedestrian Plazas and Walkways</td>
<td>668</td>
</tr>
<tr>
<td>G 2060 Site Development</td>
<td>672</td>
</tr>
<tr>
<td>G 2060.25 Site Furnishings</td>
<td>673</td>
</tr>
<tr>
<td>G 2060.30 Exterior Signage</td>
<td>674</td>
</tr>
<tr>
<td>G 2060.35 Flagpoles</td>
<td>676</td>
</tr>
<tr>
<td>G 2060.60 Retaining Walls</td>
<td>677</td>
</tr>
<tr>
<td>G 2080 Landscaping</td>
<td>678</td>
</tr>
<tr>
<td>G 30 Liquid &amp; Gas Site Utilities</td>
<td>684</td>
</tr>
<tr>
<td>G 3010 Water Utilities</td>
<td>685</td>
</tr>
<tr>
<td>G 3020 Sanitary Sewerage Utilities</td>
<td>687</td>
</tr>
<tr>
<td>G 3030 Storm Drainage Utilities</td>
<td>689</td>
</tr>
<tr>
<td>G 3060.10 Site Gas Distribution</td>
<td>692</td>
</tr>
<tr>
<td>G 4010 Site Electrical Distribution Systems</td>
<td>692</td>
</tr>
<tr>
<td>G 4050.10 Site Lighting</td>
<td>693</td>
</tr>
<tr>
<td>G 5010 Site Communications Systems</td>
<td>695</td>
</tr>
<tr>
<td>G 5010.10 Site Communications Structures</td>
<td>697</td>
</tr>
<tr>
<td>G 5010.30 Site Communications Distribution</td>
<td>705</td>
</tr>
<tr>
<td>G 5010.50 Wireless Communications Distribution</td>
<td>712</td>
</tr>
</tbody>
</table>
Guiding Principles

Design an exterior site integral with the building and ground-floor layout. The site’s design should create an inviting, comfortable and safe urban exterior environment that accommodates all programmed exterior activities. Incorporate site elements such as utilities, grading, drainage, planting, on-site stormwater treatment, lighting, furnishings and wayfinding signage into a holistic solution that addresses soil settlement and the corrosive Mission Bay environment.
A. Description & Performance

G.00 Resistance to Marine Environment

a. Metal sitework exposed to the exterior environment shall be made of 316 stainless steel or its corrosion-resistant equivalent.

b. See Geotechnical report for additional corrosion resistance for components exposed to soils.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Provide a coordinated site plan showing all schematic-level, above-grade site information from all design disciplines.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Provide a plan showing all vaults, covers, and above-grade infrastructure components with Landscape plans and paving to demonstrate a holistic and coordinated design approach.</td>
</tr>
<tr>
<td>CD</td>
<td>3. Updated coordination plan from DD phase above.</td>
</tr>
</tbody>
</table>

G 10 Site Preparation

A. Intent

Site preparation is intended to create a starting point for construction free from significant, unwanted surface and subsurface obstacles and vegetation. Site elements to be retained shall be protected from damage and cared for. Materials designated for recycling shall be collected and stockpiled for reuse. The site is prepared for construction by earth moving and rough grading, and trenched for utility connections. The Integrated Delivery Team (IDT) shall also protect the public by maintaining a secure site, and protect the environment through stormwater control.

G 1010 Site Clearing

A. Intent
G 1010 Site Clearing

Remove from the site surface debris, vegetation, and other miscellaneous material that interferes with site construction activities. Salvage material from the site that will be reused as part of the final construction or by the Owner at an offsite location.

B. Description & Performance

G 1010.00 General (LE n/a)

a. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

b. During clearing activities provide receptacles for trash, recycling, and compost materials.

c. References:

   2. Caltrans Plans and Specifications.

G 1010.10 Clearing & Grubbing (LE n/a)

a. Description: Clear from the site all debris and vegetation that is not designated to remain as part of the final site design.

b. Performance Requirements:

   1. Clear and grub the site of existing surface debris and vegetation down to a depth of 6-inches below ground surface.
   2. Stockpile any suitable agricultural topsoil and do not intermix with sub-soils.

G 1010.30 Tree & Shrub Removal (LE n/a)

a. Description: Removal of trees and shrubs to clear the site for construction activities.

b. Performance Requirements:

   1. Landscape waste should be disposed of through a green waste composting facility.
   2. Existing trees and shrubs may be incorporated in the final site design. The Integrated Delivery Team (IDT) shall assume the University will want to retain any heritage trees as defined by the City of San Francisco, in which case they shall be protected.
   3. If trees or shrubs are not designated to remain, they shall be cut down and
composted off-site or shredded and used as on-site mulch as appropriate and
directed by the IDT’s landscape architect.
4. Roots shall be grinded down or removed to the depth necessary to build the
proposed site improvements.

**G 1010.50** Earth Stripping & Stockpiling (LE n/a)

a. Description: Stripping & stockpiling of soil or material below 6-inches according to the
IDT’s soil management plan.

b. Performance Requirements:

1. Strip the site of any unsuitable soil as needed to perform the work and as
directed by the IDT’s geotechnical engineer.
2. Stockpile any soils that can be dried out or mixed with other soils to be used
as site fill or trench backfill per the IDT’s Geotechnical Report or as directed
in the field by the IDT’s geotechnical engineer.
3. Stockpile height limits shall be per the IDT’s soil management plan.

**C. Verification & Validation (All Tiers)**

<table>
<thead>
<tr>
<th>SD</th>
<th>1. See Contract.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Provide a drawing that indicates the locations of soils to be stripped and stockpiled.</td>
</tr>
<tr>
<td></td>
<td>3. Provide specifications that define procedures for site clearing and stockpiling; and define the construction waste and recycling removal process.</td>
</tr>
<tr>
<td>CD</td>
<td>4. Provide updated drawings and specifications.</td>
</tr>
<tr>
<td></td>
<td>5. Submit quantity take-offs for existing materials to be reused and calculation for reuse capacity.</td>
</tr>
<tr>
<td></td>
<td>7. Recycling and disposal tags should be organized and maintained by the IDT and submitted if requested.</td>
</tr>
</tbody>
</table>

**G 1020 Site Elements Demolition**
A. Intent

Remove foundations, minor structures, rubble, and large debris requiring dismantling, reinforcement removal, and crushing on site prior to removal or reuse. The Integrated Delivery Team (IDT) shall implement a waste diversion program as part of the overall sustainable design strategy.

B. Description & Performance

G 1020.00  General (LE n/a)

a. If existing asphalt and/or concrete structures are designated by the IDT for reuse, they shall be evaluated for environmental contaminants before being crushed on site. Reused materials shall conform to Caltrans Sections 25 and 26.

G 1020.10  Utility Demolition (LE n/a)

a. Description: Demolition of existing utilities designated by a demolition plan.
b. Performance Requirements:

1. Existing utilities with no remaining function shall be abandoned or removed as appropriate based on location and as approved or directed by the existing utility owner.
2. Existing utilities in direct conflict with proposed site development shall be removed and processed for recycling or disposal as applicable. Backfill shall be per (CR G1070 Site Earthwork).
3. Existing utilities designated for abandonment which are not in direct conflict with proposed site development shall be cut, filled with slurry throughout, and capped or plugged on the ends with concrete.

G 1020.50  Selective Site Demolition (LE n/a)

a. Description: Demolition of select existing site-specific features.
b. Performance Requirements:

1. Existing foundations or other substructure elements that are in conflict with proposed site development shall be removed and processed for reuse or disposal as applicable.
2. Any existing monitoring wells within the building footprints shall be abandoned per Health Department requirements.
C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. See Contract.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Demolition plan.</td>
</tr>
<tr>
<td>CD</td>
<td>3. Updated demolition plan.</td>
</tr>
</tbody>
</table>

4. Recycling and disposal tags should be organized and maintained by the IDT and submitted if requested.

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**G 1070 Site Earthwork**

**A. Intent**

Prepare the entire site by means of grading and trenching prior to construction of site improvements such as flatwork, roads, landscaping areas, outdoor amenities, and utilities.

**B. Description & Performance**

**G 1070.00 General (LE n/a)**

a. Design and construction shall be in accordance with criteria defined in the Project Geotechnical Report prepared by the Integrated Delivery Team (IDT), including, but not limited to:

1. Material Requirements
2. Utility Trench Bedding
3. Backfill
4. Compaction

b. The IDT shall assume that off-haul soils will need to be disposed of at a Class II facility. Soil will need to be characterized by IDT for disposal.

c. All earthwork shall comply with the latest version of the UCSF Office of Environment Health & Safety document entitled *Soil Import/Export Guidance*. This document contains requirements for soil characterization; reporting and authorization; transportation and disposal; recordkeeping, and taxes and fees.

d. Other References:
1. Mission Bay Soil Management Plan

**G 1070.10 Grading (LE n/a)**

- **Description:** Rough and fine grading to bring the subgrade and final grades to design elevations shown on the grading plans and to provide site drainage.
- **Performance requirements:**
  1. Implement rough grading by means of soil cut, fill, and compaction to bring the site soils to elevations shown on the rough grading plans.
  2. Place and compact specified engineered earthwork materials above the rough grade to prepare for placement of concrete, asphalt, or other finished grade materials.
  3. Implement fine grading of site landscape and amenities areas per the grading plans.

**G 1070.20 Excavation & Fill (LE n/a)**

- **Description:** Trenching and excavation for utility installation.
- **Performance Requirements:**
  1. See (CR A9020 Construction Dewatering) for dewatering requirements and procedures.

### C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Schematic grading plan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Grading plan.</td>
</tr>
<tr>
<td></td>
<td>3. Erosion control plan including site specific locations for proposed Best Management Practices (BMPs).</td>
</tr>
<tr>
<td>CD</td>
<td>4. Updated grading plan.</td>
</tr>
<tr>
<td></td>
<td>5. Rough grading plan.</td>
</tr>
<tr>
<td></td>
<td>6. Updated erosion control plan.</td>
</tr>
<tr>
<td></td>
<td>7. Trench section detail.</td>
</tr>
<tr>
<td></td>
<td>8. Specifications for dust control.</td>
</tr>
</tbody>
</table>
**G 20 Site Improvements**

**A. Intent**

Successful site improvement and design includes attention to the health, safety, and welfare of the general public, and attention to details, from energy efficiency methods to entrance and egress. The Integrated Delivery Team (IDT) shall incorporate all site elements into a cohesive site and building design that emphasizes UCSF’s principles, its brand, and invokes familiarity with the sites of the remainder of the Mission Bay Campus. The design must be aesthetically appealing and at the same time elegantly solve technical aspects such as site drainage and varying subsurface conditions.

**B. Description & Performance**

**G 2010.00 General (LE E (30 yrs))**

- **Description:** Roadway construction to provide site access.
- **Performance Requirements:**
  1. Provide fire truck access as coordinated with and approved by the University’s Fire Marshall and Fire Department.
  2. Provide vehicular and bicycle access to parking lots, buildings, and loading
G 2010.10  Roadway Pavement (LE E (30 yrs))

a. Description: Roadway pavement and base course construction.
b. Performance Requirements:
   1. The design engineer shall calculate the traffic Index (TI) for any roadways and design the pavement section accordingly.
   2. Materials shall conform to Caltrans Section 39.
   3. To reduce ponding which can lead to premature asphalt pavement failure, slope a minimum of 1%.
   4. All pavement slopes and surfaces along ADA accessible routes shall meet ADA requirements, pre- and post-settlement.
   5. Temporary asphalt curbs and sidewalks shall be constructed as applicable to maintain pedestrian access during construction.

G 2010.20  Roadway Curbs and Gutters (LE F (40 yrs))

a. Description: Construction of curb and gutter at perimeter of roadway pavements.
b. Performance Requirements:
   1. Construct curb and gutter to separate pavements from adjacent surfaces, provide vehicular restraint, and facilitate drainage.
   2. Curb heights shall typically be 6 to 8-inches.

G 2010.40  Roadway Appurtenances (LE D (20 yrs))

a. Description: Accessories for roadway construction.
b. Performance Requirements:
   1. Provide fire aisle designation on curbs with red paint and stenciling.
   2. Provide traffic signage and signals as appropriate.
   3. Provide thermoplastic or paint traffic striping conforming to Caltrans Section 84.

C. Verification & Validation (All Tiers)

SD 1. Schematic site layout plan with fire truck access routes and calculated turning movements using San Francisco Fire Department specific truck
G 2030  Pedestrian Plazas and Walkways

A. Intent

Pedestrian walkways of different widths, materials and proximities create a clear hierarchy of circulation and organize outdoor spaces. Paving assemblies will need to shift smoothly to accommodate areas of varying soil conditions, while maintaining a maximum finish grade difference of one-quarter inch over the life expectancy of the walking surface. When specifying color and finish, consider program, location, maintenance, slip resistance, and consistency across the project and Mission Bay Campus. Also consider the needs of low-vision users.

B. Description & Performance

G 2030.00  General

a. Where plazas or walkways are designed for emergency vehicle access, meet requirements of (CR G2010.10, Roadway Pavement).
b. Match sub base treatment with adjacent paving to reduce differential settlement.

c. Coordination with other consultants and documents, for example:
   
   1. Above-ground utilities
   2. Underground utility tunnels
   3. Streetscape features
   4. Building design
   5. Existing, adjacent site designs
   6. Geotechnical report

d. Concrete Form Materials:
   
   1. Provide formwork panels that will provide continuous, smooth, and true concrete surfaces. Provide sufficient coverage for ties from exposed concrete surface
   2. Factory-fabricated, adjustable-length form ties, removable or snap-off form ties designed to prevent form deflection material spalling. Material to be left in concrete shall be stainless steel or fiberglass.

e. Concrete:
   
   1. Use the following cementitious materials, of the same type, brand, and source, throughout project:
      
      a. Portland Cement: ASTM C 150
      b. Fly Ash: ASTM C 618, Class F or C
      c. Ground Granulated Blast Furnace Slag: ASTM C 989, Grade 100 or 120.
      d. Blended Hydraulic Cement: ASTM C 595
      e. Normal Weight Aggregates: ASTM C 33, graded.
      f. Maximum Coarse Aggregate Size: 1 inch (25 mm) nominal.
      g. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
   
   2. Finishes:
      
      a. Broom finish perpendicular to path of travel; sandblast finish, or exposed aggregate finish. Low reflectance and contrasting texture
at building entries for low-vision visitors.

b. TIER2: Greater variety of concrete finishes.

3. Colored Concrete:
   a. All colored concrete to be integral to the design mix, and obtained from the same source
   b. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing, admixtures meeting American Concrete Institute (ACI) Standards, containing no volatile organic compounds (VOCs)
   c. Match all grout and expansion joints to material color.

G 2030.11  Rigid Pedestrian Pavement (LE 25 yrs)

a. Finished concrete pedestrian pavement
   1. Saw cut all score joints where most likely occur; follow American Concrete Pavement Association (ACPA) recommendations
   2. Expansion and control joint spacing per ACPA or American Concrete Institute (ACI) Standards, whichever are more stringent
   3. Corrosion Resistance: Provide sufficient depth of cover over rebar to avoid corrosion.

G 2030.12  Pedestrian Unit Pavement

a. Concrete Unit Pavers: (LE C (15 yrs))
   1. Manufacturer’s standard, integral color, hydraulically pressed blocks, tiles or unit pavers used for pedestrian pavement set in mastic, sand setting or mortar. Choose module sizes to fit slopes and irregular spaces before cutting pavers to fit.
      a. 60 mm minimum thickness, average compressive strength 8000 psi with no individual units under 7200 psi per ASTM C 140.
      b. Flexural strength 1100 psi; Density >150 lbs/SF.
      c. Absorption: Average water absorption 5% with no unit greater than 7% per ASTM C140.
   2. Texture:
a. Full range of manufacturer’s standard finishes.

b. Stone Unit Pavers: (LE F (40 yrs)) Stone units used for pedestrian pavement set in sand or mortar.
   1. 60 mm minimum thickness, with flamed or other standard or custom texture.

c. TIER2: Permeable Pavers (LE C (15 yrs))

G 2030.13 Pedestrian Aggregate Surfacing (LE A (8 yrs))

a. Description: Loose, compacted, or stabilized crushed stone surfacing.
   1. The use of loose aggregate in main traffic areas and near building entrances is discouraged. Use in secondary or minor circulation areas only.
   2. Consider where desire lines may displace aggregate surfaces.
   3. Aggregate in secondary traffic areas may be stabilized with a binder, where permeability is not required and where surface drainage is provided.
   4. All aggregate surfaces to have edge restraints (CR G2080, Landscaping) to minimize movement of material and reduce maintenance.
   5. Choose materials that can be raked clean by maintenance crews.

G 2030.30 Exterior Steps and Ramps (LE F (40 yrs))

a. Materials:
   1. Treads, risers and ramp surfaces: Concrete or Stone (see criteria above).
   2. Guardrails & Handrails: Corrosion-resistant metal (CR G.00, Resistance to Marine Environment)

b. Stair Rise & Run:
   1. Follow 2R (riser) + T (tread) = 26-27 inches, keep width integral across grade changes.

C. Verification & Validation (All Tiers) (See G.00.C for Element-level verification)

SD
1. Submit narrative for paved areas, hierarchy of materials, indicate campus standards
G 2060 Site Development

A. Intent

Holistic-designed urban spaces provide places for outdoor use, and convenience and safety for users. Lighting levels that are coordinated with pathways, plantings and furnishings reinforce a sense of place, provide wayfinding cues, and enhance user safety.

The university places a priority on safety for its users. To minimize the potential for damage from vehicles used with malicious intent, the site shall be designed to limit high-speed strikes to the building.

The Integrated Delivery Team (IDT) shall consider materials that:

1. Resist graffiti.
2. Discourage skateboarding.

C. Verification

SD 1. Site Protection Plan showing site development features intended to protect the building, particularly any lobbies, from high-speed...
vehicles. Indicate path(s) of vehicles along anticipated highest speed routes toward building and particularly lobbies.

DD 2. Update to Site Protection Plan:

CD 3. Update to Site Protection Plan:


G 2060.25 Site Furnishings

A. Intent

Seating of varying sizes and arrangements create social areas of different scales and encourage the use and enjoyment of outdoor areas. Conveniently-located trash and recycling containers reduce litter and divert materials from landfill. Ensure that 50% of site seats have backs and arms.

Site furnishings located on the project’s green roof will require compliance with all applicable building criteria (e.g., material flammability).

B. Description & Requirements

G 2060.26 General

a. Affixing:

1. Ensure all exterior site furnishings are affixed to permanent, stable surfaces for seismic stability as required. Furnishings attached to roofing membranes over interior spaces shall not compromise the integrity of the roofing membrane.

b. Maintenance:

1. Ensure products and materials are easy to maintain and will withstand established campus cleaning practices.
2. 50% of seating shall have backs and arms.

G 2060.27 Furnishings

a. The Integrated Delivery Team (IDT) shall integrate into the site design, provide, and install the following items per University-selected vendors and models:

1. Bollards (LE D (20 yrs))
G 2060.30 Exterior Signage

A. Intent

Exterior signage shall support the goals and programmatic requirements for wayfinding, located in the Planning portion of this document. Exterior signage should, as much as possible, integrate with the building architecture and site design.

Consider use of digital and/or interactive (tactile) campus wayfinding maps.

B. Description & Performance

G 2060.31 General (Non-Digital LE D (20 yrs); Digital LE A (8 yrs) (TIER 2))

a. Signage Content: Solicit content from the University. Mockups shall include solicited content for donor and University approval.

b. Locations and Assumed Quantities: Except where noted below, see Urban Design and
Exterior Building Planning portions of this document for locations and quantity of signs, if any.

c. Mockups:

1. Content Mockups: See (CR Z1040.42, Mockups) for requirements where required below.

d. Design and Construction:

1. UCSF Gateway Stone Wall:
   a. See UCSF Block 25A, Site Details Sheet L-703 and associated specifications.
   b. Content Mockup: Show in exterior renderings.

2. UCSF Gateway Column:
   a. See UCSF MB Building 17 A/B, Lighting and Furniture Details Sheet L10.02 and associated specifications.
   b. Content Mockup: Show in exterior renderings.

3. Building Identification (Building-Attached) Signage:
   a. See UCSF Signage Standards Manual and Ordering Catalog.
   b. Content Mockup: Show each sign in exterior renderings at a content-legible scale.

4. Freestanding Building Identification Signage:
   a. See UCSF Signage Standards Manual and Ordering Catalog.
   b. Content Mockup: Show each sign in exterior renderings at a primary content-legible scale.

5. Information Kiosks:
   a. See UCSF Signage Standards Manual and Ordering Catalog.
   b. Kiosk requires 120V electrical power.
   c. Content Mockup: Show each sign in exterior renderings at a primary content-legible scale.

6. Freestanding Accessibility Signs:
a. Signs to match other examples around campus (check with University).
b. Content Mockup: None.

7. Building Entry Door Graphics:
   a. At all building entry doors.
   b. See UCSF Signage Standards Manual and Ordering Catalog.
   c. Content Mockup: Not required.

C. Verification & Validation

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Location of signs on Site Plan including Landscaping, at-grade or above-ground Utility features and Site Furnishings.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Update of SD plans. Submittals of proposed signage.</td>
</tr>
<tr>
<td></td>
<td>4. Schedule of signage information gathering, review and approvals, including adequate time for each.</td>
</tr>
</tbody>
</table>

Construction

5. See Contract.
6. Request signage content.
7. Provide mockups for approval.
8. Revise mockups if requested.

G 2060.35 Flagpoles

A. Intent

Provide site-appropriate, corrosive-resistant flagpoles as identified in the programming phase. Poles shall either be freestanding or attached to the building, but in either case shall facilitate safe flag changing without requiring equipment.

B. Description & Performance

G 2060.36 General (LE D (20 yrs))

- Performance:
G 2060.60  Retaining Walls

A. Intent

Provide site retaining wall design and construction as necessary based on site conditions and proposed site layout. Incorporate design aesthetics that complement site design and building architectural features.

B. Description & Performance

G 2060.61  General (LE F (40 yrs))

2. Conform to wind and seismic loads as applicable.

b. Mounting Types:
   1. Standard ground-set flagpoles shall be from to 30 to 50 feet in nominal height, as appropriate for design.
   2. Wall-mounted flagpoles may be installed vertically or inclined at a 45-degree angle (outrigger).

c. Flag size considerations:
   1. Flag size will determine the minimum distance between flagpoles. For installations of multiple flagpoles, a distance of at least one foot more than the length of the flag is the minimum recommended. A distance of 1-1/2 times the flag's length will allow a one-size-larger flag to be flown in the future.

d. Fittings:
   1. Provide internal halyards to minimize the potential for vandalism and help eliminate noise. Include winch with an automatic brake.

e. Materials and Finishes:
   1. Provide aluminum or stainless-steel poles.
   2. Provide pole finishes to match building or site design.
a. Description: Retaining walls associated with site construction not intended to support buildings or other structures.

b. Performance Requirements:

1. Retaining walls shall be engineered based on site-specific existing and proposed conditions.
2. Retaining wall designs shall utilize criteria specified in the Integrated Delivery Team’s geotechnical report.
3. Drainage shall be incorporated into retaining wall design.
4. Retaining walls shall be constructed from reinforced, cast-in-place concrete or from reinforced concrete masonry unit (CMU) construction.
5. Handrails and guardrails to be located per codes and regulations.

C. Verification

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Location of site retaining walls including approximate height.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD</td>
<td>2. Plan and elevation drawings of proposed wall including backfill material and drainage system.</td>
</tr>
<tr>
<td>CD</td>
<td>3. Updated plan and elevation drawings.</td>
</tr>
<tr>
<td></td>
<td>4. Structural and seismic calculations prepared by a California Professional Civil or Structural Engineer.</td>
</tr>
<tr>
<td></td>
<td>5. Material specifications for concrete and reinforcement.</td>
</tr>
<tr>
<td>Construction</td>
<td>6. Concrete Mix Design</td>
</tr>
<tr>
<td></td>
<td>7. Reinforcing Bar Shop Drawings.</td>
</tr>
</tbody>
</table>

G 2080 Landscaping

A. Intent

Open space on campus is a valuable amenity. All landscape areas should be designed with lighting, pathways, planting, and seating to create outdoor spaces that encourage socializing and relaxation. Visually connect these spaces with the adjacent buildings, adjacent open spaces, and integrate them with pedestrian routes.
Planting design should emulate native plant communities, requiring little water and tolerating a windy, bay front location. Stormwater treatment areas should be integrated into planted areas as an amenity, and be designed to exceed regulatory requirements.

Landscape areas should consider any particular requirements for patients and staff, such as visibility. Design access to these areas, in particular any vegetated roof areas, for maintenance crews and materials.

### B. Description & Requirements

**G 2080.00 General**

a. Design

1. Address solar orientation, wind, water use, anticipated user needs, and site soils
2. Planting areas and water use to conform to WEL0

b. Maintenance

1. All areas should be designed and constructed with campus exterior maintenance practices in mind
2. Select plant species that produce low quantities of leaf and flower litter.

**G 2080.01 Stormwater Management**

a. Conform with minimum criteria described in G3030, Storm Drainage Utilities plus the following additional criteria.

1. Design layout with overlays of sun orientation and sunlight hours, soil depths, vehicular and pedestrian routes, underground utilities, and tunnels.
2. Select adapted plants that withstand wet winters and dry summers, not riparian species that prefer year round water.
3. Consider aesthetic appearance of stormwater areas during dry seasons.

**G 2080.02 Vegetated Roof Landscaping (LE P (20 yrs)) (TIER 3)**

a. Reference:

1. See Programming, Planning and Design Criteria section of this document for suggestion of appropriateness of Vegetated Roof for this project.
2. See (CR B3010.50 Vegetated Roof Assembly) for remainder of system.
b. Design:

1. Design an inviting, accessible amenity, tailored to the needs and requirements of building staff and users.
2. Do not use rounded stone or crushed rock mulch in any green roof locations used by children.
3. Design access route to and from green roof for building facilities and maintenance crews, based on their requirements. Include stable, accessible paths to all areas of green roofs requiring maintenance or servicing.
4. Design with consideration of views from upper floors and surrounding buildings, and in coordination with adjacent programmed areas. Coordination considerations include privacy and views into and out of the building’s windows from maintained green roof areas.
5. Design in combination with other required, functional roof-top elements.
   a. Coordinate with structural and architect to set growing medium depth.
   b. Conform to ASTM / E2777-14 for green roofs.
   c. Select plants appropriate for growing medium depth, climate, water use, solar orientation, and lifespan.
   d. Select growing medium appropriate for supporting plants to maturity
   e. Include anchoring systems as required for large shrub and tree rootballs
   f. For irrigation system, see (CR G2080.10, Landscaping, Irrigation). Ensure irrigation system is installed correctly to maximize water application to plant roots and to minimize runoff.
   g. Address wind uplift through material size and stability.
   h. Verify with all agencies requirements for, or restrictions on, the use of organic mulch on green roofs
   i. Verify with all agencies and requirements for, or restrictions on, the materials used for site furnishings
   j. Do not allow crushed rock mulch to mingle with growing media
   k. Accommodate window washing personnel and equipment, including access and staging
G 2080 Landscaping

l. Verify that locations of building exhaust vents and systems do not affect the health of green roof plants or the enjoyment of the green roof as an amenity for visitors and staff.
m. Verify during DD and CD, via submitted overlay plans, that all MEP systems and locations and all required types of access are coordinated. Indicate on plan all adjacent program assignment to verify G2080.02b(4).

c. Description: A vegetated roof assembly, consisting of an extensive system with a variety of sedum species as tiles, plugs, or plants, and a maximum of 6” growing medium; or an intensive green roof system with a greater than 6” depth of growing medium and perennials, shrubs, and trees. To be coordinated with landscaping and with potential rainwater/graywater design strategy.

d. Performance:
   1. Confirm roof is capable of accommodating loads.
   2. Include AVRS system, which is capable of:
      a. Detaining and retaining rainwater and irrigation water
      b. Retaining sufficient water for plant uptake and year round health
      c. Preventing root rot
      d. Allowing airflow under multilayer system
      e. De-energizing wind flow under multilayer system to reduce chance of wind uplift
   3. Install root barrier under system and above roof waterproofing system
   4. Roofing system must have leak detection system mat installed as part of the entire system.

G 2080.10 Irrigation (LE 10 yr warranty)

a. Description: CalSense Irrigation system
b. Functional Requirements:
   1. Ensure self-adjustment through soil moisture sensor and weather sensor
   2. Include a rain sensor shut-off

G 2080.20 Turf and Grasses (LE A (8 yrs))

a. Turf or lawn areas:
1. Conform to WELO levels for MAWA.
2. Use native species, tolerant of drought, sun, and shade.
3. Limit fertilization to minimum required for growth. No inorganic fertilizers.

**G 2080.30 Plants (LE D (20 yrs) for trees; 3-25 yrs other)**

a. Includes: All species of succulents, perennial grasses, woody shrubs, and trees.

b. Functional Requirements:

1. Native or climate adapted.
2. No annuals or biennials, and limited herbaceous and semi-woody perennials
3. WUCOLS designation of Low Water Use
4. No species with excessive maintenance or fertilization requirements
5. Mix of evergreen and deciduous species to provide year-round interest
6. No invasive species per CAL-IPC and horticultural review with UCSF
7. Food sources and habitat for pollinators, songbirds, and beneficial predators
8. Sufficient soil volume for tree growth based on mature tree size.

c. Selection:

1. Size specifications per American Standards for Nursery Stock ANSI Z60.1
2. Plant quality per ANSI Z60.1
3. Plant spacing for mature plant size per Bay Friendly Landscape Guidelines.
4. Include mature height, spread, and estimated lifespan of plant species on planting schedule.

d. Installation:

1. Conform to all ANSI A300 standards.
2. Conform to all ISA standards for tree planting, staking, and protection.
3. No tree grates.
4. Provide sufficient open planting area for trees’ Critical Root Zone per ISA and ANSI A300.
5. Mulch all planting areas in accordance with WELO.

**G 2080.50 Planting Accessories**

a. Landscape Edging (LE D (20 yrs))

1. Metal edging to be used for aggregate pathway material restraints, and to divide planting areas from other, adjacent areas.
b. Tree Grates: Tree grates are discouraged.

**G 2080.80 Landscaping Activities**

a. Soils Testing
   1. Soil analyses performed before and after landscape installation.
   2. Testing laboratory to meet Third Party Testing Lab Accreditation.

b. Stripping and Stockpiling (See CR G1010.50, Site Clearing, Stripping & Stockpiling)

c. Amending:
   1. All planting soil to be composted in accordance with WELO.
   2. No inorganic fertilizers to be applied to planting area soils.

d. Compaction:
   1. Soil compaction percentage to be field tested before and after planting.
   2. Ensure soil compaction percentage does not exceed what is beneficial for plant growth, per ASTM D7380-15.

C. Verification

| SD | 1. Submit narrative for planting and irrigation, landscape coefficients, peak water use estimates. Indicate all water sources, irrigation system components, and standards. |
|    | 2. Estimated area in sf for stormwater treatment |
|    | 3. Initial plant species list |
|    | 4. Submit narrative for paved areas, hierarchy of materials, indicate campus standards |
|    | 5. Indicate required products and components |
|    | 6. For custom work, include reference standards. |
| DD | 7. Stormwater plan |
|    | 8. Irrigation plan |
|    | 9. Refined planting design |
|    | 10. All product submissions, cut sheets, and specifications. Material samples as required |
|    | 11. Soil analyses and amendments |
### Technical Criteria

#### G 30  Liquid & Gas Site Utilities

#### CD

1. Submit landscape maintenance plans.
2. Installation specifications, final water use calculations
3. C3 plans and attendant materials as required
4. Construction details and enlargement areas
5. Final, detailed planting plan and schedule with quantities, sizes, and spacing
6. Clear specifications and details for tree selection, planting, pruning, and staking
7. All required items called out on layout and materials plans
8. All verification standards cited in proposal checked for compliance.

#### Construction

9. All mock ups and samples approved before installation
10. Field compaction tests before and after installation
11. All soil testing and amending verified and approved before installation.

#### Startup

12. Irrigation system test.

### G 30  Liquid & Gas Site Utilities

#### A. Intent

Provide utilities to meet the user needs for proposed onsite facilities established by the Integrated Delivery Team (IDT). The IDT shall select system materials that, over their expected lifetime, successfully:

1. Accommodate the anticipated differential soil settlement across the site and between the site and the building.
2. Resist corrosion of all types, including those resulting from the site’s marine characteristics.
3. Promote the sustainability objectives of the University.

#### B. Description & Performance

**G 30.00 General (LE F (40 yrs))**
a. Existing Conditions: See (CR 1040, Existing Conditions) for assumptions regarding utilities provided to the site.

b. Performance Requirements:

1. All connections shall be watertight.
2. Joints at the building line shall be designed and installed to accommodate anticipated settlement with flexible couplings.
3. Trench bedding and backfill shall be per (CR G1070, Site Earthwork).
4. On-site piping shall be offset 10-feet from centerline of trees.
5. Report from the IDT’s Corrosivity Expert/Consultant providing recommendations and requirements for achieving expected lifetimes of the above- and below-ground Liquid & Gas Site Utilities as it concerns corrosion from environmental agents. Updated report to analyze and verify the expected lifetimes of the final, proposed above- and below-ground Liquid & Gas Site Utilities design.

C. Verification & Validation (All Tiers)

1. Schematic water plan.
2. Report from the IDT’s Corrosivity Expert/Consultant proposing recommendations and requirements for achieving expected lifetimes of the above- and below-ground Liquid & Gas Site Utilities as it concerns corrosion from environmental agents.
3. Report from the IDT’s Corrosivity Expert/Consultant analyzing and verifying the expected lifetime of the proposed Above- and Below-Ground Liquid & Gas Site Utilities design.

G 3010 Water Utilities

A. Intent

Provide potable and recycled water services to meet all domestic, firefighting, and irrigation demands of the proposed facilities. The Integrated Delivery Team (IDT) shall coordinate above-ground utility features holistically, intentionally, and thoughtfully with the site and landscape design to the extent permitted by the utility owner.
### Block 33

**SITEWORK**

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#### G 3010 Water Utilities

**B. Description & Performance**

**G 3010.00 General (LE F (40 yrs))**

- a. Description: Water distribution for domestic consumption, firefighting, and irrigation.
- b. Performance Requirements:
  1. See (CR G30.B, Liquid & Gas Site Utilities, Description & Performance) for system-level requirements.
  2. Pipes shall be designed to accommodate anticipated settlement.
  3. New piping connecting to water mains in adjacent Right of Ways shall be installed in conformance with the Standards of the Public Utility or University Utility provider identified in (CR 1040, Existing Conditions).
  4. Water metering and backflow prevention shall be in conformance with the Standards of Public Utility or University Utility provider identified in (CR 1040, Existing Conditions).

#### C. Verification & Validation (All Tiers)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>SD</strong></td>
<td>1. Schematic water plan.</td>
</tr>
<tr>
<td><strong>DD</strong></td>
<td>2. Fire hydrant flow and pressure test from Utility Provider to determine available water pressure.</td>
</tr>
<tr>
<td></td>
<td>3. Water demand and pipeline sizing calculations or modeling results.</td>
</tr>
<tr>
<td></td>
<td>4. Detailed water plan including pipe material, diameters, and lengths; valves, bends, meters, backflow devices, hydrants, and any other appurtenances.</td>
</tr>
<tr>
<td></td>
<td>5. Pre and post settlement pipeline drawing defining settlement at utility locations entering building line and the callout for the settlement joint proposed to accommodate settlement.</td>
</tr>
<tr>
<td><strong>CD</strong></td>
<td>6. Material specifications.</td>
</tr>
<tr>
<td></td>
<td>7. Updated water demand and pipeline sizing calculations or modeling results.</td>
</tr>
<tr>
<td></td>
<td>8. Updated water plan.</td>
</tr>
</tbody>
</table>
G 3020 Sanitary Sewerage Utilities

A. Intent

Provide sanitary sewerage service to meet all domestic and other equipment demands of the proposed facilities.

B. Description & Performance

G 3010.00 General (LE F (40 yrs))

a. Description: Sanitary sewerage for building demands, grease interceptors, lab waste sampling ports, loading dock drains, trash enclosure drains, or other sanitary sewer appurtenances.

b. Performance Requirements:

1. See (CR G30.B, Liquid & Gas Site Utilities, Description & Performance) for system-level requirements.

2. Pipes shall be designed to accommodate anticipated settlement, maintaining positive drainage post settlement.

3. Laterals shall be minimum 6-inch diameter.

4. Provide sufficient number of cleanouts of sufficient size to facilitate visual inspection utilizing closed caption television of the entire length of the lateral between the University owned building and the Utility Provider main.

5. New piping connecting to sanitary sewer mains in adjacent Right of Ways shall be installed in conformance with the Standards of the Public Utility or University Utility Provider identified in (CR 1040, Existing Conditions).

6. Sewer design shall be in conformance with the Mission Bay Project, Separate
Sanitary Sewer Analysis, prepared for Santina & Thompson, Inc. by Olivia Chen Consultants.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Sanitary sewer sizing calculations.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Schematic sanitary sewer plan.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DD</th>
<th>3. Details for sewer connections and manholes.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4. Updated pipeline sizing calculations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DD</th>
<th>5. Updated sanitary sewer plan including pipe materials, diameters, lengths, invert elevations, manhole rim elevations, and slopes (pre and post anticipated settlement); and locations of any grease interceptors, lab waste sampling ports, loading dock drains, trash enclosure drains, or other sewer appurtenances.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6. Pre and post settlement pipeline drawing defining settlement at utility locations entering building line and the callout for the settlement joint proposed to accommodate settlement.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8. Details for sewer connections, manholes, grease interceptors, lab waste sampling ports, loading dock drains, trash enclosure drains, or other sewer appurtenances.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CD</th>
<th>9. Updated sanitary sewer sizing calculations.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>10. Updated sanitary sewer plan.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CD</th>
<th>11. Sanitary sewer profiles including manholes, pipe cover; clearances to existing or proposed utilities; and utility potholing data showing depth, type, and diameter of existing utility crossings.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>12. Material submittals including pipeline, joints, and flexible couplings that meet settlement requirements.</td>
</tr>
<tr>
<td></td>
<td>13. For manholes, vacuum testing in accordance with ASTM C1244.</td>
</tr>
<tr>
<td></td>
<td>14. Closed Circuit Television (CCTV) logs validating no sags or damaged pipe joints.</td>
</tr>
</tbody>
</table>
## G 3030 Storm Drainage Utilities

### A. Intent
Protect the site from flooding during the design storm event.

See (CR 1030.58, Stormwater Management) for enhanced sustainability requirements.

### B. Description & Performance

<table>
<thead>
<tr>
<th>Description</th>
<th>Performance Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G 3030.00 General (LE F (40 yrs))</strong></td>
<td></td>
</tr>
<tr>
<td>a. Description: Storm drain to serve building demands and site drainage needs.</td>
<td></td>
</tr>
<tr>
<td>b. Performance Requirements:</td>
<td></td>
</tr>
<tr>
<td>1. See (CR G30.1B, Liquid &amp; Gas Site Utilities, Description &amp; Performance) for system-level requirements.</td>
<td></td>
</tr>
<tr>
<td>2. Conform to all requirements of UCSF Small Municipal Separate Storm Sewer System as defined in the SWRCB MS4 General Permit Waste Discharge Requirements Order No. 2013-0001-DWQ NPDES Permit No. CAS 000004 for redevelopment projects.</td>
<td></td>
</tr>
<tr>
<td>3. Design Storm Event: 10-Year</td>
<td></td>
</tr>
<tr>
<td>4. Site storm water runoff should be directed towards post-construction Low Impact Development (LID) stormwater Best Management Practices (BMPs) and/or captured for reuse to comply with UCSF’s MS4 Permit. LID approaches use stormwater management solutions that promote the use of ecological and landscape-based systems and hydrologic processes by increasing retention, detention, infiltration, and treatment of stormwater. In Mission Bay, infiltration into groundwater is not permitted. Subdrainage systems are required.</td>
<td></td>
</tr>
<tr>
<td>5. Pipes shall be designed to accommodate anticipated settlement, maintaining positive drainage post settlement.</td>
<td></td>
</tr>
<tr>
<td>6. Pipe sized to drain at a velocity of 2.5 feet per second (ft/sec) to 5 ft/sec flowing full.</td>
<td></td>
</tr>
<tr>
<td>7. Provide sufficient number of cleanouts of sufficient size to facilitate visual inspection utilizing closed caption television of the entire length of the lateral between the University owned building and the Utility Provider main.</td>
<td></td>
</tr>
</tbody>
</table>
8. New piping connecting to Storm Drain mains in adjacent Right of Ways shall be installed in conformance with the Standards of the Public Utility or University Utility provider identified in Section 1040.

9. Storm drain design shall be in conformance with the Revised Summary Drainage Study for the South of Channel Watershed of the Mission Bay Project, prepared by Santina & Thompson, Inc.

c. References:

1. Small Municipal Separate Storm Sewer System (MS4) Permit.
2. San Francisco Green Stormwater Infrastructure Typical Details.
3. Revised Summary Drainage Study for the South of Channel Watershed of the Mission Bay Project, prepared by Santina & Thompson, Inc. dated December 1, 2000.
7. ASTM International C1244-11, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Stormwater hydrology calculations with projected flows from site and pipeline sizing calculations or modeling results.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Overland Flow route for stormwater exceeding design storm event.</td>
</tr>
<tr>
<td></td>
<td>3. Schematic storm drainage plan including proposed post-construction stormwater BMPs to comply with UCSF’s MS4 Permit.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DD</th>
<th>4. Details for post-construction stormwater BMPs, storm drain connections, storm drain inlets, and manholes.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5. Updated pipeline sizing calculations or modeling results.</td>
</tr>
<tr>
<td></td>
<td>6. Storm drain manhole sizing calculations (as necessary based on pipe diameters and relative pipe angles).</td>
</tr>
<tr>
<td>G 3030 Storm Drainage Utilities</td>
<td></td>
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<tr>
<td>-------------------------------</td>
<td></td>
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<tr>
<td>Technical Criteria</td>
<td></td>
</tr>
</tbody>
</table>

7. Sizing calculations for any proposed post-construction stormwater treatment facilities.

8. Updated storm drainage plan including post-construction stormwater BMPs, pipe materials, diameters, lengths, invert elevations, and slopes (pre and post anticipated settlement).

9. Pre and post settlement drawing defining settlement at rainwater leader locations at the building line and the callout for the settlement detail proposed to accommodate settlement.

<table>
<thead>
<tr>
<th>CD</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Details for post-construction stormwater BMPs, storm drain connections, storm drain inlets, and manholes.</td>
</tr>
<tr>
<td>12. Updated pipeline sizing calculations or modeling results.</td>
</tr>
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<td>13. Updated storm drain manhole sizing calculations (as necessary based on pipe diameters and relative pipe angles).</td>
</tr>
<tr>
<td>14. Updated sizing calculations for any proposed post-construction stormwater treatment facilities.</td>
</tr>
<tr>
<td>15. Details for any proposed post-construction stormwater treatment facilities.</td>
</tr>
<tr>
<td>16. Updated storm drainage plan including post-construction stormwater BMPs, pipe materials, diameters, lengths, invert elevations, rim and grate elevations, and slopes (pre and post anticipated settlement).</td>
</tr>
<tr>
<td>17. Storm drain profiles including structures, pipe cover; clearances to existing or proposed utilities; and utility potholing data showing depth, type, and diameter of existing utility crossings.</td>
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<tr>
<th>Construction</th>
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<tbody>
<tr>
<td>18. Material Submittals</td>
</tr>
<tr>
<td>19. For manholes, vacuum testing in accordance with ASTM C1244.</td>
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<tr>
<td>20. Closed Circuit Television (CCTV) logs validating no sags or damaged pipe joints.</td>
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</table>

<table>
<thead>
<tr>
<th>Startup</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Maintenance instructions and implementation schedule for post-construction stormwater BMPs.</td>
</tr>
</tbody>
</table>
**G 3060.10 Site Gas Distribution**

**A. Intent**
Coordination of Utility Provider’s Natural Gas Service lateral to the Point of Connection.

**B. Description & Performance**

**G 3030.00 General (LE F (40 yrs))**

a. Description: See D3010.10, Fuel Piping for Requirements.
b. Performance Requirements:
   1. See (CR G30.B, Liquid & Gas Site Utilities, Description & Performance) for system-level requirements.

**C. Verification & Validation (See D3010.10.C, Fuel Piping for Verification and Validation)**

**G 4010 Site Electrical Distribution Systems**

**A. Intent**
Incoming electrical service supplied by the local utility company to the project site and extended to the building by the design/build team to accommodate building loads.

**B. Description & Performance**

**G 4010.00 General (LE n/a)**

a. Description: Local utility company, either PG&E or SFPUC, will be responsible for bringing power to a vault nearest to the project site.
b. Performance Requirements:
   1. New utility connections and extensions shall be coordinated with University’s Utility Master Plan (UMP) and Long Range Development Plan (LRDP).
   2. The Integrated Delivery Team (IDT) shall be responsible for extending the electrical service from the nearest vault and extending it to the main building.
SITEWORK

G 4050.10 Site Lighting

for distribution (CR 5020)
3. The IDT shall coordinate with the local utility for requirements related to conduit installation including, but not limited to, conduit sizing, burial depth, etc.

G 4010.10 Electrical Utility Services (LE n/a)

a. Description: Electrical service shall be appropriately sized and coordinated with the local utility for an adequate point of connection.

b. Performance Requirements:

1. The IDT shall coordinate with utility for a dedicated primary service to the site for the building.

C. Verification & Validation (All Tiers)

| SD | 1. Provide electrical loads to the local utility and begin coordination to bring power to site. |
| DD | 2. Site plan showing the point of connection and extension of electrical service to the project site. |
| CD | 3. Provide updated electrical loads and electrical single line and final site plan to the utility company for their coordination. |
| Construction | 4. Finalize point of connection and receive approval from the local utility and University for tie-in. Request inspection by the local utility prior to closing trench carrying the utility conduits from the vault the building point of connection. |
| Startup | 5. None. |

G 4050.10 Site Lighting

A. Intent

Thoughtfully planned lighting levels that coordinate with pathways, plantings and furnishings enhance the perceptions of place, provide wayfinding clues, and enhance user safety. Adequate site lighting
levels must weigh advantages of quantity against contributions to site light pollution. Site lighting and controls shall be optimized and integrated holistically as an important aspect of the building’s overall energy performance.

Site Lighting is a significant contributor to building maintenance and therefore should be located and employ the latest technology to minimize operational costs.

### B. Description & Performance

#### G4050.10 Site Lighting Fixtures (LE D (20 yrs))

a. Description: Light fixtures specified and installed to promote visual comfort and security of the site and building occupants without sacrificing the energy requirements of the project.

b. Performance Requirements:

1. Aesthetics and type of luminaires used shall be compatible with the area it is located in. Placement, illumination level, distribution shall be chosen to eliminate glare, promote visual acuity, and meet dark sky requirements.
2. Fixtures located in areas of high foot traffic shall be tamper resistant.
3. Quality of light is of high importance.
4. Avoid the use of “in-ground” outdoor lighting due to water intrusion and settling.
5. Do not install fixtures above 30 feet. If unavoidable, provide access for changing fixtures without the need to rent special lifting equipment.
6. Exterior lighting shall be designed to take safety of occupants into consideration. Avoid creating “dark areas” or “hot spots”.

#### G4050.90 Site Lighting Control (LE B (10 yrs))

a. Description: Lighting control technologies implemented to provide the most efficient and effective electric lighting control system for the site.

b. Performance Requirements:

1. Lighting controls shall be designed to react to daylight and occupancy.
2. Lighting controls shall be BACnet compatible to allow tie-in to BAS.
3. Use of proprietary lighting control systems is not allowed; open protocol systems are required.
4. Exterior light fixtures on emergency circuits shall remain turned off during
daylight hours.

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>Step</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1. Target foot-candle levels for each exterior space per IESNA standards.</td>
</tr>
<tr>
<td>DD</td>
<td>2. Site Plan indicating lighting layout, initial photometrics that meets foot-candle levels set forth.</td>
</tr>
<tr>
<td>Construction</td>
<td>4. Manufacturer’s shop drawings for lighting control system equipment layout, device interconnection and wiring, device and sensor coverage.</td>
</tr>
<tr>
<td>Startup</td>
<td>5. Provide training to building facility staff.</td>
</tr>
</tbody>
</table>

G 5010 Site Communications Systems

A. Intent

The Integrated Delivery Team (IDT) shall provide a site communications infrastructure of outside building campus pathways and cabling, located, sized and configured to support the project’s low voltage connectivity requirements to the larger campus in which the project site is located. Each Campus building has physically redundant pathways and cabling between two campus main distribution facilities and each building distribution facility, and it will be the IDT’s responsibility to extend this design and infrastructure to the new building. The IDT shall consider the site communications redundancy requirements of the campus building then design and implement Site communications systems that, over their expected lifetimes, successfully:

1. Provide campus area network connectivity between the building BDF and one of the two Campus MDCs.
2. Provide campus fire alarm monitoring connectivity between the building fire alarm panel and the Mission Bay campus fire alarm monitoring station at Rock Hall.
3. Provide non VoIP Telephone service to UC Faculty and Staff between the building BDF and one of two Mission Bay Campus Primary AT&T MPOEs located in each of the two campus MDCs.
4. Provide DAS connectivity between the Mission Bay campus DAS headend and the building BDF.
Technical Criteria

G 5010  Site Communications Systems

5. Allow the outside plant cabling infrastructure to be replaced, renewed and/or augmented while first generation systems remain operational.
6. Support change and growth over the life of the building.
7. Support campus Wifi system outside of the building on the site.

B. Description & Performance

G5010.00 Description

a. Campus Area Network: 10 Gigabit Ethernet service over single mode fiber optic cable between one of the two campus Main Distribution Centers (MDCs) and the building BDF. The campus area Network supports the following building systems:

1. Wired Ethernet devices:
   a. VoIP Telephone devices
   b. Workstations, laptops, network attached computing devices
   c. Wireless Access Points
   d. Multi-Purpose printers, copiers, scanners
   e. Network attached printers
   f. Fax Gateways
   g. 25live room scheduling panels
   h. Digital signage through network attached devices
   i. Safety & Security: Video Surveillance Cameras
   j. Safety & Security: ACAMS panels
   k. Safety & Security: Intrusion detection system primary connection
   l. Safety & Security: Intercom stations
   m. AV system projectors and displays, monitoring & management
   n. AV system control panels, controllers, digital signal processors, amplifiers
   o. Video Conferencing codecs and control panels
   p. Audio Conferencing VoIP gateways
   q. Building energy management system devices

b. Fire Alarm Monitoring System: Single mode fiber optic ring that extends from fire alarm monitoring station in Rock Hall to each campus Building BDF.
16th street at UCSF Mission Bay.
2. A new fiber optic ring shall be extended from Rock Hall at 1550 4th Street to Mission Bay Blocks 33 and 34.

c. Non-VoIP telephone service from the Local Exchange Carrier (LEC) over OSP copper twisted pair cabling between one of the three existing campus cross connect cabinets or two existing MDCs. The Mission Bay Campus has two Primary AT&T MPOEs that provide dial tone to campus buildings through the university owned and operated OSP copper cabling. These MPOEs provide Non VoIP telephone service to the following devices in new campus buildings:

1. Elevator phone in each elevator car
2. Two fire alarm dialers in the building fire alarm panel
3. Telephone at the building lobby security desk
4. Intrusion alarm back up communications
5. PG&E electric meter
6. PG&E gas meter
7. Specialty alarms and or devices monitored by non UC staff or outside contractors.

d. Non-UCSF Telephone service from the Local Exchange Carrier (LEC) to non-UCSF tenants in leased spaces or non-UCSF equipment such as an ATM or Locker System. The IDT shall provide new pathways and have the local exchange carrier AT&T establish an MPOE in the buildings BDF to provide dial tone to Non-UCSF tenants and or equipment in the building.

1. Existing AT&T Infrastructure at Illinois Street.

e. DAS: Connectivity from UCSF Mission Bay Campus DAS headend location to Building BDF.

1. The existing DAS headend at the UCSF Mission Bay campus is located in the Medical Center.
building campus pathways and enclosures configured, located, and sized to support the projects low voltage connectivity requirements to the campus that the building site is located. Each Campus building has physically redundant pathways between two campus main distribution facilities’ MDFs and each building distribution facility, BDF the continuation of this infrastructure to all new Campus buildings is a project requirement. The IDT shall consider the outside plant pathway redundancy requirements of all campus building then design and implement an outside plant pathway infrastructure that, over their expected lifetimes, successfully:

1. Provide physically separate underground pathways connected to existing campus communications pathways that provide physically separate pathways between the building BDF and one of the two Campus MDFs.
2. Support campus fiber optic and copper communications distribution cabling.
3. Support the campus fire alarm monitoring fiber optic cable ring.
4. Support extension of Local Exchange Carrier services to non-UCSF clients leasing space in the building.
5. Support replacement, renewal and or augmentation of outside plant cabling while first generation cabling remains operational.
6. Support growth and replacement of outside plant cabling systems over the life of the building.
7. Support campus Wifi equipment outside of the building on the building site.
8. Support campus IP devices outside of the building on the building site.

B. Description & Performance

G5010.10 General

a. Description

1. The UCSF Mission Bay campus underground telecom infrastructure is a grid of 4 inch conduits grouped in duct banks and routed between precast concrete underground vaults, building distribution facilities (BDFs) and two main distribution centers (MDCs) on the Mission Bay Campus. The conduits utilized are RTRC manufactured of fiberglass reinforced epoxy. RTRC conduit can withstand the soil settlement found in Mission Bay area better than PVC. A portion of the existing campus conduits are lined with 1 and 1-1/4 inch HDPE inner ducts to support placement of fiber optic cable sheaths over the life of the campus. The communications vaults are designated as “TMH”s and are
laid out on an X-Y grid. An alpha character is used to describe the north south location and a numeric character is used to describe the west to east location. The UCSF Mission Bay campus North of 16th street utilizes A-N with “A” at Mission Bay Boulevard South and “N” at 16th street. The numbers 1-18 are utilized for the west to east designation with “1” at the corner of Owens Street and Mission Bay Boulevard south and “18” at 3rd street. The existing east west Telecom structures are located along 16th street, Gene Friend Way (14th) and Nelson rising Lane (13th). The existing north south are located along Owens Street, 5th Street, and an area between 4th and 3rd streets. Each campus building is interconnected to this grid through two physically diverse connections separated by a minimum of 90 degrees and in many cases 180 degrees.

2. The campus MDCs are interconnected to the following telecom man holes TMHs at Genentech Hall 600 16th Street:
   a. TMH-L10 North side of Genentech Hall
   b. TMH-N13 South Side of Genentech Hall
   c. TMH-N9 South Side of Genentech Hall

3. The campus MDCs are interconnected to the following telecom man holes TMHs at Helen Diller 1450 3rd Street:
   a. TMH-E17 at Nelson Rising Lane
   b. TMH-A17 West of Building

4. The Rock Hall and the fire alarm monitoring center are interconnected to the following telecom man holes TMHs
   a. TMH-G12 West of Building
   b. TMH-E12 North of Building

5. The UCSF Mission Bay campus north of 16th street is connected to the Medical Center South of 16th Street through the following telecom man hole TMH:
   a. TMH-N15 northeast corner of 4th street and 16th street.

6. The UCSF Medical Center south of 16th street and North of Mariposa Street utilizes the same communications vault identification system. North to south
Technical Criteria

G 5010.10 Site Communications Structures

are the letters ‘O’ to ‘W’ and East to West are number 17 to 1.
7. The Medical Center Primary MPOE is located in the Energy Center Building on 3rd street directly to the west of block 33.
   a. TMH-P17 is the existing vault in the energy center drive way off of 3rd street
8. The Existing structures and spaces that form an existing pathway from the west side of 3rd street to the existing campus underground infrastructure north of 16th street at TMH-N15 are as follows:
   a. TMH-P17 to the Energy Center MPOE room
   b. Energy Center MPOE room to TMH-R16
   c. TMH-R16 to TMH-R14
   d. TMH-R14 to TMH-Q14
   e. TMH-Q14 to TMH-O14
   f. TMH-O14 to TMH-O13
   g. TMH-)13 to TMH-N15 (crossing at 16th street)
9. The Vault numbering scheme for Block 33 will be north to south the Letters ‘O’ to ‘S’ and West to East the numbers 18-22.

b. Performance
1. The IDT shall survey the existing outside plant communications pathways and structures, document all open conduit and innerduct pathways and design new pathways, structures and inner ducts to connect the new campus building to:
   a. UCSF Mission Bay campus MDC2 at 1450 3rd Street in the Helen Diller Family Cancer Research Building for fiber optic connectivity only.
   b. UCSF Mission Bay Rock Hall at 1550 4th Street
   c. The UCSF Mission Bay DAS Head end in the Medical Center.
   d. UCSF Mission Bay campus MDC1 at 500 16th Street in Genentech Hall for copper connectivity only.
   e. Local exchange Carrier infrastructure in Illinois Street for Non-UCSF Tenants and equipment.
c. Reference

1. The IDT shall survey the existing outside plant communications pathways and structures, document all open conduit and innerduct pathways and design new pathways, structures and inner ducts to connect the new campus building to the existing campus infrastructure.
2. ANSI/TIA -758-A Customer Owned Outside Plant Telecommunications Infrastructure Standard

G 5010.11 Communications Vaults (LE F (40yrs))

a. Description

1. Precast Communications Vaults for interconnection of building BDF with existing Site Communications Structures.
   a. See Table G5010.11 for Site Communications Vault Requirements.

b. Performance

1. See Table G5010.11 for site communications vault requirements
2. Maximum spacing between pre cast communications vaults shall be 400 feet
3. Campus buildings shall have a pre cast communications vault within 50 feet of the building perimeter in each of the two diverse conduit pathways that enter into the building BDF.
4. All Cast Iron Covers shall have “UCSF COMMUNICATIONS” and the “TMH-###” alpha numeric ID number cast into the center section of the cover.
5. All hot dipped tilt up covers on 3660-4 style vaults shall have a hot dipped galvanized ID plate attached to the side of the tilt up cover frame. “UCSF COMM” and the “TMH-###” shall be machine cut into the ID plate.

c. References

1. American Concrete Institute
   a. ACI 318-16 Building Code Requirements for Structural Concrete and Commentary
2. ASTM

3. AASHTO M 306-10 for Utility Gray Iron Castings

**G 5010.12 Site Communications Conduits (LE F (40yrs))**

a. **Description**

1. Site and campus communication conduits are required connect the Building BDF to the existing campus site communications structures
   a. Each campus building shall be interconnected to the existing campus communications structures and provided with conduit and innerduct pathways to support Site Communications Distribution to:
      - Addf MDC1 in Genentech Hall with underground conduit and vaults.
      - MDC2 in the Helen Diller Cancer Research Building with underground conduit and vaults.
      - Rock Hall campus fire alarm monitoring station
      - Campus DAS Head End in the Medical Center.
      - Local Exchange Carrier structures

b. **Performance**

1. New Campus buildings shall be provided with two diverse conduit pathways to interconnect the Building BDF with the existing campus communications structures. The new campus building on Mission Bay Block 33 shall be designed to this requirement. The IDT shall build the two diverse pathways on block 33, but shall only connect a single pathway west across 3rd street to interconnect to existing TMH-P17 at the UCSF Medical Center Energy Center. The other leg of the pathway shall route south along west side of Illinois Street to Block 34 and terminate in new underground vault at the north end of block 34.
   a. Minimum of (3) four inch conduits in each diverse conduit pathway.
   b. The two diverse building connections shall separated by a minimum of 90 degrees and in many cases 180 degrees to the building perimeter.
2. Underground conduit fittings shall have an 8 foot minimum bend radius. The 90 degree vertical bend up into the BDF can have a 4 foot minimum bend radius if necessary.

3. The maximum number of cumulative degree of bends in any point to point outside plant conduit segment shall be 225 degrees.

4. Individual conduits in a multi conduit duct bank shall be splayed using 11.25 degree and or 22.5 degree fittings at communications vaults.

5. Minimum depth of cover for underground conduits shall be 30 inches.

6. Underground communications conduits shall be mandrel tested and low pressure air tested at 4 PSI for 30 minutes. Following successful testing the conduit segments shall be cleaned and provided with a measured polyester pulling tape, rated for 1250 pound pulling tensions.

7. Underground conduit pathways shall be 4 inch heavy wall ID Controlled RTRC fiberglass reinforced epoxy conduit.

8. Underground RTRC Conduit shall be encased in Controlled Density Fill and capped with a 4 inch 3000 PSI concrete colored RED.

9. Blank expansion plugs shall be provided in the ends of all spare and or unused underground communications conduits. Pull tapes shall be tied off on the back of the blank expansion plug.

10. All conduit terminations at communications structures such as vaults, handholes, pedestals and building entrance facilities shall be labeled

   a. Tech Products, EVERLAST modular letters and holders are the campus standard for Conduit ID Tags in site structures and building distribution facilities.

   b. Reference

   1. NEC

   2. Underwriters Laboratories

      a. UL-651 – Rigid Nonmetallic Electrical Conduit

   3. American National Standards Institute (ANSI)


   4. National Electrical Manufacturers Association (NEMA)
G 5010.10 Site Communications Structures

a. TC2 – Electrical Plastic Tubing and Conduit
b. TC14B – RTRC Conduit

G 5010.13 Site Communications Innerducts (LE F (40 yrs))

a. Description

1. Site and campus communication conduits shall be lined with innerducts.

b. Performance

1. One Conduit in each of the two diverse conduit entrances into the Building BDF from the existing campus underground communications structures shall be filled with inner duct:
   a. 1 Inch SIDR 11 HDPE Smooth Outside Ribbed Inside.
   b. Four 1 inch innerducts in One 4 inch Conduit.
   c. Colors shall be White, Black, Blue and Red
   d. Each Innerduct shall be provided with a marked/measured polyester pulling tape with a 1250 pound tension capacity

2. Innerducts shall extend a 6 inches past the end of building conduit ends and term-a-duct ends in underground structures.

3. Conduit to Innerduct quad plugs shall be utilized at all conduit ends to seal the innerducts to the conduit.

4. Innerduct plugs shall be provided in all spare and or unused innerducts

C. Verification & Validation (All Tiers)

SD 1. Submit product cut sheets for all site communications structures

2. Submit a single line diagram indicating who the building BDF will be interconnected to the required locations.

3. Update narrative describing how the building BDF will be interconnected with the required locations on the UCSF Mission Bay campus and what new site communications structures will be required.

DD 4. Develop a site plan that is coordinated with the UCSF Mission Bay Campus properties that shows the site communications structures and the interconnection of these structures to existing campus communications structures to support the site communications
G 5010.30  Site Communications Distribution

A. Intent

The Integrated Delivery Team (IDT) shall provide a site communications infrastructure of outside building campus cabling configured, located, and sized to support the projects low voltage connectivity requirements to the campus that the building site is located. Each Campus building has physically redundant fiber optic cabling between two campus main distribution facilities’ MDFs and each building distribution facility, BDF the continuation of this infrastructure to all new campus systems indicated in G5010.00.

5. Site Plans shall be developed on a site civil engineering back ground at a scale of 1 inch equals 100 feet.
6. Update Product cut sheets
7. Update SD narrative.

CD
8. Update site plan and provide and overall Site Communications structure drawing at 1 Inch equals 80 feet with enlarged site plans at 1 inch equals 40 feet.
9. Provide butterfly diagrams of all new underground vault structures.
10. Submit samples of all labeling and identification products to be utilized as well as a schedule of all labeling alpha numeric conduit and vault identification.
11. Show final conformance to Programming and Performance requirements.

Construction
12. Have all specified submittal requirements available for University review if needed.
13. Provide Detailed shop drawings from precast vault manufacturer as well as Foundries casting the Gray Iron Utility castings. Include structural calculations and evidence that referenced standards are being met.
14. Schedule and perform all required mandrel and low pressure air tests with IOR.
buildings is a project requirement. The IDT shall consider the outside plant cabling requirements of all campus building then design and implement an outside plant cabling infrastructure that, over their expected lifetimes, successfully:

1. Provide fiber optic connectivity between the building BDF and one of the two Campus MDFs to support campus IP network devices and the campus building management systems.
2. Providefiber optic connectivity to support the campus fire alarm monitoring system and its ring topology.
3. Provide copper connectivity between the building BDF and ICSF MB Campus MDC1 at Genentech Hall, 500 16th Street to support Local Exchange Carrier Dial tone to non-VoIP voice communications devices in the building.
4. Support connectivity to campus Wifi equipment outside of the building on the building site.

B. Description & Performance

G 5010.30 General

a. Description

1. Outside plant cabling systems cable, equipment and supplementary components

G 5010.31 Outside Plant Fiber Optic Cabling Systems (LE D (20 yrs))

a. Description

1. Outside plant single mode fiber optic cabling systems cable, equipment and supplementary components.

b. Performance

1. The OSP fiber optic cable sheath shall be non-metallic dielectric loose tube filled and flooded HDPE or MDPE sheath.
   a. The cable sheath shall meet Telcordia GR-20.

2. The OSP fiber optic cable sheath shall be mechanically clamped to the termination shelf and the cable sheath removed to the buffer tubes outside of the shelf.

3. The OSP fiber optic cable sheath shall be labeled/identified with stainless steel
tags attached with stainless steel tie wraps

a. The OSP Cable Numbering scheme utilizes the Campus building Capital Asset Allocation Numbers, CAAN, for the Building and the campus MDCs

b. Cable sheaths shall be labeled at the entrance and exit of all conduits and structures as well as at service loops and the termination shelves.

c. The Stainless Steel ID tags are a Panduit product to match existing. The tags shall be machine engraved.

4. The single mode fiber optic glass in the cable sheath shall be meet OS2 requirements for single mode and shall have the following specific performance characteristics

   a. 1310 – 0.35 dB/Km
   b. 1383 – 0.35 dB/Km
   c. 1550 – 0.25 dB/Km

5. The single mode glass shall support Dense Wave Division Multiplexing, DWDM.

6. All single mode fiber optic glass that routes BDF to MDC shall be fusion spliced to factory terminated and tested SC-UPC pigtails.

   a. Coupler for mating SC-UPC Pigtails shall be Duplex.

7. All single mode fiber optic glass that routes BDF to Rock Hall for Fire Alarm Monitoring shall be fusion spliced to factory terminated and tested ST-UPC pigtails.

   a. Couplers for mating ST-UPC Pigtails shall be simplex.

8. All single mode fiber optic glass that routes BDF to DAS Headend shall be fusion spliced to factory terminated and tested LC-UPC pigtails.

   a. Coupler for mating LC-UPC Pigtails shall be Duplex

9. At the Building BDF the single mode pigtails shall be located in a rack mount fiber optic termination and splice shelf unit.

10. MDC1 has existing ADC Fiber Distribution Frame system with splice shelves and fiber Optic termination shelves. The Termination Shelves will require new
12 pack SCUPC pigtails as well as splice trays manufactured and tested by TE/ADC. These Pigtails are typically long lead items.

11. MDC2 has an existing ADC OMX 600 Fiber Optic Distribution Frame fully loaded with SCUPC single mode pigtails, coupler panels, termination shelves, and fusion splice trays. The University will assign the termination locations in the OMX 600 Frame to the IDT.

12. Fiber termination/splice shelves, coupler panels and fusion splice trays shall be clearly labeled with the campus cable number scheme using laser printed adhesive back labels.

13. Fiber Optic Cable Segments
   a. MDC2 at 1450 3rd Street to Block 33 single mode
   b. Rock Hall BDF and Fire Alarm Monitoring to Building BDF Ring Leg A 12 single mode
   c. Campus DAS Headend to Building BDF 144 Single Mode

14. All Fiber optic cable sheaths shall be routed through inner duct in Outside Plant communications conduits.
   a. Fire alarm monitoring fiber Optic cable sheaths shall be placed in red colored inner duct.
   b. Cable sheath to innerduct compression plugs shall be provided at the ends of each innerduct segment.
   c. Innerduct shall not extend through underground structures and shall terminate 4-6 inches after exiting any conduit segment

15. Fiber Optic cable sheaths shall be carefully and neatly tie wrapped to racking brackets fastened to the vertical racking on the side walls of the underground structures.

16. The Single mode fiber optic system shall be tested bi-directionally with an OTDR at 1310 with event traces at an approved scale and labeled with the complete optic cable and strand ID.

17. The single mode fiber optic system shall be tested bi-directionally at 1310nm with a light Source and power meter that provides the optical attenuation from mated pair to mated pair end to end BDF termination to MDC termination. The attenuation reporting shall be a budget variance style report with the attenuation budget for connectors and cable shown individually. The
system design shall provide an attenuation margin 50 percent under the operating attenuation for 1000BaseLX and 1000BaseSX Cisco transceivers.

18. See UCSF ITS Fiber Standards –v1-10 9 14 for complete testing and reporting requirements.

c. Reference

1. Telcordia GR-20
2. UCSF ITS Fiber Standards –v1-10 9 14

G 5010.32 Outside Plant Copper Cabling Systems (LE F (40 yrs))

a. Description

1. Outside plant Twisted Pair Copper cabling systems cable, equipment and supplementary components.

b. Performance

1. The OSP copper cable shall be 24 Gauge filled ALPETH with an ANMA designation on the cable sheath.

   a. The cable sheath shall meet Telcordia GR-421-CORE.

2. The OSP Copper cable sheath shall be mechanically bonded to the ground bar at the existing campus cross connect cabinet.

   b. Feeder 1, MDC1-Cross Connect Cabinet CB-E16: Nelson Rising Lane Campus Housing. Connects to TMH-E16
   c. Feeder 3, MDC2-Cross Connect Cabinet CB-D9: Corner Nelson Rising Lane and 5th street. Connects to TMH-D9

3. The OSP Copper cable sheath shall be labeled/identified with stainless steel tags attached with stainless steel tie wraps

   a. The OSP Cable Numbering scheme utilizes the Campus building Capital Asset Allocation Numbers, CAAN, for the Building and the campus MDCs
   b. Cable sheaths shall be labeled at the entrance and exit of all conduits and structures as well as at service loops and the
4. OSP Copper cable shall be terminated in the building BDF on 100 pair wall mounted protector units fully loaded with 5 pin fuses with splice tail Input and fuse tail output.

5. The protector fuse tail output from the protector units shall be punched down and labeled on Commscope Systimax Visipatch 360 terminal blocks coordinated with the Visipatch block field in the BDF.

6. The OSP copper cable is terminated at the cross box on the existing 3M splice tails.

7. 50 Percent of the copper OSP cable pairs shall be cross connected to the campus feeder cable at the cross box.

8. Fiber termination/splice shelves, coupler panels and fusion splice trays shall be clearly labeled with the campus cable number scheme using laser printed adhesive back labels.

9. Copper cable segments
   a. MDC1 Genentech Hall to Block 33 BDF 100 Pair

10. Copper OSP cables of 100 pair count or less shall be routed through 1.25 inch HDPE SIDR 11 1.25 inch inner duct. The cable shall be sealed to the inner duct at the ends of each inner duct segment with inner duct to cable sheath simplex plugs.
   a. Fire alarm monitoring fiber optic cable sheaths shall be placed in red colored inner duct.
   b. Cable sheath to innerduct compression plugs shall be provided at the ends of each innerduct segment.
   c. Innerduct shall not extend through underground structures and shall terminate 4-6 inches after exiting any conduit segment.

11. Copper cable sheaths shall be carefully and neatly tie wrapped to racking brackets fastened to the vertical racking on the side walls of the underground structures.

12. The Copper OSP Cable shall be tested for Attenuation, Continuity, Shorts,
Opens and Crosses with test results labeled with the cable ID and provided to the University.

c. Reference

1. Telcordia GR-421-CORE

C. Verification & Validation (All Tiers)

<table>
<thead>
<tr>
<th>SD</th>
<th>1. Submit Product cut sheets identifying Site Communications Distribution components, and manufacturers.</th>
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<td>2. Submit a single line diagram for each cabling system indicating the structures that that cabling systems will terminate at and pass through in order for the building BDF will be interconnected to the required locations.</td>
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<td>3. Update narrative describing the outside plant cabling system, terminations, equipment used to interconnect the building BDF with the required locations on the UCSF Mission Bay campus and what new site communications cables will be required.</td>
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| DD   | 4. Develop a site plan that is coordinated with the UCSF Mission Bay Campus properties that shows the site/campus communications cabling and the interconnection of these structures to existing campus communications structures to support the site communications systems indicated in G5010.00. |
|      | 5. Site Plans shall be developed on a site civil engineering back ground at a scale of 1 inch equals 100 feet. |
|      | 6. Update Product cut sheets. |
|      | 7. Update SD narrative. |

| CD   | 8. Update site plan and provide and overall campus Communications Cabling drawing at 1 Inch equals 80 feet with enlarged site plans at 1 inch equals 40 feet. |
|      | 9. Provide butterfly diagrams for the cable routing, conduit and innerduct utilization at all underground vault structures utilized for cable routing between the Building BDF and the required locations on the UCSF Mission Bay campus. |
G 5010.50  Wireless Communications

10. Submit samples of all labeling and identification products to be utilized as well as a schedule of all OSP Cable and termination labeling and identification.

11. Show final conformance to Programming and Performance requirements.

12. Have all specified submittal requirements available for University review if needed.

13. Provide detailed shop drawings for a fiber optic termination and splice enclosures including all cable and enclosure labeling, fusion splice layouts and cable routing and clamping.

14. Schedule and perform all required optical attenuation and OTDR tests with IOR.

15. Schedule and perform all required copper cable tests with IOR.

16. Test results for review and acceptance by the University prior to interconnection of any network hardware.

17. Record Drawings that include all as-Built conditions as well as the cable, conductor and strand labeling and identification numbering applied in the field.

18. Onsite staffing and test equipment to support the University ITS staff in interconnecting Network Hardware to the new OSP Site/Campus Communications cabling.

G 5010.50  Wireless Communications Distribution

A. Intent

The Integrated Delivery Team (IDT) shall provide a site communications infrastructure of pathways, enclosures and cabling configured, located, and sized to support Campus Wifi service in outdoor court yards and seating areas outside of the building and on the building site. The IDT shall consider the outdoor Wifi service requirements of the campus building site then design and implement an outside plant infrastructure that, over their expected lifetimes, successfully:
1. Support campus Wifi equipment outside of the building on the building site.
2. Meet UCSF and industry standards indicated in this section and other sections of this document.

B. Description & Performance

G 5010.50 General

a. Description

   1. Outdoor Wifi systems cable, equipment and supplementary components.

b. Performance

   1. Provide site pathways and enclosures to support Campus Wifi Service throughout the Building site outside of the building envelop.

   2. Where possible the pathways and enclosures should be designed to support Category 6 four pair Indoor/Outdoor rated cables with maximum cable length from wall termination in a BDF or IDF to 8pin 8pos jacks in the outdoor enclosure of 300 feet.

   3. If the cable length must exceed 300 feet the outdoor enclosure shall be designed to support 120 volt AC electrical power, optical to copper transceivers and optical cable terminations in addition to the Wifi Wireless Access Point Devices.

   4. Coordinate all outdoor wireless infrastructure with the University and the University’s RF consultant.

   5. Outdoor enclosures shall be tamper proof and secure

   6. Outdoor enclosures shall be coordinated with the landscape design if located in locations other than on the building exterior.

   7. Outdoor enclosures located on the building exterior shall be architecturally integrated while remaining optimally RF effective.

   8. Minimum site coverage capacity can be calculated as follows:

      a. Total seating positions available between the exterior of the building and the edge of the site.

      b. Seated positions

         • Exterior architectural ledges and of features design to accommodate sitting at the exterior of the building.
Technical Criteria

### G 5010.50 Wireless Communications

- Landscape features designed to support sitting outside of the building.
- Benches, chairs, stools integrated into the hardscape areas on the site.

**c.** Plus the total square feet of outdoor walkable hardscape on the site divided by 40.

**d.** The sum of these two numbers should provide the maximum quantity of simultaneously connected Wifi users on the Building site outside of the building.

### C. Verification & Validation (All Tiers)

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| **SD** | 1. Submit Product cut sheets identifying Wireless Site Communications Distribution components, and manufacturers.  
2. Update the Proposal Narrative to take into consideration updated building exterior design and site landscape at the Schematic Design level. |
| **DD** | 3. Develop a site plan at a scale of 1 inch equals 40 feet indicating the locations of Wireless Site Communications enclosures and the coverage area that these enclosures will provide when outfitted with the University provided Wireless Access Points.  
4. Update Product cut sheets  
5. Update SD narrative. |
| **CD** | 6. Update site plan showing all wifi enclosure locations on the building exterior and on the site. Site Wifi Communications infrastructure drawing at 1 Inch equals 80 feet with enlarged site plans at 1 inch equals 40 feet.  
7. Provide detailed drawings of all wifi enclosures with notations indicating how the wifi access points will be supported in the enclosures and how the power and network connectivity will be provided in the enclosures.  
8. Submit calculations for cable lengths and voltage drop to each enclosure. |
9. Coordination meetings with the Universities RF Consultant.
10. Show final conformance to Programming and Performance requirements.

11. Have all specified submittal requirements available for University review if needed.
12. Provide detailed shop drawings for all exterior enclosures and or enclosures integrated with the building exterior.
13. Schedule and perform all required optical attenuation and OTDR tests with IOR.
14. Schedule and perform all required copper cable tests with IOR.
15. Test results for review and acceptance by the University prior to interconnection of any network hardware.
16. Record Drawings that include all as-built conditions.

17. Onsite staffing and test equipment to support the University ITS staff in interconnecting wireless hardware to the new site Wifi Communications infrastructure.
Z General

Z 1040.10 Regulatory Requirements 719
Z 1040.30 References 720
Z 1040.40 Quality Assurance 726
Z 1060.30 Owner-Furnished Products 729
Z 1090.10 Commissioning 733
Guiding Principles

The listed Code and Regulatory requirements are minimums that must be met; and in no cases shall UCSF requests or criteria be construed to lessen these requirements. UCSF Contract requirements or project criteria are often more stringent than these requirements. It is the Integrated Delivery Team’s responsibility to determine, and design to, the most stringent requirements for each case. Building components and systems not listed, but necessary to satisfy the performance criteria, shall meet all applicable Codes,
Regulations, Industry and Referenced UCSF Standards.
Additionally, the Integrated Delivery Team is expected to take the time to understand the current thinking of the University, and how that might differ from previously created guidelines and standards.
Z 1040.10 Regulatory Requirements

A. Intent

The following regulatory requirements are in addition to those identified in the contract.

Dates of the following documents are provided for convenience, but it is the Integrated Delivery Team’s (IDT) responsibility to confirm the complete set of regulations that apply to this project along with their applicable versions.

The Americans with Disabilities Act (ADA) differs from other Codes and Regulations in that its requirements must be met continuously during operation of the facility. Wear and tear, for instance, is not a justification for non-compliance with the ADA. Consequently, the IDT must deliver solutions that are robust enough to provide ADA compliance over their expected lifetimes, accounting for potential wear and tear, and with minimal maintenance.

The clinic portion of the building is intended to become licensed through California’s Health and Safety Code (H&SC). As such, it needs to be designed to the more stringent requirements of the OSHPD-3 requirements of Title 24, California Building Standards Code.

B. Requirements

1. California Water Efficient Landscape Ordinance (WELO); 2015.
2. Streets Plan and the 2010 San Francisco Stormwater Management Ordinance.
4. Revised Summary Drainage Study for the South of Channel Watershed of the Mission Bay Project, prepared by Santina & Thompson, Inc. dated December 1, 2000.
7. City and County of San Francisco, Department of Public Health, Environmental Health Section, Maher Ordinance (San Francisco Health Code Article 22A).
10. SFPUC Efficient Irrigation Ordinance (local adaptation of California’s AB 1881 MWELO).
11. Occupational Safety and Health Administration (OSHA) Sanitation standard (1910.141).
C. Verification & Validation (All Tiers)

1. List all the regulatory requirements, including those identified in the contract, that apply to the project along with their applicable versions, for University review.

2. Update list of all the regulatory requirements, including those identified in the contract, that apply to the project along with their applicable versions, for University review.

3. "Health Facilities Checklist, Section 1226 [OSHPD 3] Clinics, 1226.6 Primary Care Clinics, DRAFT 5/6/15": Identify each line with one of the following: check (if documented design is in compliance); “N/A” (if not applicable to project); “No” (if not in compliance, or not intended to be in compliance in subsequent phases of design); “DD”, “CD”, or “CA” (if intended to be in compliance, but won’t be documented until the indicated phase of design).

Z 1040.30 References

A. Intent

The following reference documents are in addition to those identified in the contract. The identified portions of the following referenced Guidelines and Standards shall be considered an extension of this document’s criteria.

Unless instructed otherwise by this document or in writing by the University, Guidelines are intended to inform design decisions; Standards are intended to be followed.

Dates of the following documents are provided for convenience, but it is the Integrated Delivery Team’s responsibility to confirm the complete set of reference documents that apply to this project along with their applicable versions.

Not all systems are described in the latest UCSF Facilities Design Guidelines and Standards, nor can
either stay current with the evolving nature of requirements and opportunities; hence, the Integrated Delivery Team shall, at the beginning of each phase of design, but particularly intensely at the beginning of Schematic Design, interview University stakeholders in order to understand where current preferences deviate from documented guidelines and standards. The team shall document those deviations for project reference, and for later incorporation into the Guidelines and Standards by the University.

**B. Requirements**

**Z 1040.31 International Code Council (ICC)**


**Z 1040.32 State of California**

- California Invasive Plant Council (IPC) Invasive Plant Inventory; (Reference, not regulation)

**Z 1040.33 Bay Area**

- Bay Friendly Landscape Guidelines.

**Z 1040.34 University of California**

- UC Sustainable Practices Policy; June 22, 2015; Entirety
- UC Guidelines for Providing Gender Inclusive Facilities; (July 1, 2015); Entirety
- Savings by Design (SBD) Participant Handbook; (February 5, 2015); Entirety
- UC Ergonomics Policy (under development, entirety)
- UC Environment, Health & Safety (EH&S) Laboratory Safety Design Guide, (September 2007); Entirety) (For UCSF addenda to this UC Criteria see CR Z1040.35 References, UCSF).

**Z 1040.35 University of California, San Francisco (UCSF)**

- UCSF Physical Design Framework; (September 2010); Entirety.
- UCSF Signage Standards Manual and Ordering Catalog; (December 2006); Entirety.
- UCSF Donor Signage Guidelines; (Revised June 2005); Entirety.
- UCSF Block 25A, Site Details Sheet L-703 (for Gateway Stone Walls)
- UCSF MB Building 17 A/B, Lighting and Furniture Details Sheet L10.02 (for Gateway
Columns)
g. UCSF BIM Standard Guidelines (2016); Entirety.
h. UCSF ITS Fiber Standards – V1 (September 14, 2010); Entirety.
i. UCSF ITS/TeleHealth Standards (??); Entirety.
j. UCSF Door Hardware Standards – Section 08710 (December 16, 2011); Entirety.
k. UCSF Conveying Systems Standards (??); Entirety.
l. UCSF Fire Alarm System Standards Specification 16720 (??); Entirety.
m. UCSF Security Alarm - Access Controls - Security Camera Design Standards (??);
   Entirety.
n. UCSF Gender Inclusive Facilities Presentation (November 4, 2015).
o. UCSF Small Municipal Separate Storm Sewer System as defined in the SWRCB MS4
   General Permit Waste Discharge Requirements Order No. 2013-0001-DWQ NPDES
   Permit No. CAS 000004 for redevelopment projects.
p. UCSF Campus Wide Seismic Bracing of Equipment, (August 26, 2015)
q. UCSF Safety And Security Standard Specifications
   1. 13700 Basic Security Requirements
   2. 13710 Access Control and Alarm Monitoring
   3. 13735 Intercom Systems
   4. 13740 Intrusion Detection System
   5. 13770 Security System Cabling
   6. 13780 Security System Labeling
   7. 13790 Security System Commissioning
r. UCSF Integrated Automation Standards – 250000 and Subsections (2016), Entirety:
   1. 250000 Integrated Automation
   2. 250513 Conductors and Cables for Integrated Automation
   3. 250528 Pathways for Integrated Automation
   4. 250553 Identification for Integrated Automation
   5. 251119 Integrated Automation Network Operator Workstations
   6. 251219 Protocol Integration Network Gateways
   7. 251223 Client-Server Information Database Integration Network Gateways
   8. 251300 Integrated Automation Control and Monitoring Network
   9. 251313 Integrated Automation Control and Monitoring Network Supervisory
Control
10. 251400 Integrated Automation Local Control Units
11. 251423 Integrated Automation Field Equipment Panels
12. 251519 Integrated Automation Software for Local Control Units
13. 251523 Graphics for Integrated Automation
14. 253100 Integrated Automation Instrumentation and Terminal Devices for Facility Equipment
15. 253313 Thermal Utility Metering Interface
16. 253513 Integrated Automation Actuators and Operators
17. 253515 Switches and Relays
18. 253516 Integrated Automation Sensors and Transmitters
19. 253517 Air and Gas Pressure and Flow Measurement
20. 253518 Liquid Pressure and Flow Measurement
21. 253519 Integrated Automation Control Valves
22. 253526 Integrated Automation Compressed Air Supply
23. 259000 Integrated Automation Control Sequences

s. UCSF Ergonomics & Human Factors Program; (latest, entirety).
t. UCSF Addenda to UC Environment, Health & Safety (EH&S) Laboratory Safety Design Guide, (September 2007); Entirety) (http://www.ehs.ucsf.edu/ucsf-addendum-uc-ehs-laboratory-safety-design-guide#dsy16046-DSY_App%20A)

Z 1040.36 UCSF Mission Bay Campus

a. UCSF Mission Bay Phase Two Planning Study; (August 2011); Entirety
b. UCSF Mission Bay Campus Master Plan and Design Guidelines; (April 1999); Entirety
c. UCSF Long Range Development Plan (LRDP); (2014); Entirety
d. UCSF Mission Bay Open 4th Street Plaza Plans; (2011-2012); Entirety
e. Risk Management Plan, Mission Bay Area, San Francisco CA (May 11, 1999)
f. Guidance for incorporating Sea-Level Rise into Capital Planning in San Francisco; Assessing Vulnerability and Risk to support Adaptation; Sea-Level Rise Committee for the San Francisco Capital Planning Committee (September 2014)

Z 1040.37 UCSF Mission Bay Campus: Facilities Design Guidelines

The University has generally chosen a performance approach over a prescriptive one in order to access the highest value the Integrated Delivery Team can deliver for a given life-cycle cost. This should not
however imply that the Integrated Delivery Team should ignore the existing University infrastructure and knowledge base, such as spare parts and training. All things being equal, or of marginal benefit, the Integrated Delivery Team shall prefer:

a. Approaches, vendors and models consistent with the preponderance of existing systems.
b. Solutions that are consistent with existing practices and training.

In many cases, the components listed in the Guidelines represent a quality that has been found to have acceptable lifetimes given UCSF’s Mission Bay environment, wear and tear, and maintenance schedules. However, the guidelines are:

c. In some cases technologically obsolete.
d. Not in all cases representative of the University’s current preferred systems, best practices, and vendors.
e. Considered for generalized UCSF, and not particular project, conditions (eg. locations with high wear and tear).

The Integrated Delivery Team shall create and maintain a schedule with columns for the following fields:

f. Every element proposed for the project which has a corresponding prescriptive solution in the latest Facilities Design Guidelines.
g. Description of recommended deviations from those prescriptive elements where applicable.
h. Reason for the deviation.
i. Whether the University has approved the deviation.
j. Verification that the deviation meets the Technical Performance Criteria.
k. Comments and references to additional verification where applicable.

References:

l. CR Table Z1040.30-A, Facilities Design Guidelines (Excerpted) which supersedes the following documents:
m. UCSF Facilities Design Guidelines: Mission Bay Campus; (Revised, November 2003)
p. UCSF Facilities Design Guidelines: Electrical (May, 2015) (Relevant portions supersede
These plans are managed by the San Francisco Office of Community Investment and Infrastructure (OCII), also known as the “Successor Agency”, but originally developed by the “Former Agency”:

- a. Mission Bay Soil Management Plan; (Latest Edition); Entirety.
- e. Mission Bay South Infrastructure Master Plan (Attachment D to Mission Bay South Owner Participation Agreement) recorded on December 3, 1998 including all amendments.
- f. Revised Summary Drainage Study for the South of Channel Watershed of the Mission Bay Project including Overland Flow Analysis, Separated Storm Drain Analysis, and Supplementary Calculations, prepared by Santina & Thompson, Inc. dated December 1, 2000.

C. Verification & Validation (All Tiers)

- 1. List all reference documents, including those identified in the contract, that apply to the project along with their applicable versions, for University review.
- 2. Updated list of all the reference requirements, including those identified in the contract, that apply to the project along with their
3. Conduct a workshop with University Facility Services to understand the correctness of the University’s Guidelines and Standards. The Schematic Design workshop should be anticipated to be extensive. Subsequent workshops should target updates.

4. Document with Facilities Services’ recommended deviations from Guidelines and Standards for:
   a. Project reference
   b. Future incorporation of deviations into Guidelines and Standards

5. Facilities Design Guidelines Deviations Schedule.

**Z 1040.40 Quality Assurance**

**A. Intent**

Installer qualifications are provided to ensure that installers of systems are thoroughly familiar with the systems they’re installing.

Mockups are intended to identify component installation and systems integration issues in advance of widespread installation during construction. Conference room construction is primarily to verify acoustical performance of entire system (including realistic flanking (unintended acoustical paths (eg. ductwork, electrical boxes, conduit))) through testing of in-place mockup.

The exterior building enclosure mock up is to address issues related to constructability of the assemblies verifying the required sequencing of work and compatibility of the different materials at all interfaces of the various assemblies and components. Testing of the enclosure mockup is to verify the environmental performance of the enclosure.

**B. Description & Requirements**

**Z 1040.41 Installer Qualifications**

a. See Table Z1040.41-A

**Z 1040.42 Mockups**

a. Exterior Enclosure:
1. Vertical wall system mockup shall be full-scale and large enough to accommodate examples of the following components:
   a. Fully-Glazed wall system with fully-glazed entrance door.
   b. Any operable windows in fully-glazed wall system, if applicable.
   c. Solid panel wall system of each material type.
   d. Any operable windows in solid panel walls.
   e. Continuation up and over roofing parapet.
   f. Roofing extending 5-feet horizontally inboard from parapet.
   g. Above grade wall weather barrier tie-in with any below grade or podium slab waterproofing membranes, if applicable.

2. The mockup must be sealed at the back side with an access door in order to enable for the applicable testing to occur.

3. Laboratory Testing:
   a. Independent laboratory testing of the mock-up to be based on system performance requirements.

4. Field Performance testing.
   a. Field performance testing of the mockup to replicate the constructed performance testing (See CR B20.02.d).

b. Medium Conference Room:
   1. In-place construction including:
      a. Completion of all partitions to structural decks above and below.
      b. Any fire safing and acoustical sealant that completes the acoustical sealing of the space.
      c. Door(s)
      d. Interior windows(s), if applicable.
      e. Raised floor and associated underfloor baffles, if applicable.
      f. Acoustical surface treatments.
      g. All utility systems penetrations and closure.
      h. Carpeting.
      i. Ceiling Finishes.
      j. Painting is not required.
2. Testing:
   a. Perform acoustical testing of two partitions enveloping the room; these must include the partition with the entry door and the wall with the most penetrations. Test in accordance with ASTM E336-15, and report the NIC, ASTC, and FSTC. If room size warrants, utilize Annex A2 and report the NR and NIC. It is assumed that the ASTC will form the basis of comparison against the requirements, as only realistic flanking paths should be included in the mock-up.
   b. Perform acoustical testing of the interior reverberation time, defined as the time required for a signal to decay by 60dB. Test in accordance with ISO 3382-2:2008, using “engineering” accuracy and either the 20dB or the 30dB evaluation range as needed. Report the calculated reverberation time for direct comparison against requirements.
   c. Intermediate Distribution Frame (IDF) Room.
      1. Completely finished in-place construction including:
         a. Completion of all partitions to structural decks above and below.
         b. Door(s)
         c. Raised floor and acoustical baffles, if applicable.
         d. All utility systems, penetrations and closure.
         e. All equipment included in (CR D6090.20 Data Communications Support Spaces).
         f. All interior finishes.
   d. Exterior and Interior Signage.
      1. Content Mockup: See (CR G2060.30 and C1090.22 for signage types requiring content mockups):
         a. All content mockups shall include University-provided content (text) for University and Donor review and approval.
         b. Option 1: superimpose rendered mockup of signage into exterior or interior building renderings at a content-legible scale. Significantly-oblique-angle views are not acceptable.
         c. Option 2: if the schedule permits adequate time for University and
Donor review and revision, the mockup may be provided full-scale, in-place, and made from alternative materials (cardboard, paper, etc.) in order to convey the sign’s visual intent.

2. Construction Mockup:
   a. Provide one mockup of each sign type for University approval.
   b. In-place mockups are acceptable.

C. Verification & Validation (All Tiers) (See systems for additional verification)

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<th>SD</th>
<th>1. Identify In-Place construction locations.</th>
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<tbody>
<tr>
<td>DD</td>
<td>2. DD drawings of mockup locations NOT In-Place.</td>
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<tr>
<td>CD</td>
<td>3. CD drawings of mockup locations NOT In-Place.</td>
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<td>4. Mockup drawings showing representatives of all assemblies as well as applicable enclosure details.</td>
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<td>5. Samples of any finishes proposed to be excluded (with University approval) in the mockup.</td>
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<td></td>
<td>6. Review of manufacturer(s) quality assurance and quality control during production of mock-up components, and compliance with approved and stamped shop drawings or submittals.</td>
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<tr>
<td></td>
<td>7. Construct Mockups with enough lead time AFTER testing to modify construction detailing as necessary to modify design to ensure performance criteria.</td>
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</table>

Z 1060.30 Owner-Furnished Products

A. Intent

Unless otherwise noted by (in order of precedence) the Contract, this section, the Space Data Sheets, or elsewhere in this document, the Integrated Delivery Team (IDT) is responsible for providing and installing all items.

Regardless of whether the IDT or University is responsible for procurement and/or installation of equipment, it is expected that the IDT will work with the University to understand the requirements for
space, access clearances, utilities, environmental control, seismic protection, safety and proper lighting for each product, in enough time to be able to:

1. Incorporate each into the project without additional cost or delay.
2. Allow the University to select comparable alternatives where required.

B. Description & Requirements

Z 1060.30 Owner-Furnished Products

a. General Notes:

1. The IDT shall provide all seismic bracing of all items as required and described by (CR F1030.35, Seismic Control - Protection of Nonstructural Components), regardless of procurement responsibility or scheduling.
2. University-Furnished or University-Installed items may include items expected to be furnished or installed by the IDT outside of the base bid.
3. University-Furnished means delivered to space in which it is to be installed.
4. See CR Table Z1060.32 for Communications Systems

b. University-Furnished, University-Installed:

1. Unattached plastic Garbage, Compost and Recycling bins and their bin-supported signage.
2. Compost Accumulation Bins at Loading Area
3. Office Equipment (Multi-function Copiers, etc.)
4. Vending & ATM Machines.
5. Vendor-provided lockers (Amazon, Laundry).

c. University-Furnished, IDT-Installed:

1. Existing Laboratory & Clinical Equipment, including any type of existing Biological Safety Cabinets.
2. New Biological Safety Cabinets that are not ducted to the building exhaust system (recirculating type).

d. Deferred work furnished and installed by the IDT outside of the base bid:

1. Paper Towel Dispensers.
2. Café Interior Fit-out, including grease interceptor (IDT provides utility connection points terminating in the room with locations coordinated with
3. Laboratory and Clinical Furniture.
4. New Laboratory & Clinical Equipment including shared sterilization equipment if required.
5. New Biological Safety Cabinets that are ducted to the building exhaust system.
6. Loose Furniture, potentially seismically-braced but otherwise not connected to building infrastructure (e.g., Tall File Cabinets).
7. Workstations (Furniture).

e. Integrated Delivery Team-Furnished and Installed (Select items to confirm these don’t have University responsibility)

1. Casework.
2. Remainder of Toilet Accessories (except paper towel holders). Confirm toilet accessory providers during design phase.
3. **Loading Dock Equipment**
5. All signage, including, but not limited to: Gateway Signage; Exterior Accessibility Signage; Donor Signage; and Exterior and Interior Café Signage.
6. Unattached metal-clad Garbage, Compost and Recycling bins and their bin-supported signage.
7. Markerboards, Tackboards, Glassboards, etc. attached to the building.
8. Window Treatment.
9. Laboratory Furnishings (Casework, Shelving, Countertops, Utility Fittings)
10. Uninterruptible Power Source (UPS).
11. A/V Equipment (Screens and Technology in Conference Room spaces).
<table>
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<tr>
<th>Section</th>
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GENERAL

Z 1090.10 Commissioning

A. Intent

The University will be hiring a Commissioning Agent (Cx) to validate the building performance. The University through the utilization of the Skyspark building analytic software and the commissioning process will seek to change the way our building are maintained, operated, and managed. Software utilization and analytic rules shall be designed to improve the overall management of the building’s energy efficiency, building systems, warranty period and maintenance practices. It is expected that commissioning and construction programming, energy benchmarking, and automatic fault detection will persist into building operations and provide the fundamental foundation of a Smart Building.

The Integrated Delivery Team (IDT) is expected to support the activities of the Cx through the completion of their work.

B. Description & Requirements

Z1090.11 Integrated Delivery Team (IDT) Responsibilities

a. Schedule and oversee the final testing and start-up of utilities, operational systems, and equipment
b. Assist the University with building commissioning in conjunction with the University Representative, the Commissioning Agent (Cx), University facility and maintenance personnel, and required Subcontractors throughout the construction process.
c. During commissioning and before Final Completion, the IDT and University Representative will oversee Subcontractor operation, adjustment, and balancing of all equipment, and training of University’s employees in the correct operation and maintenance of equipment.

C. Verification & Validation (all Tiers)

SD 1. CX will develop the owners project requirements by means of OPR Workshops that will include at a minimum the attendance of the following UCSF representatives: Commissioning and Controls Manager, Capital Programs Representatives, Chief Engineer, COE Automation Supervisor, Energy Manager, CP Project Manager, and
## Technical Criteria

### Z 1090.10 Commissioning

**DD** 2. Cx will develop a commissioning plan.

**CD** 3. Cx will develop the analytic testing functions and strategy with input from UCSF’s Commissioning and Controls Manager and COE Automation Supervisor. Work is to be performed at a UCSF location, utilizing at a minimum two-three hour working sessions to be conducted on different days. At the first meeting, the Cx will have at have a drafted comprehensive strategy and analytic testing plan to meet the OPR. Drafted documents shall be issued at least one week before the first meeting.

**Construction** 4. Cx will finalize the analytic testing functions and strategy with input from UCSF’s Commissioning and Controls Manager, COE Automation Supervisor, and Chief Engineer.

**Startup** 5. Post startup Cx will review analytic testing results with UCSF’s Commissioning and Controls Manager, COE Automation Supervisor, Chief Engineer, IDT and Controls Contractor representatives. Work is to be performed at a UCSF location, utilizing at a minimum two-three hour working sessions, to be conducted on different days.

**Occupancy** 6. Cx will review before meeting all reset and optimization strategies and initiate an improvement process with the goal of improving the building’s energy performance and or comfort level. UCSF representatives shall be in attendance: Commissioning and Controls Manager, COE Automation Supervisor, Chief Engineer and Energy Manager. Representatives from the IDT and Controls Contractor shall be required to attend. At a minimum two-three hour meetings to be conducted on different days.
8. Cx will conduct a lessons learned presentation that will highlight the successes and failures of the commissioning and building processes, and summarizes any known loose ends that might impede the efficient operation of the building. UCSF representatives: Commissioning and Controls Manager, Chief Programs Representatives, Chief Engineer, COE Automation Supervisor, Energy Manager, CP Project Manager, and the Director of Utilities and Infrastructure shall be in attendance.
Appendix

Table D3050.90-A  Pipe & Valve Color Identification 737
Table D3050.90-B  Pipe & Insulation Lettering 739
Table D6030.12-A  Conference Room AV Systems 740
Table D6030.13-A  Classroom AV Systems 746
Table D6090.20-A  Telecom Space Buildout 752
Table D6090.42-A  Horizontal Station Cable: General Minimum Quantities 757
Table D6090.42-B  Horiz. Station Cable: Conference Rooms 758
Table D6090.42-C  Horizontal Station Cable: Classrooms 759
Table D6090.42-D  Horizontal Station Cable: Ophthalmology 760
Table F1030.10-A  STC Criteria, Partitions without Doors 761
Table F1030.10-B  STC Criteria, Partitions with Doors 761
Table F1030.10-C  Noise Criteria (NC) 762
Table G5010.11-A  Communications Vault Table 764
Table Z1040.30-A  Facilities Design Guidelines (Excerpted) 765
# Table D3050.90-A Pipe & Valve Color Identification

<table>
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<th>DRAWING SYMBOL</th>
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<tr>
<td>HHWR</td>
<td>Heating Hot Water Return</td>
<td>Y</td>
</tr>
<tr>
<td>HPS</td>
<td>High Pressure Steam (over 100 psig) (3)</td>
<td>Y</td>
</tr>
<tr>
<td>HPR</td>
<td>High Pressure Steam Condensate Return</td>
<td>Y</td>
</tr>
<tr>
<td>ICW</td>
<td>Industrial Cold Water</td>
<td>GW</td>
</tr>
<tr>
<td>IHW</td>
<td>Industrial Hot Water</td>
<td>Y</td>
</tr>
<tr>
<td>IHWR</td>
<td>Industrial Hot Water Return</td>
<td>Y</td>
</tr>
<tr>
<td>LPS</td>
<td>Low Pressure Steam (1-15 psig) (3)</td>
<td>Y</td>
</tr>
<tr>
<td>LPR</td>
<td>Low Pressure Steam Condensate Return</td>
<td>Y</td>
</tr>
<tr>
<td>MPS</td>
<td>Medium Pressure Steam (15-100 psig) (3)</td>
<td>Y</td>
</tr>
<tr>
<td>MPR</td>
<td>Medium Pressure Steam Condensate Return</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>Nitrogen (2)</td>
<td>GW</td>
</tr>
<tr>
<td>NPW</td>
<td>Non-Potable Water (Pipe is to be purple)</td>
<td>Y</td>
</tr>
<tr>
<td>OXY</td>
<td>Oxygen (3)</td>
<td>Y</td>
</tr>
<tr>
<td>PR</td>
<td>Pressure Relief</td>
<td>R</td>
</tr>
<tr>
<td>SPR</td>
<td>Fire Sprinkler</td>
<td>R</td>
</tr>
<tr>
<td>TCA</td>
<td>Temperature Control Air (3)(5)</td>
<td>Y</td>
</tr>
<tr>
<td>VAC</td>
<td>Vacuum</td>
<td>GB</td>
</tr>
<tr>
<td>WSP</td>
<td>Wet Standpipe</td>
<td>R</td>
</tr>
</tbody>
</table>

(1) Color coding for pipe labels:

- **Y**: Yellow background with Black lettering.
- **GW**: Green background with White lettering.
- **GB**: Green background with Black lettering.
- **W**: White background with Black lettering.
- **R**: Red background with White lettering.
- **B**: Blue background with White lettering.
Technical Criteria

Table D3050.90-A  Pipe & Valve Color

(2) Labels shall spell out the full name in capital letters. Order custom labels as necessary. For services not listed, use agreed upon Drawing Symbols, Label Names, and Colors. All labels shall indicate flow direction.

(3) Indicate average operating pressure in psig within parenthesis; e.g. (50).
### Table D3050.90-B  Pipe & Insulation Lettering

<table>
<thead>
<tr>
<th>Pipe and Insulation O.D. (in Inches)</th>
<th>Minimum Letter Height (in Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 to 1-3/8</td>
<td>1/2</td>
</tr>
<tr>
<td>1-1/2 to 2-3/8</td>
<td>3/4</td>
</tr>
<tr>
<td>2-1/2 to 7-7/8</td>
<td>1-1/4</td>
</tr>
<tr>
<td>8 to 10</td>
<td>2-3/2</td>
</tr>
<tr>
<td>Over 10</td>
<td>3-1/2</td>
</tr>
</tbody>
</table>
### Table D6030.12-A Conference Room AV Systems

<table>
<thead>
<tr>
<th>System</th>
<th>Equipment</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>Project 1</td>
<td>Supplier A</td>
</tr>
<tr>
<td>Project</td>
<td>Project 2</td>
<td>Supplier B</td>
</tr>
<tr>
<td>Project</td>
<td>Project 3</td>
<td>Supplier C</td>
</tr>
</tbody>
</table>

Note: More details and specifications can be found in the original document.
## Table D6030.12 - A - Conference Room AV Systems

<table>
<thead>
<tr>
<th>Room Occupants Seated at Table:</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Occupants Not Seated at Table:</td>
<td>8</td>
<td>10</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Room Occupants Seated at Table with Back to Display:</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Room Occupants Total:</td>
<td>195 NSF</td>
<td>260 NSF</td>
<td>360 NSF</td>
<td>625 NSF</td>
</tr>
</tbody>
</table>

### Physical Environment

#### Lighting and Critical Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Room Width at Display Wall, Front of Room</td>
<td>15.0 Ft</td>
<td>13.0 Ft</td>
<td>15.0 Ft</td>
<td>25.0 Ft</td>
</tr>
<tr>
<td>Minimum Room Depth</td>
<td>10.0 Ft</td>
<td>20.0 Ft</td>
<td>24.0 Ft</td>
<td>25.0 Ft</td>
</tr>
<tr>
<td>Maximum Edge of Table to Front of Room</td>
<td>8.5 Ft</td>
<td>13.0 Ft</td>
<td>19.0 Ft</td>
<td>20.0 Ft</td>
</tr>
<tr>
<td>Lighting Temperature Minimum</td>
<td>7500K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting Color rendition Index</td>
<td>90 or better for fixtures in presenter and whiteboard area</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Room Occupants

<table>
<thead>
<tr>
<th>Seated at Table</th>
<th>Not Seated at Table</th>
<th>Seated at Table with Back to Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

### Electrical Power Locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenter: Floor</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Presenter: Lectern</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Table Top</td>
<td>No</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Wall at top</td>
<td>No</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Participants: Table Top</td>
<td>1 duplex</td>
<td>1 duplex</td>
<td>1 duplex</td>
<td>2 duplex</td>
</tr>
<tr>
<td>Flat Panel Display Wall: inside back box</td>
<td>1 duplex</td>
<td>1 duplex</td>
<td>1 duplex</td>
<td>1 duplex</td>
</tr>
<tr>
<td>AV Credenza, AV Equipment Rack</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>AV System Support Room</td>
<td>No</td>
<td>No</td>
<td>2 duplex (1) 20a 120V Circuit Per Room/System</td>
<td></td>
</tr>
</tbody>
</table>

### Wired Ethernet Locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenter: Floor</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Presenter: Lectern</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Table Top</td>
<td>No</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Wall Above Table Top</td>
<td>No</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Front of Room Flat Panel Display on Wall</td>
<td>41 1 Giga Port</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Front of Room Wallmounted IP/POE Clock</td>
<td>41 1 Giga Port</td>
<td>41 1 Giga Port</td>
<td>41 1 Giga Port</td>
<td>41 1 Giga Port</td>
</tr>
<tr>
<td>Ceiling Mounted Projector</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Outside Room At Primary Entrance: Wall Scheduling Panel or Digital Signage</td>
<td>0 1 Giga Port</td>
<td>11 1 Giga Port</td>
<td>11 1 Giga Port</td>
<td>11 1 Giga Port</td>
</tr>
<tr>
<td>AV System Support Room</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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May 28, 2016

Mission Bay East Campus Phase 1 (Block 33)

University of California, San Francisco, Project No: 34603
### Table D6030.12-A Conference Room AV Systems

<table>
<thead>
<tr>
<th>Wireless Ethernet</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Medium Conference Flex</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Presenter</td>
<td>Available in Addition to Wired Presenter Port</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Wired Ethernet Connected Devices

<table>
<thead>
<tr>
<th>Control devices</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Medium Conference Flex</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV switching systems management Control</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Audio processing systems management control</td>
<td>Yes, at Wall Mounted System in Room</td>
<td>Yes, at Wall Mounted System in Room</td>
<td>Yes, at AV System Support Room</td>
<td>Yes, at AV System Support Room</td>
<td>Yes, at AV System Support Room</td>
</tr>
<tr>
<td>Audio communications VoIP Cisco UC</td>
<td>Yes, at Wall Mounted System in Room</td>
<td>Yes, at Wall Mounted System in Room</td>
<td>Yes, at AV System Support Room</td>
<td>Yes, at AV System Support Room</td>
<td>Yes, at AV System Support Room</td>
</tr>
<tr>
<td>Video communications CODEC, Cisco UC</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Media Capture System</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Display systems monitoring &amp; management</td>
<td>Yes, at Wall Mounted System in Room</td>
<td>Yes, at Wall Mounted System in Room</td>
<td>Yes, at AV System Support Room</td>
<td>Yes, at AV System Support Room</td>
<td>No</td>
</tr>
<tr>
<td>Scheduling system or digital signage</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes, Outside of Room at Entrance</td>
</tr>
</tbody>
</table>

### Other Physical Configuration Requirements

<table>
<thead>
<tr>
<th>Floor configuration</th>
<th>Flat Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacency Requirements</td>
<td>No</td>
</tr>
<tr>
<td>Combining Requirement</td>
<td>No</td>
</tr>
<tr>
<td>AV System Level</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Control

| Touch Panel for AV system with Wizard Style programming compatible with UCSF ETS Standards | Required Cisco Telepresence LCD Touch Panel | Required Crestron LCD Touch Panel |
| Touch Panel for Video Conferencing and Audio Conferencing compatible with UCSF TeleHealth Standards | No | Yes |
| Touch Panel for AV system with basic AV system Control | Not Required | Required |
| Integration with lighting system | Not Required | Required |
| Integration with sharing systems | Yes, at Wall Mounted System in Room | Yes, at Table top, Component of Telepresence System |
| Display systems monitoring & management | Yes, at AV System Support Room | Yes, at AV System Support Room |
| Scheduling system or digital signage | No | Yes, Outside of Room at Entrance |

### Presentation

| Video Content Presentation from portable source HDMI, VGA, Wireless | Required | Required |
| Audio Content Playback | Required | Required |
| Audio, Speech Reinforcement of Presenter | Required | Required |
| Audio, Microphone for Audience | Required | Required |
| Audio, Assisted Listening System | Required | Required |
| Audio, Auxiliary Output | Required | Required |
| Audio, Auxillary Input | Required | Required |
| Audio, Auxillary Input | Required | Required |

### Conferencing

| Audio Conferencing Presenter and Participants | Required, integrated with wall mounted Telepresence System per UCSF TeleHealth Standards | Required, integrated with Audio System through VoIP Gateway integrated with Audio DSP and Codec |
| Video Conferencing Presenter and Participants | Required, integrated with wall mounted Telepresence System per UCSF TeleHealth Standards | Required, integrated with AV System per UCSF TeleHealth Standards |

### Media Capture

| Presenter as source Microphone and Video Camera | Required | Required |
| Presenter Presentation Content Audio and Video as Source | Required | Required |
| Guest Presentation as Source Synchronous with Presenter | Required | Required |
| Audience/Participant/Students | Required | Required |
| Auxiliary Audio/Video Source | Required | Required |

### AV Support Systems

| Assistive Listening | Required | Required |
| Audio/Visual Monitoring/Remote Management through campus ethernet | Required | Required |
## Table D6030.12-A Conference Room AV Systems

<table>
<thead>
<tr>
<th>AV System Environment</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Medium Conference Flex</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presenter Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectern at Front of Room</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table Top, Towards Front of Room</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table Top, Towards Back of Room</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall at Wall Mounted Auxiliary Displays (TLC Style)</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Control Panel/Device
- Table Top Touch Panel Network Attached to Telepresence Unit
- Table Top Touch Panel to Control entire AV system

### Presenter Video Display
- Yes

### Wireless Microphone
- Yes

### Participant Devices
- Yes Integrated with Wall Mounted Cisco Telepresence System per UCSF
- Yes at table top and integrated with Wall Mounted Cisco Telepresence System per UCSF
- Yes Ceiling Mounted and integrated with Cisco Telepresence System per UCSF ETS and TeleHealth standards

### Campus Standards & Warranties
- Shure: SPX Series Wireless Microphone Systems
- Crestron: Control, Scheduling and Digital Switching systems
- Cisco: Unified Communication Manager, Native Support
- Cisco: Telepresence Codec units
- Sonic Foundry: Media Site Lecture Capture
- Equipment: Professional/Commercial Grade 24/7 Operation
- UCSF ETS Standards for Classroom AV Systems
- Warranty: 3 year minimum standard product warranty directly from manufacturer for all video display equipment

### System Standards
- Image Compression: CCITT Group 4, JPEG, JPEG2000, JPEG XR, Lossless JPEG, JPEG, PNG, TIFF/JP, TIFF/IT, HEVC

### Industry Standards
- ANSI/INFOCOMM 1M-2009, Audio Coverage Uniformity in Enclosed Listener Areas
- ANSI/INFOCOMM 3M-2011, Projected Image Contrast Ratio
- ANS/INFOCOMM 10-2013, Audio Visual Systems Performance Verification
- IES DG-17-05 Fundamentals of Lighting for Video Conferencing
## Table D6030.12-A Conference Room AV Systems

<table>
<thead>
<tr>
<th>Video Projector</th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Medium Conference Flex</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Image Resolution</td>
<td>1920 x 1080 pixels</td>
<td>1920 x 1080 pixels</td>
<td>1920 x 1080 pixels</td>
<td>1920 x 1080 pixels</td>
<td>1920 x 1080 pixels</td>
</tr>
<tr>
<td>Display Aspect Ratio</td>
<td>16:9</td>
<td>16:9</td>
<td>16:9</td>
<td>16:9</td>
<td>16:9</td>
</tr>
<tr>
<td>Flat Panel Display Brightness</td>
<td>450 cd/m²</td>
<td>450 cd/m²</td>
<td>700 cd/m²</td>
<td>700 cd/m²</td>
<td>700 cd/m²</td>
</tr>
<tr>
<td>Flat Panel Display Backlighting</td>
<td>LED Edge Lit</td>
<td>LED Edge Lit</td>
<td>LED Full Array</td>
<td>LED Full Array</td>
<td>LED Full Array</td>
</tr>
<tr>
<td>Contrast Ratio</td>
<td>3000:1</td>
<td>4000:1</td>
<td>4000:1</td>
<td>4000:1</td>
<td>4000:1</td>
</tr>
<tr>
<td>Response Time</td>
<td>2 ms</td>
<td>3 ms</td>
<td>3 ms</td>
<td>3 ms</td>
<td>3 ms</td>
</tr>
<tr>
<td>Flat Panel Display Mounting</td>
<td>Swing Arm for easy rear access</td>
<td>Swing Arm for easy rear access</td>
<td>Full Out for easy rear access</td>
<td>Full Out for easy rear access</td>
<td>Full Out for easy rear access</td>
</tr>
</tbody>
</table>

### Video Conference Camera

| Resolution | 1920 x 1080 30 fps color | 1920 x 1080 60 fps color | 1920 x 1080 60 fps color | 1920 x 1080 60 fps color | 1920 x 1080 60 fps color |
| Optical Zoom Range | 7X Auto Focus | 10X Auto Focus | 12X Auto Focus | 12X Auto Focus | 12X Auto Focus |
| Pan/Tilt Range | Pan = 30 Tilt = 45-30 | Pan = 30 Tilt = 45-30 | Pan = 30 Tilt = 45-30 | Pan = 30 Tilt = 45-30 | Pan = 30 Tilt = 45-30 |
| Relative Aperture | F 2.0 | F 1.7 | F 1.7 | F 1.7 | F 1.7 |
| POE | Required | Required | Required | Required | Required |

### Audio

| Integrated Microphone In Display/Camera unit | Yes | Yes | Yes | Yes | Yes |
| Table Top Microphone | N/A | N/A | N/A | N/A | N/A |
| Full Range and Base Speaker | Yes Integrated with wall Mount Telepresence System | Yes Integrated with wall Mount Telepresence System | Yes Sound Bar at Wall Mount Display | Ceiling Mounted | Ceiling Mounted |
| Audio DSP and Amplifier | N/A | N/A | N/A | N/A | N/A |
| Ceiling Microphones | N/A | N/A | N/A | N/A | N/A |

### Input

| DVI | Yes (2) | Yes (2) | Yes (2) | Yes (2) | Yes (2) |
| HDMI | Yes | Yes | Yes | Yes | Yes |
| PC Audio In | Yes | Yes | Yes | Yes | Yes |

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Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4683
May 28, 2016 pm
May 28, 2016 pm

744
<table>
<thead>
<tr>
<th></th>
<th>Huddle Room</th>
<th>Small Conference</th>
<th>Medium Conference Fixed</th>
<th>Medium Conference Flex</th>
<th>Large Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AV Support Infrastructure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathways and Enclosures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter: Large Format Recessed Floor Box</td>
<td>No</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter: Wall Box Power/Network/AV disconnect point</td>
<td>No</td>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter: Huddle Room Enclosure in wall extends power, network and AV connectivity to table top from disconnect point at floor</td>
<td>No</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants: Wall Box for Power to Table top power systems</td>
<td>Yes</td>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV System Support: Wall Box large format with integrated swing arm mount and integrated power and low voltage receptacles behind Flat Panel</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Displays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall box with double gang uniting Rear (course capture video camera support)</td>
<td>NA</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Wall box with double gang uniting Front (video conference video camera support)</td>
<td>NA</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Wall box with double gang uniting outside entry door for scheduling panel</td>
<td>No</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathway to Lighting Control Panel</td>
<td>NA</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>Pathway to Window Shade Control Panel</td>
<td>NA</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>Expected Rack Units of Cabinet Space Per Room</td>
<td>No Rack mount Equipment Expected</td>
<td>No Rack mount Equipment Expected</td>
<td>No Rack mount Equipment Expected</td>
<td>Allocate 22 RU</td>
<td>Allocate 22 RU</td>
</tr>
<tr>
<td>Expected Electrical Consumption at AV Racks</td>
<td>N/A</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>80 watts per rack unit</td>
</tr>
<tr>
<td>Furniture Requirements to Support AV System</td>
<td>No, All Devices Wall mounted on or behind Display, Mic integrated with Display</td>
<td>No, All Devices Wall mounted on or behind Display, Mic on Table Top</td>
<td>No, All Devices Wall mounted on or behind Display, Microphones on Table Top</td>
<td>No All AV Equipment to be located in an AV Support Room</td>
<td>No, All Devices Wall mounted on or behind Display, Mic on Table Top</td>
</tr>
</tbody>
</table>

Table top should have recessed enclosure for HDMI and VGA/Audio connector and (2) duplex power receptacles. Presenter locations will require (3) wired Campus network ports.
## Table D6030.13-A Classroom AV Systems

<table>
<thead>
<tr>
<th>Room Occupants Seated at Table:</th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Occupants Not Seated at Table:</td>
<td>68</td>
<td>48</td>
<td>38</td>
<td>14</td>
</tr>
<tr>
<td>Room Occupants Seated at Table with Back to Display:</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Room Occupants Total:</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>25</td>
</tr>
</tbody>
</table>

### Physical Environment

#### Acoustical, Lighting and Critical Dimensions

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Room Width at Display Wall, Front of Room</td>
<td>28.0 Ft</td>
<td>28.0 Ft</td>
<td>24.0 Ft</td>
<td>16.0 Ft</td>
</tr>
<tr>
<td>Minimum: Room Depth</td>
<td>40.0 Ft</td>
<td>30.0 Ft</td>
<td>28.0 Ft</td>
<td>22.0 Ft</td>
</tr>
<tr>
<td>Maximum Back Edge of Table to Front of Room</td>
<td>36.0 Ft</td>
<td>28.0 Ft</td>
<td>25.0 Ft</td>
<td>18.0 Ft</td>
</tr>
<tr>
<td>Lighting Room Level Control</td>
<td>Dimming, IP Interface to AV Control</td>
<td>Switched Manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting Temperature Maximum</td>
<td>3500K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting Color Rendition Index</td>
<td>90 or Better for fixtures in Presenter and whiteboard area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting Zones within space</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Lighting Level at Presenter Face</td>
<td>Max 45 Degree Min 30 Degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Lighting level at Presenter Face</td>
<td>75 Foot Candles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Lighting level at Presenter Face</td>
<td>50 Foot Candles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting: Digital Addressable Lighting Interface, DALI</td>
<td>For Light Fixtures Over Table, Display and Whiteboard area</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Window Shade Control

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Height Bottom of Video Image</td>
<td>54 inches</td>
<td>54 inches</td>
<td>54 inches</td>
<td>48 inches</td>
</tr>
<tr>
<td>Maximum Height Bottom of Video Image</td>
<td>60 inches</td>
<td>60 inches</td>
<td>60 inches</td>
<td>54 inches</td>
</tr>
<tr>
<td>Maximum Active Screen Height</td>
<td>87.5 inches</td>
<td>65.0 inches</td>
<td>65.0 inches</td>
<td>44.0 inches</td>
</tr>
<tr>
<td>Minimum Active Screen Width</td>
<td>140.0 inches</td>
<td>104.0 inches</td>
<td>104.0 inches</td>
<td>78.5 inches</td>
</tr>
</tbody>
</table>

#### Electrical Power Locations

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenter: Floor</td>
<td>3 duplex</td>
<td>3 duplex</td>
<td>3 duplex</td>
<td>3 duplex</td>
</tr>
<tr>
<td>Presenter: Lectern</td>
<td>2 duplex</td>
<td>2 duplex</td>
<td>2 duplex</td>
<td>No Lectern</td>
</tr>
<tr>
<td>Presenter: Table Top</td>
<td>N/A</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Wall (Learning Center Style)</td>
<td>1 duplex</td>
<td>1 duplex</td>
<td>1 duplex</td>
<td>N/A</td>
</tr>
<tr>
<td>Participants: Table Top</td>
<td>1 Simplex per seat at table surface</td>
<td>1 Simplex per seat at table surface</td>
<td>1 Simplex per seat at table surface</td>
<td>1 Simplex per seat at table surface</td>
</tr>
<tr>
<td>Flat Panel Display Wall: inside back box</td>
<td>2 duplex</td>
<td>2 duplex</td>
<td>2 duplex</td>
<td>2 duplex</td>
</tr>
<tr>
<td>AV Credenza, AV Equipment Rack</td>
<td>N/A</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>AV System Support Room</td>
<td>2 duplex (2) 20a 120V Circuit</td>
<td>2 duplex (2) 20a 120V Circuit</td>
<td>2 duplex (2) 20a 120V Circuit</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Table D6030.13 - A Classroom AV Systems

### APPENDIX Block 33

**May 28, 2016 Mission Bay East Campus Phase 1 (Block 33)**

**University of California, San Francisco, Project No: M4603**

<table>
<thead>
<tr>
<th>Wired Ethernet Locations</th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenter: Floor</td>
<td>(4) 1 Gig Port</td>
<td>(4) 1 Gig Port</td>
<td>(4) 1 Gig Port</td>
<td>(1) 1 Gig Port</td>
</tr>
<tr>
<td>Presenter: Lectern (Extended From Floor)</td>
<td>(4) 1 Gig Port</td>
<td>(4) 1 Gig Port</td>
<td>(4) 1 Gig Port</td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Wall Above Table Top</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Table Top (Flush Enclosure, Extended From Floor)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Front of Room: Flat Panel Display on Wall</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Front of Room: Wall mounted IP/POE Clock</td>
<td>(1) 1 Gig Port</td>
<td>(1) 1 Gig Port</td>
<td>(1) 1 Gig Port</td>
<td>(1) 1 Gig Port</td>
</tr>
<tr>
<td>Ceiling Mounted Projector</td>
<td>(2) 1 Gig Port</td>
<td>(2) 1 Gig Port</td>
<td>(2) 1 Gig Port</td>
<td>N/A</td>
</tr>
<tr>
<td>Outside Room At Primary Entrance: Wall Scheduling Panel or Digital Signage</td>
<td>(1) 1 Gig Port</td>
<td>(1) 1 Gig Port</td>
<td>(1) 1 Gig Port</td>
<td>(1) 1 Gig Port</td>
</tr>
<tr>
<td>AV System Support Room</td>
<td>(6) 1 Gig Port</td>
<td>(6) 1 Gig Port</td>
<td>(6) 1 Gig Port</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Wireless Ethernet

<table>
<thead>
<tr>
<th>Participants</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenter</td>
<td>Available in Addition to Wired Presenter Port</td>
<td>Available in Addition to Wired Presenter Port</td>
<td>Available in Addition to Wired Presenter Port</td>
<td>Available in Addition to Wired Presenter Port</td>
</tr>
</tbody>
</table>

### Wired Ethernet Connected Devices

<table>
<thead>
<tr>
<th>Control devices</th>
<th>Yes, at Presenter</th>
<th>Yes, at Presenter</th>
<th>Yes, at Presenter</th>
<th>Yes, at Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV switching systems management</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
</tr>
<tr>
<td>Audio processing systems management control</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
</tr>
<tr>
<td>Audio communicators VoIP UCC</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
</tr>
<tr>
<td>Video communications CODEC, Ethernet</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
</tr>
<tr>
<td>Course capture system</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>Yes, at Equipment</td>
<td>No</td>
</tr>
<tr>
<td>Display systems monitoring &amp; management</td>
<td>Yes, at Display</td>
<td>Yes, at Display</td>
<td>Yes, at Display</td>
<td>Yes, at Display</td>
</tr>
<tr>
<td>Scheduling system or digital signage</td>
<td>Yes, at Entrance</td>
<td>Yes, at Entrance</td>
<td>Yes, at Entrance</td>
<td>Yes, at Entrance</td>
</tr>
<tr>
<td>Presenter devices data networking</td>
<td>Yes, at Presenter</td>
<td>Yes, at Presenter</td>
<td>Yes, at Presenter</td>
<td>Yes, at Presenter</td>
</tr>
<tr>
<td>Non-Presenter Participant devices</td>
<td>Yes (TLC style Break Out Environment)</td>
<td>Yes (TLC style Break Out Environment)</td>
<td>Yes (TLC style Break Out Environment)</td>
<td>No</td>
</tr>
</tbody>
</table>

### Other Physical Configuration Requirements

<table>
<thead>
<tr>
<th>Floor configuration</th>
<th>Flat Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacency Requirements</td>
<td>Flat Floor</td>
</tr>
<tr>
<td>Combining Requirement</td>
<td>Flat Floor</td>
</tr>
</tbody>
</table>

### Control

| Touch Panel for AV system with Wizard Style programming compatible with UCSF ETS Standards | Required, 9 inch | Required, 9 inch | Required, 9 inch | Required, 9 inch |
| Touch Panel for Video Conferencing and Audio Conferencing compatible with UCSF TeleHealth Standards | N/A | N/A | N/A | N/A |
| Touch Panel for AV system with basic AV system Control | N/A | N/A | N/A | N/A |
| Integration with lighting systems | Required | Required | Required | Not Required |
| Integration with shading systems | Required | Required | Required | Not Required |
| Integration with movable partition system | Required | Required | Required | Required |
| Hand held remote, tethered to table | N/A | N/A | N/A | N/A |
| Ipad, Iphone, Android, Microsoft Device as Control Device | N/A | N/A | N/A | N/A |
### Table D6030.13-A Classroom AV Systems

<table>
<thead>
<tr>
<th></th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presentation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video Content</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Presentation from</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>portable source</td>
<td>HDMI, VGA,</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>Wireless</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Video Content</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Presentation from</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fixed source</td>
<td>HDMI, VGA</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Audio Content</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Playback</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Audio: Speech</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>Reinforcement of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio: Speech</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>Reinforcement of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audience</td>
<td>Required</td>
<td>Required</td>
<td>Not Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>Audio: Auxiliary</td>
<td>Required</td>
<td>Required</td>
<td>Not Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>Input</td>
<td>Required</td>
<td>Required</td>
<td>Not Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>Audio: Auxiliary</td>
<td>Required</td>
<td>Required</td>
<td>Not Required</td>
<td>Not Required</td>
</tr>
<tr>
<td>Output</td>
<td>Required</td>
<td>Required</td>
<td>Not Required</td>
<td>Not Required</td>
</tr>
<tr>
<td><strong>Conferencing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio Conferencing</td>
<td>No</td>
<td>Yes (1 room per building)</td>
<td>Yes (1 room per building)</td>
<td>Standalone VoIP Conference Unit</td>
</tr>
<tr>
<td>Presenter and</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Participants</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td><strong>Media Capture</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Presenter as source</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>N/A</td>
</tr>
<tr>
<td>Microphone and Video</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>N/A</td>
</tr>
<tr>
<td>Guest Presentation</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>N/A</td>
</tr>
<tr>
<td>as Source</td>
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<td>Required</td>
<td>Required</td>
<td>N/A</td>
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<tr>
<td>Simultaneous with</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Presenter</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<td><strong>AV Support Systems</strong></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Assistive Listening</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Audio/Visual</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Monitoring/Remote</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Management through</td>
<td>Required</td>
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<td>Required</td>
</tr>
<tr>
<td>Campus Ethernet</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td><strong>AV System Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectern at Front of</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Room</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table Top at Front</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>of Room</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table Top at Back</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>of Room</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall at Wall Mounted</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Auxiliary Displays</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(TLC Style)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Presenter Devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Panel/Device</td>
<td>Yes, Touch Panel</td>
<td>Yes, Touch Panel</td>
<td>Yes, Touch Panel</td>
<td>Yes, Touch Panel</td>
</tr>
<tr>
<td></td>
<td>Per ETS standards</td>
<td>Per ETS standards</td>
<td>Per ETS standards</td>
<td>Per ETS standards</td>
</tr>
<tr>
<td>at Lectern</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laptop/Tablet</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wired Ethernet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laptop/Tablet/other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>handheld</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wireless Ethernet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed in room</td>
<td>Yes, University</td>
<td>Yes, University</td>
<td>Yes, University</td>
<td>Yes, University</td>
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<tr>
<td>computing platform</td>
<td>Provided, Contractor Installed</td>
<td>Provided, Contractor Installed</td>
<td>Provided, Contractor Installed</td>
<td>Provided, Contractor Installed</td>
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<tr>
<td>Wired on table top</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU below table or</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
</tr>
<tr>
<td>lectern top</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphic display</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tablet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV system configured</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to accept portable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter Video</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
</tr>
<tr>
<td>Display</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wired Microphone</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
<td>Yes at all lectern locations</td>
</tr>
<tr>
<td>Wireless Microphone</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
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</table>
### Table D6030.13 - Classroom AV Systems

<table>
<thead>
<tr>
<th>Participant Devices</th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio/Video Conferencing Microphones</td>
<td>Yes, Ceiling</td>
<td>Yes, Ceiling</td>
<td>Yes, Ceiling</td>
<td>No, VoIP Conference Phone on Table Top with Three Microphones</td>
</tr>
<tr>
<td>Course Capture Microphones</td>
<td>Yes, Ceiling</td>
<td>Yes, Ceiling</td>
<td>Yes, Ceiling</td>
<td>No</td>
</tr>
<tr>
<td>Audio Speakers</td>
<td>Yes, Ceiling</td>
<td>Yes, Ceiling</td>
<td>Yes, Ceiling</td>
<td>Yes, Display Mounted</td>
</tr>
</tbody>
</table>

### Campus Standards & Warranties

| Shure: SPX Series Wireless Microphone Systems | Yes | Yes | Yes | No |
| Crestron: Control, Scheduling and Digital Switching systems | Yes | Yes | Yes | No |
| Cisco: Unified Communication Manager, Native Support | Yes for VOP Integration to Audio Conferencing | Yes for VOP Integration to Audio Conferencing | Yes for VOP Integration to Audio Conferencing | Yes for VOP Integration to Audio Conferencing |
| Cisco: Telepresence Codec units | Integrated with AV system | Integrated with AV system | Integrated with AV system | (1 room per Building) Display Mounted SX20 series with table top Touch 10 control panel and dual microphones |

### Sonic Foundry: Media Site Media Capture

| Equipment: Professional/Commercial Grade 24/7 Operation | Required | Required | Required | No |
| UCSF ETS Standards for Classroom AV Systems | Required |
| Warranty: 3 year minimum standard product warranty directly from manufacturer for all video display equipment | Required |

### System Standards

| Audio Conferencing: G.722, G.723, G.726, G.728, G.729, AAC-LD | Required | Required | Required | Required |
| Image Compression: CCITT Group 4, JPEG, JPEG2000, JPEG XR, Lossless-JPEG, JPEG, PNG, TIFF/EP, TIFF/IT, HEVC | Required | Required | Required | Required |

### Industry Standards

| ANSI/INFOCOMM 1M-2009, Audio Coverage Uniformity in Enclosed Listener Areas. | Required |
| ANSI/INFOCOMM 3M-2011, Projected Image Contrast Ratios. | Required | N/A | N/A |
| ANSI/INFOCOMM 10-2013, Audio Visual Systems Performance Verification. | Required |
| IES DG-17-05 Fundamentals of Lighting for Video Conferencing | Required | Required | Required | Required |

### AV Equipment

<table>
<thead>
<tr>
<th>Video Displays</th>
<th>Minimum Image Resolution</th>
<th>Display Aspect Ratio</th>
<th>Flat Panel Display Brightness</th>
<th>Flat Panel Display Backlighting</th>
<th>Flat Panel Display Mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1920 x 1080 pixels</td>
<td>16:9</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>1020 x 1080 pixels</td>
<td>16:9</td>
<td>700 cd/m2</td>
<td>LED Full Array</td>
<td>Wall with tilt out bottom to access equipment behind display</td>
</tr>
<tr>
<td>Table D6030.13-A Classroom AV Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Classroom Large-1</strong></td>
<td><strong>Classroom Medium-2</strong></td>
<td><strong>Classroom Medium-1</strong></td>
<td><strong>Classroom Small</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Video Projector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Image Resolution</td>
<td>1920 x 1200 pixels</td>
<td>1920 x 1200 pixels</td>
<td>1920 x 1200 pixels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Aspect Ratio</td>
<td>16:10</td>
<td>16:10</td>
<td>16:10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brightness</td>
<td>7000 lm (ISO 21118)</td>
<td>7000 lm (ISO 21118)</td>
<td>7000 lm (ISO 21118)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>10,000:1</td>
<td>10,000:1</td>
<td>10,000:1</td>
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<td></td>
</tr>
<tr>
<td>Light Source</td>
<td>Laser Diode, Class 3R</td>
<td>Laser Diode, Class 3R</td>
<td>Laser Diode, Class 3R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Method and Panel Size</td>
<td>1 Chip DLP, 0.95 inch</td>
<td>1 Chip DLP, 0.95 inch</td>
<td>1 Chip DLP, 0.67 inch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lens</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Projection Screen</strong></td>
<td></td>
<td></td>
<td>See Video Display</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flat Ceiling Mounted Screen/Roller</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tab Tensioned</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Voltage Control Compatible with AV Control System</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen Material optimized for Laser Projector and High Ambient Room Light</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Video Conference Camera</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>N/A</td>
<td>N/A</td>
<td>1920 x 1080 60 fps color</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical Zoom Range</td>
<td>N/A</td>
<td>12X Auto Focus</td>
<td>12X Auto Focus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pan Tilt Range</td>
<td>N/A</td>
<td>Pan = +90 Tilt = -25</td>
<td>Pan = +90 Tilt = -25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field of View</td>
<td>N/A</td>
<td>43.5V 72H</td>
<td>43.5V 72H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POE</td>
<td>N/A</td>
<td>Not Required</td>
<td>Not Required</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Media Capture Camera</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>1920 x 1080 60 fps color</td>
<td>1920 x 1080 60 fps color</td>
<td>1920 x 1080 60 fps color</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical Zoom Range</td>
<td>20X Auto Focus</td>
<td>20X Auto Focus</td>
<td>20X Auto Focus</td>
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<tr>
<td>Pan Tilt Range</td>
<td>Pan = +70 Tilt = -30</td>
<td>Pan = +70 Tilt = -30</td>
<td>Pan = +70 Tilt = -30</td>
<td></td>
<td></td>
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<tr>
<td>Horizontal View angle</td>
<td>8 to 70 Degrees</td>
<td>8 to 70 Degrees</td>
<td>8 to 70 Degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Illumination</td>
<td>1.6 LUX</td>
<td>1.6 LUX</td>
<td>1.6 LUX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Object Distance</td>
<td>Wide 0.91m, Tel 1.0m</td>
<td>Wide 0.81m, Tel 1.0m</td>
<td>Wide 0.81m, Tel 1.0m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Image Sensor</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Image Sensor Effective Pixels</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*See Video Display*
<table>
<thead>
<tr>
<th>AV Support Infrastructure</th>
<th>Classroom Large-1</th>
<th>Classroom Medium-2</th>
<th>Classroom Medium-1</th>
<th>Classroom Small</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pathways and Enclosures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter: Large Format Recessed Floor Box Power/Network/AV</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>disconnect point at floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Presenter: Wall box Power/Network/AV disconnect point</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes for auxiliary wall displays in TLC style space</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Presenter: Recessed Enclosure in Lectern and or table top</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>presenter and AV connectivity to table top from disconnect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>point at floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants: Flush Floor Box/Poke Through for Power to Table</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>top power systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes for auxillary wall displays in TLC style space</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>AV System Support: Wall Box large format (Chief PAC516 style)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at Flat Panel Displays</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Presenter: Recessed Enclosure in Lectern and or table top</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>presenter and AV connectivity to table top from disconnect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>point at floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants: Wall box Power to Table top power systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes for auxillary wall displays in TLC style space</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Wall box with double gang mudding Rear (course capture video</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>camera support)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wall box with double gang mudding Front (Video conference</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>video camera support)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wall box with double gang mudding outside entry door for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>scheduling panel</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pathway to Lighting Control Panel</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pathway to Window Shade Control Panel</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Expected Rack Units of Cabinet Space Per Room</td>
<td>Allocate 20-24 RU</td>
<td>Allocate 20-24 RU</td>
<td>Allocate 20-24 RU</td>
<td>None</td>
</tr>
<tr>
<td>Expected Electrical Consumption at AV Racks</td>
<td>80 watts per rack</td>
<td>80 watts per rack</td>
<td>80 watts per rack</td>
<td>80 watts per rack</td>
</tr>
<tr>
<td>unit</td>
<td>unit</td>
<td>unit</td>
<td>unit</td>
<td>unit</td>
</tr>
<tr>
<td>Furniture Requirements to Support AV System</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credenza</td>
<td>N/A</td>
<td>All Devices</td>
<td>Wall mounted on or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>behind Display, Mic at Table Top</td>
<td></td>
</tr>
<tr>
<td>Table top should have recessed enclosure for HDMI and VGA/Audio</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>connector and (2) duplex power receptacles. Presentor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>locations will require (3) wired Campus network ports.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectern top should have recessed enclosure for HDMI and VGA/Audio</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>connector and (2) duplex power receptacles. Presentor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>locations will require (3) wired Campus network ports.</td>
<td></td>
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</tr>
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</table>
Table D6090.20-A  Telecom Space Buildout
## APPENDIX

### Table D6090.20-A  Telecom Space Buildout

<table>
<thead>
<tr>
<th>Flows without IDF</th>
<th>Single Floor</th>
<th>Single Floor</th>
<th>Single Floor</th>
<th>Three Floors</th>
<th>Three Floors</th>
<th>Whole Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Floor Plate Serving Area</td>
<td>14999 Gross Sq Ft</td>
<td>9999 Gross Sq Ft</td>
<td>14999 Gross Sq Ft</td>
<td>19999 Gross Sq Ft</td>
<td>44997 Gross Sq Ft</td>
<td>56997 Gross Sq Ft</td>
</tr>
<tr>
<td>Maximum Number of Floors Served by Telecom Room</td>
<td>1 Floor</td>
<td>1 Floor</td>
<td>1 Floor</td>
<td>1 Floor</td>
<td>3 Floor</td>
<td>3 Floor</td>
</tr>
<tr>
<td>Maximum 4 pair cable Length Jack to Connecter Block in Wall Field</td>
<td>295.0 Ft</td>
<td>295.0 Ft</td>
<td>295.0 Ft</td>
<td>295.0 Ft</td>
<td>295.0 Ft</td>
<td>295.0 Ft</td>
</tr>
<tr>
<td>Maximum 4 Pair Horizontal Cable Length on a Floor Plate</td>
<td>240.0 Ft</td>
<td>240.0 Ft</td>
<td>240.0 Ft</td>
<td>240.0 Ft</td>
<td>240.0 Ft</td>
<td>240.0 Ft</td>
</tr>
<tr>
<td>Maximum 4 Pair Cable Terminations in CPF</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Minimum 1Gbps Wall Field Width</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Minimum Width, Telecom Room</td>
<td>10.0 Ft</td>
<td>11.0 Ft</td>
<td>11.0 Ft</td>
<td>11.0 Ft</td>
<td>11.0 Ft</td>
<td>11.0 Ft</td>
</tr>
<tr>
<td>Minimum Length, Telecom Room</td>
<td>8.0 Ft</td>
<td>10.5 Ft</td>
<td>13.5 Ft</td>
<td>16.0 Ft</td>
<td>22.0 Ft</td>
<td>17.0 Ft</td>
</tr>
<tr>
<td>Minimum Dimension: Finished Floor to Bottom of Deck Above</td>
<td>10.0 Ft</td>
<td>10.0 Ft</td>
<td>10.0 Ft</td>
<td>10.0 Ft</td>
<td>10.0 Ft</td>
<td>10.0 Ft</td>
</tr>
<tr>
<td>Minimum Dimension: Clear Door Opening</td>
<td>3 feet wide, 7 feet tall Double</td>
<td>3 feet wide, 7 feet tall Single</td>
<td>3 feet wide, 7 feet tall Single</td>
<td>3 feet wide, 7 feet tall Single</td>
<td>3 feet wide, 7 feet tall Single</td>
<td>3 feet wide, 7 feet tall Single</td>
</tr>
<tr>
<td>Minimum Dimension: Wall to Front of Rack Mounted Vertical Cable Managers</td>
<td>5.0 Ft</td>
<td>5.0 Ft</td>
<td>5.0 Ft</td>
<td>5.0 Ft</td>
<td>5.0 Ft</td>
<td>5.0 Ft</td>
</tr>
<tr>
<td>Minimum Dimension: Wall to Back of Rack Mounted Vertical Cable Managers</td>
<td>4.5 Ft</td>
<td>4.5 Ft</td>
<td>4.5 Ft</td>
<td>4.5 Ft</td>
<td>4.5 Ft</td>
<td>4.5 Ft</td>
</tr>
<tr>
<td>Minimum Depth of Equipment Rack With Double Sided Cable Managers</td>
<td>1.4 Ft</td>
<td>1.4 Ft</td>
<td>1.4 Ft</td>
<td>1.4 Ft</td>
<td>1.4 Ft</td>
<td>1.4 Ft</td>
</tr>
<tr>
<td>Height: Equipment Rack</td>
<td>No Equipment Racks, Cabinets or active equipment in CPF</td>
<td>84 inches</td>
<td>84 inches</td>
<td>84 inches</td>
<td>84 inches</td>
<td>84 inches</td>
</tr>
<tr>
<td>Minimum Quantity of Equipment Racks</td>
<td>2 Racks</td>
<td>3 Racks</td>
<td>4 Racks</td>
<td>5 Racks</td>
<td>6 Racks</td>
<td>6 Racks</td>
</tr>
<tr>
<td>Maximum Quantity of Equipment Rack Rows</td>
<td>1 Row</td>
<td>1 Row</td>
<td>1 Row</td>
<td>1 Row</td>
<td>2 Rows</td>
<td>1 Row</td>
</tr>
<tr>
<td>Minimum Quantity of Server Cabinets for Security NVRs</td>
<td>1 Cabinet</td>
<td>1 Cabinet</td>
<td>1 Cabinet</td>
<td>1 Cabinet</td>
<td>1 Cabinet</td>
<td>1 Cabinet</td>
</tr>
<tr>
<td>Minimum Dimension Between Rack Rows Front of Vertical Cable Manager to Front of Vertical Cable Manager</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Height: Top of Upper Cable Runway to Finished Floor</td>
<td>88 inches</td>
<td>88 inches</td>
<td>88 inches</td>
<td>88 inches</td>
<td>88 inches</td>
<td>88 inches</td>
</tr>
<tr>
<td>Height: Top of Cold Rack Row Layout</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
</tr>
<tr>
<td>Minimum Linear Feet of Plywood Backboards on Walls</td>
<td>21.0 Ft</td>
<td>38.0 Ft</td>
<td>44.0 Ft</td>
<td>48.0 Ft</td>
<td>50.0 Ft</td>
<td>62.0 Ft</td>
</tr>
<tr>
<td>Minimum Height: Top of Plywood Backboards to Finished Floor</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
</tr>
<tr>
<td>Minimum Height: Bottom of Starline Track Busway to Finished Floor</td>
<td>114 inches</td>
<td>114 inches</td>
<td>114 inches</td>
<td>114 inches</td>
<td>114 inches</td>
<td>114 inches</td>
</tr>
<tr>
<td>Minimum Height: Bottom of Light Fixture Guard to Finished Floor</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
</tr>
<tr>
<td>Minimum Height: Top of Wall Mounted Terminal Blocks Above Finished Floor</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
</tr>
<tr>
<td>Equipment Racks, Cabinets and Cable Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Critical Dimensions and Statistics

<table>
<thead>
<tr>
<th>Flows without IDF</th>
<th>Single Floor</th>
<th>Single Floor</th>
<th>Single Floor</th>
<th>Three Floors</th>
<th>Three Floors</th>
<th>Whole Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height: Top of Plywood Backboards to Finished Floor</td>
<td>21.0 Ft</td>
<td>38.0 Ft</td>
<td>44.0 Ft</td>
<td>48.0 Ft</td>
<td>50.0 Ft</td>
<td>62.0 Ft</td>
</tr>
<tr>
<td>Minimum Linear Feet of Plywood Backboards on Walls</td>
<td>21.0 Ft</td>
<td>38.0 Ft</td>
<td>44.0 Ft</td>
<td>48.0 Ft</td>
<td>50.0 Ft</td>
<td>62.0 Ft</td>
</tr>
<tr>
<td>Minimum Height: Bottom of Starline Track Busway to Finished Floor</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
</tr>
<tr>
<td>Minimum Height: Bottom of Light Fixture Guard to Finished Floor</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
<td>72 inches</td>
</tr>
<tr>
<td>Minimum Height: Top of Wall Mounted Terminal Blocks Above Finished Floor</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
<td>102 inches</td>
</tr>
<tr>
<td>Equipment Racks, Cabinets and Cable Management</td>
<td>Required, See D7030 Video Surveillance System</td>
<td>Required, See D7030 Video Surveillance System</td>
<td>Required, See D7030 Video Surveillance System</td>
<td>Required, See D7030 Video Surveillance System</td>
<td>Required, See D7030 Video Surveillance System</td>
<td>Required, See D7030 Video Surveillance System</td>
</tr>
</tbody>
</table>

### Physical Environment

- **Cable Pass-Thru Facility, CPF**
  - Area: 4000 to 5999 GSF
  - Area: 10,000 to 14,999 GSF
  - Area: 15,000 to 19,999 GSF
- **Intermediate Distribution Facility, IDF**
  - Area: 10,000 to 14,999 GSF
  - Area: 15,000 to 18,999 GSF
- **Build Distribution Facility, BDF**
  - Area: 10,000 to 14,999 GSF
  - Area: 15,000 to 18,999 GSF
| Block 33 | University of California, San Francisco, Project No: M4603 | 754 |

**APPENDIX**

**Table D6090.20 - A Telecom Space Buildout**

| Mission Bay East Campus Phase 1 (Block 33) |
| May 28, 2016 |

<table>
<thead>
<tr>
<th>Cable Pass-Through Facility, CPF</th>
<th>Cable Runway</th>
<th>Intermediate Distribution Facility, IDF</th>
<th>Bldg. Distribution Facility, BDF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Floors without and IDF</strong></td>
<td><strong>Single Floor</strong></td>
<td><strong>Single Floor</strong></td>
<td><strong>Single Floor</strong></td>
</tr>
<tr>
<td><strong>Area: 4000 to 9999 GSF</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
</tr>
<tr>
<td><strong>Area: 10,000 to 14,999 GSF</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
</tr>
<tr>
<td><strong>Area: 15,000 to 19,999 GSF</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
</tr>
<tr>
<td><strong>Area: 10,000 to 14,999 GSF</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
</tr>
<tr>
<td><strong>Area: 15,000 to 18,999 GSF</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
<td><strong>Required</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cable Runway**

- **Two Levels of Cable Runway**
- **Upper Cable Runway for Horizontal Station Cable Routing to Wall Mounted Terminal Block from Building Telecom Outlets**
- **Lower Cable Runway for Copper Patch Cables Rack Mounted to Wall Mounted Cable Terminations**
- **Vertical Wall Mounted Cable Runway**
- **15 inch Wide 9 inch Run Spacing UL listed**
- **15 inch Wide 9 inch Run Spacing UL listed**
- **20 inch Wide 9 inch Run Spacing UL listed**
- **Cable Runway Radius Dropouts**
- **Cable Runway To Equipment Rack Mounting and Elevation Brackets**
- **Seismic Bracing and Suspension of Non Structural Cable Runways**

**Architectural Requirements**

- Coordination of Telecom, Security, Structural, Electrical, Mechanical, Fire Sprinkler Buildout of the space demonstrated by enlarged floor plans, RCP, Elevations and sections
- Required by Project Architect

**Structural Requirements**

- Seismic Bracing and Attachment of Non Structural Elements including but not limited to wall partitions, backing, equipment racks, cable runways, and electrical distribution inside of the telecom rooms
- Required to be designed by a Licensed Structural Engineer

**Bonding and Grounding**

- Ground Bar Bonded Telecom Ground Bar in BDF
- Ground Bar Bonded to Main Electrical Ground and Building Switchgear in Main Electrical room
- Equipment Racks and Cabinets each bonded to telecom ground bar in room
- Cable Runways Vertical and Horizontal Bonded to Telecom Ground Bar in Room

**Electrical System**

- Minimum Electrical Load Per Equipment Rack
- Minimum Circuiting per AC/AMS Panel
- Minimum Circuiting for Main Comms Outlets
- Electrical Breaker Panel Dedicated to Telecom Room
- Uninterrupted Power System, Battery Type, 15 Minute Runtime at Full Load 24 Hour Diesel Generator
- Universal Electric Starline Track Busway located above equipment rack rows for Power Distribution to Equipment Racks
- Rack Mount PDUs in the Equipment Rack
- Flush Wall boxes for Access Control System Power
- Flush Wall boxes for DAS System Power
- Recessed Wall Lighting
- Lighting to provide 50 foot candles at 3 feet above the finished floor throughout each telecom room

**Table D6090.20 - A Telecom Space Buildout**

<table>
<thead>
<tr>
<th>Minimum Circuiting per Equipment Rack</th>
<th>120/208 Volts 3 phase Circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Circuiting per AC/AMS Panel</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Minimum Circuiting for Main Comms Outlets</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Electrical Breaker Panel Dedicated to Telecom Room</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Uninterrupted Power System, Battery Type, 15 Minute Runtime at Full Load 24 Hour Diesel Generator</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Universal Electric Starline Track Busway located above equipment rack rows for Power Distribution to Equipment Racks</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Rack Mount PDUs in the Equipment Rack</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Flush Wall boxes for Access Control System Power</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Flush Wall boxes for DAS System Power</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
<tr>
<td>Recessed Wall Lighting</td>
<td>120/208 Volts 3 phase Circuits</td>
</tr>
</tbody>
</table>

**University of California, San Francisco, Project No: M4603**

**Mission Bay East Campus Phase 1 (Block 33)**

**Appendix**
<table>
<thead>
<tr>
<th>Mechanical System</th>
<th>Cable Pass-Thru Facility, CPF</th>
<th>Intermediate Distribution Facility, IDF</th>
<th>Bidg. Distribution Facility, BDF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Floor</td>
<td>Single Floor</td>
<td>Single Floor</td>
</tr>
<tr>
<td>24 x 7 Cooling, Temperature Range 70-75 Degrees F, Humidity 30-55%</td>
<td>Not Required in CPF, No Active equipment is located in CPF</td>
<td>Required</td>
<td>NA</td>
</tr>
<tr>
<td>System to be located outside of telecom room, adjacent to the telecom room and ducted to wall supply and return registers</td>
<td>NA</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>Sprinkler Heads and Piping</td>
<td>Yes, protected heads, high temperature elements</td>
<td>NA</td>
<td>Required</td>
</tr>
<tr>
<td>Coordination with Interior Room Buildout of Telecom Racks, Cable Runways, Electrical Busways, Light Fixtures and Seismic Bracing</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**BMS and Fire Alarm Devices**

| Thermostat: Immediately Adjacent to Door, Coordinate with Interior Room Buildout | NA | Required | NA | Required | NA | Required |
| Smoke Detector: On underside of Deck, Coordinate with Interior Buildout of Racks, Cable Runways and Barring of Non Structural Components | Required | N/A | Required | N/A | Required | N/A |

**Active Equipment Allowed In Telecom Room**

| Rack Mounted Network Switches, OPCI | Yes | Yes | Yes | Yes | Yes | Yes |
| Wall Mounted Access Control Panels and Power Supplies | Yes | Yes | Yes | Yes | Yes | Yes |
| 4 Post Cabinet Mounted Network Video Recorders and Video Surveillance Components | No | No | Yes | Yes | Yes | Yes |
| 4 Post Cabinet Mounted Distributed Antenna System Components | No | No | Yes | Yes | Yes | Yes |
| Wall Mounted Emergency Responder Antennas and Antenna Cables | Yes | Yes | Yes | Yes | Yes | Yes |
| Wall Mounted Emergency Responder Repeater Unit | Yes | Yes | Yes | Yes | Yes | No |
| Rack Mounted Clock Controller | Yes | Yes | Yes | Yes | Yes | Yes |

**Equipment Not to Be Located in Telecom Rooms**

<table>
<thead>
<tr>
<th>Mechanical Systems</th>
<th>Plumbing Systems</th>
<th>Building Management system Panels</th>
<th>Electrical Panels and Enclosures Not Providing Service to the Telecom Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locate Outside of Telecom Room</td>
<td>Fire Sprinkler for Room Only</td>
<td>Locate in Electrical Room</td>
<td>Locate in Electrical Room</td>
</tr>
</tbody>
</table>

**Other Physical Configuration Requirements**

<table>
<thead>
<tr>
<th>Floor configuration</th>
<th>Sealed Concrete Floor</th>
<th>Sealed Concrete Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stacking Requirements</td>
<td>IDF's and CPS should be stacked vertically within the building and the stack should be treated as a shaft with respect to fire rating to eliminate the need for fire stopping between floors. Possible Stack BDF however it may be connected to IDF Stack with 4 inch conduits.</td>
<td></td>
</tr>
<tr>
<td>Vertical Pathways Between IDF's, CPF's and BDF</td>
<td>Slots in the structural deck between the IDF's, CPF's and BDF are preferred over conduits. Vertical Cable Runways should provide a continuous vertical pathway through the slots. Slots area should be a minimum of 8 inches by 36 inches.</td>
<td></td>
</tr>
</tbody>
</table>

May 28, 2016

Mission Bay East Campus (Phase 1 Block 33)
University of California, San Francisco, Project No: M4603
### Table D6090.20 - A Telecom Space Buildout

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Area Range</th>
<th>Action</th>
<th>General Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cable Pass-Thru Facility (CPF)</strong></td>
<td>Area: 4000 to 9,999 GSF</td>
<td>Single Floor</td>
<td>Section 17010 Communications General Requirements</td>
</tr>
<tr>
<td><strong>Intermediate Distribution Facility (IDF)</strong></td>
<td>Area: 10,000 to 14,999 GSF</td>
<td>Single Floor</td>
<td>Applies to grounding and bonding of telecom fixtures within and between the IDFs, CPFs, BDF and Building Main Electrical Ground</td>
</tr>
<tr>
<td></td>
<td>Area: 15,000 to 19,999 GSF</td>
<td>Single Floor</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Area: 10,000 to 14,999 GSF</td>
<td>Three Floors</td>
<td>Applies to grounding and bonding of telecom fixtures within and between the IDFs, CPFs, BDF and Building Main Electrical Ground</td>
</tr>
<tr>
<td></td>
<td>Area: 15,000 to 18,999 GSF</td>
<td>Three Floors</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Bldg. Distribution Facility (BDF)</strong></td>
<td>Area: 10,000 to 14,999 GSF</td>
<td>Whole Building</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Area: 15,000 to 18,999 GSF</td>
<td>Whole Building</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Campus and Industry Standards

- **UCSF OAASIS-ENS Division 01710 Summary Standards for Facility Planning Current 2008**
- **ANSI/TIA-568-C – Commercial Building Standard for Telecommunications Pathways and Spaces**
- **ANSI/TIA-607-B – Telecommunications Grounding and Bonding for Customer Premises Systems**
- **ANSI/TIA-606 – Telecommunications Labeling and Identification**
- **NEC Article 700 Emergency Systems**
- **NEC Article 800  Communications Circuits**
- **EIA-310-D, Cabinets, Racks, Panels, and Associated Equipment**
- **Telecordia GR-63-CORE NEBS Requirements: Physical Protection**

- **UCSF-ITS has standardized on the Commsope Systimax Structured Cabling System.**
- **Visipatch 360 Wall Mounted Terminal Blocks are Required for the Termination of Copper 4 Pair Cabling.**

- **UPS and Non UPS electrical power shall be distributed through three phase Starline track busways and circuit breaker modules located above the equipment rack row, See Electrical System.**
# Horizontal Station Cable: General Minimum Quantities

<table>
<thead>
<tr>
<th>Location/Room Type</th>
<th>Maximum Cable Color</th>
<th>Faceplate Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owens Hall</td>
<td>Blue/Net</td>
<td>8 Position 8 contact block (1) Cable/Jack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jack Only (No Faceplate)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface Mount Enclosure (6) Cables/Jacks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Furniture Bezel (4) Cables/Jacks (2) Blue Net</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wall Phone Faceplate (1) Cable/Jack (1) Blue Net</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Simplex Wall Faceplate (4) Cables/Jacks (2) Blue Net</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duplex Wall Faceplate (8) Cables/Jacks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rack Mount Patch Panel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 Position 8 contact block (2) Cable/Jacks (2) Blue Net</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Green Net</td>
</tr>
</tbody>
</table>
|                  |                    | Through top | **NOTE:**
|                  |                    | **Faceplate Types** |
|                  |                    | Owens Hall | **Table D6090.42** B
|                  |                    | Conference | **See Table D6090.42 B**
|                  |                    | Medium & Small | **See Table D6090.42 B**
|                  |                    | Rooms | **See Table D6090.42 B**
|                  |                    | Office | **See Table D6090.42 B & D6090.42 C**
|                  |                    | Conference Room | **See Table D6090.42 B**
|                  |                    | Above Work Stations | **See Table D6090.42 C**
|                  |                    | Presenter Table Top Location | **See Table D6090.42 C**
|                  |                    | Under top Lecturn | **See Table D6090.42 C**
|                  |                    | Conference Room | **See Table D6090.42 B**
|                  |                    | Through top | **See Table D6090.42 B**

**APPENDIX 757**

May 28, 2016

Mission Bay East Campus Phase 1 (Block 33)
University of California, San Francisco, Project No: M4603
Table D6090.42-B  Horiz. Station Cable: Conference Rooms

<table>
<thead>
<tr>
<th>Wired IP connections Per Room Type</th>
<th>Minimum Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Huddle</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inside of Room</strong></td>
<td></td>
</tr>
<tr>
<td>Table Top: Presenter Seated at Table, (others use WiFi)</td>
<td>0</td>
</tr>
<tr>
<td>Table Top: Cisco 8831 VoIP Audio Conference Unit</td>
<td>0</td>
</tr>
<tr>
<td>Table Top: Cisco Touch10 Control Panel, Video Conference</td>
<td>1</td>
</tr>
<tr>
<td>Table Top: Crestron LCD Control Panel, AV System</td>
<td>0</td>
</tr>
<tr>
<td>Table Underside: Networked Computing Device, OFCI</td>
<td>1</td>
</tr>
<tr>
<td>Display Wall AV Back Box: LCD Display Panel, Presenations</td>
<td>1</td>
</tr>
<tr>
<td>Display Wall AV Back Box: Cisco Integrated Codec/Display</td>
<td>1</td>
</tr>
<tr>
<td>Display Wall AV Back Box: Other AV Devices</td>
<td>1</td>
</tr>
<tr>
<td>Display Wall Above Table Top: Presenter Seated at Table (others use WiFi)</td>
<td>4</td>
</tr>
<tr>
<td>Display Wall Above Table Top: Cisco VoIP Handset/Speaker</td>
<td>1</td>
</tr>
<tr>
<td>Ceiling: Wireless Access Point</td>
<td>1</td>
</tr>
<tr>
<td>Ceiling: Video Projector Control / Monitoring Interface</td>
<td>0</td>
</tr>
<tr>
<td>Display Wall: IP Based Clock</td>
<td>1</td>
</tr>
<tr>
<td><strong>Outside of Room</strong></td>
<td></td>
</tr>
<tr>
<td>Wall Outside of Room at Entrance: Room Scheduling Panel, 25Live or other App</td>
<td>0</td>
</tr>
<tr>
<td><strong>AV Equipment Room</strong></td>
<td></td>
</tr>
<tr>
<td>AV Equipment Room: DSP IP VoIP Gateway Audio Conference</td>
<td>0</td>
</tr>
<tr>
<td>AV Equipment Room: DSP IP Control Interface</td>
<td>0</td>
</tr>
<tr>
<td>AV Equipment Room: Crestron Digital Controller IP Interface</td>
<td>0</td>
</tr>
<tr>
<td>AV Equipment Room: Cisco Codec Rack Mount</td>
<td>0</td>
</tr>
<tr>
<td>AV Equipment Room: Other Equipment</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note:** All Table Top and Underside Table Top devices shall have the buildings Category 6 structured cabling system terminated at the floor box under the table and shall be extended to the table top recessed enclosure with category 6 workplace extension cables factory manufactured by the manufacturer of the structured cabling system. Jacks shall be labeled at the faceplates in the floor box and faceplates in the flush table top enclosure.
### Table D6090.42-C  Horizontal Station Cable:

#### Classrooms

<table>
<thead>
<tr>
<th>Location</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Auditorium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inside of Room</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecturn Top: Presenter Lap Top</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lecturn Top: Presenter Control Panel</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lecturn Under Top: Networked Computing Device, OFCI</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lecturn Under Top: Other AV Device, Scaler, Swicther</td>
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<td>Table Top: Presenter Seated at Table, (others use Wifi)</td>
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<td>Table Top: Cisco 8831 VoIP Audio Conference Unit</td>
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<td>Table Top: Cisco Touch10 Control Panel, Video Conference</td>
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<td>Table Under Top: Networked Computing Device, OFCI</td>
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<td>Display Wall AV Back Box: LCD Display Panel, Presentations</td>
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<tr>
<td>Display Wall AV Back Box: Cisco Integrated Video Conference System</td>
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<tr>
<td>Display Wall AV Back Box: Other AV Devices</td>
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<tr>
<td>Display Wall: IP Based Clock</td>
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<tr>
<td>Ceiling: Wireless Access Point</td>
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<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Ceiling: Video Projector Control / Monitoring Interface</td>
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<tr>
<td>Ceiling : Media Capture Camera</td>
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</tr>
<tr>
<td>Back Wall: Media Capture Camera</td>
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<tr>
<td><strong>Outside of Room</strong></td>
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<td></td>
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</tr>
<tr>
<td>Wall Outside of Room at Entrance: Room Scheduling Panel, 25Live or other App</td>
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<td>AV Equipment Room: DSP IP VoIP Gateway Audio Conference</td>
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<td>AV Equipment Room: DSP IP Control Interface</td>
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<td>AV Equipment Room: Crestron Digital Controller IP Interface</td>
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<td>AV Equipment Room: Cisco Codec Rack Mount</td>
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<tr>
<td>AV Equipment Room: Lighting Control Interface</td>
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<tr>
<td>AV Equipment Room: Other Rack mount Equipment</td>
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</table>

**Note:** All Table Top and Underside Table Top devices shall have the buildings Category 6 structured cabling system terminated at the floor box under the table and shall be extended to the table top recessed enclosure with category 6 workplace extension cables factory manufactured by the manufacturer of the structured cabling system. Jacks shall be labeled at the faceplates in the floor box and faceplates in the flush table top enclosure.
### Appendix

#### Table D6090.42-D  Horizontal Station Cable: Ophthalmology

<table>
<thead>
<tr>
<th>Location</th>
<th>Waiting Room</th>
<th>Sub Waiting Room</th>
<th>Optical Dispensing</th>
<th>Screening Room</th>
<th>Diagnostic Imaging room</th>
<th>Exam Room</th>
<th>Procedure Room</th>
<th>Isolated Clean Utility</th>
<th>Team Work Room</th>
<th>Consult Room</th>
<th>Microbiology Lab</th>
<th>Surgical Simulation Lab</th>
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<tbody>
<tr>
<td><strong>Inside of Room</strong></td>
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<td>Wall: VoIP Phone</td>
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<td>Wall: Entrance Side: Telepresence System</td>
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<td>Wall: Right Hand Side of Room at Instruments and/or Equipment</td>
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<tr>
<td>Wall: Left Hand Side of Room at Instruments and/or Equipment</td>
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<td>Wall: Telepresence System</td>
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<td>Wall: At Instruments &amp; Equipment</td>
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<td>Staff Work Area Outside of Rooms Clusters</td>
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</table>

| Ceiling: Wireless Access Point | 4 | 4 | 2 | 0 per POD | 2 per POD | 6 per POD | 2 per POD | 2 per POD | 2 | 2 | 0 | 4 |

| Stir Work Area | 14 | 8 | 7 | 22 | 23 | 22 | 22 | 9 | 29 | 5 | 11 | 15 |
### Table F1030.10-A  STC Criteria, Partitions without Doors

| Minimum STC Requirements, Partitions Without Doors | Corridors and Reception | Commons, Open Collab., Social Hub | Open-Plan Office, Hotel Stations | Libraries | Huddle Rooms, Focus Rooms | Private Offices | Conference Rooms, Classrooms | File Rooms, Storage, Mail/Copy/Server | Operating Rooms, Procedure Rooms | Exam Rooms, Testing Rooms, Pre/Post-Op | Laboratories, Lab Support | Retail, Pantry / Kitchenette | Restrooms, Locker/Shower Rooms | Auditorium |
|---------------------------------------------------|-------------------------|-----------------------------------|---------------------------------|-----------|--------------------------|----------------|-----------------------------|---------------------------------|-------------------------------|------------------------------------|------------------------------------|-------------------------------|-----------------------------|-----------------------------|---------|
| Corridors and Reception                           | NR                      | NR                                | NR                              | 40        | 45                       | 45             | 50                          | NR                              | 40                            | NA                                 | 45                                | 45                           | NR                          | NR                          | 40      |
| Commons, Open Collab., Social Hub                | NR                      | 40                               | 45                              | 50        | 45                       | 50             | 50                          | NR                              | 40                            | 55                                 | 50                                | 45                           | 45                  | 45          | 60      |
| Open-Plan Office, Hotel Stations                 | NR                      | 45                               | 50                              | 45        | 50                       | 50             | 50                          | NR                              | 40                            | 45                                 | 55                                | 50                           | 45                           | 45          | 60      |
| Libraries                                         | NR                      | 50                               | 50                              | 55        | 50                       | 50             | 50                          | NR                              | 40                            | 45                                 | 50                                | 45                           | 45                           | 50          | 60      |
| Huddle Rooms, Focus Rooms                        | 50                      | 50                               | 50                              | 50        | 50                       | 50             | 50                          | NR                              | 55                            | 50                                 | 50                                | 45                           | 45                           | 50          | 60      |
| Private Offices                                   | 50                      | 50                               | 50                              | 50        | 50                       | 50             | 50                          | NR                              | 55                            | 50                                 | 50                                | 45                           | 45                           | 50          | 60      |
| Conference Rooms, Classrooms                     | 50                      | 50                               | 50                              | 50        | NR                       | NR             | 50                          | NR                              | 40                            | NR                                 | NR                                | 60                           | 60                           | 60          | 60      |
| File Rooms, Storage, Mail/Copy/Server            | NR                      | 45                               | 45                              | 55        | 45                       | 45             | 45                          | NR                              | 45                            | NR                                 | NR                                | 60                           | NR                           | NR          | 60      |
| Waiting Rooms                                     | NR                      | 55                               | 50                              | 45        | 45                       | 45             | 45                          | NR                              | 45                            | NR                                 | NR                                | 60                           | NR                           | NR          | 60      |
| Operating Rooms, Treatment Rooms, Procedure Rooms| NR                      | 50                               | 50                              | 55        | 55                       | 55             | 55                          | NR                              | 45                            | NR                                 | NR                                | 60                           | 60                           | 60          | 60      |
| Exam Rooms, Testing Rooms, Pre/Post-Op           | 50                      | 45                               | 45                              | 55        | 45                       | 45             | 45                          | NR                              | 45                            | NR                                 | NR                                | 60                           | NR                           | NR          | 60      |
| Laboratories, Lab Support                        | 45                      | 45                               | 45                              | 45        | 45                       | 45             | 50                          | NR                              | 45                            | 45                                 | 50                                | 45                           | NR                           | NR          | 60      |
| Retail, Pantry / Kitchenette                     | NR                      | 45                               | 45                              | 50        | NR                       | NR             | 50                          | 50                              | 50                            | NR                                 | NR                                | 50                           | 45                           | NR          | 60      |
| Restrooms, Locker/Shower Rooms                   | NR                      | 60                               | 60                              | 60        | 60                       | 60             | 60                          | 60                              | 60                            | 60                                 | 60                                | 60                           | 60                           | 60          | 60      |

*NR* means No Rating
*NA* means Adjacency Discouraged

### Table F1030.10-B  STC Criteria, Partitions with Doors
### Table F1030.10-C Noise Criteria (NC)

<table>
<thead>
<tr>
<th>Minimum STC Requirements, Partitions With Doors</th>
<th>Corridors and Reception</th>
<th>Commons, Open Collabor., Social Hub</th>
<th>Libraries</th>
<th>Huddle Rooms, Focus Rooms</th>
<th>Private Offices</th>
<th>Conference Rooms, Classrooms</th>
<th>File Rooms, Storage, IDF, Mail/Copy/Server</th>
<th>Waiting Rooms</th>
<th>Operating Rooms, Treatment Rooms, Procedure Rooms</th>
<th>Exam Rooms, Testing Rooms, Pre/Post-Op</th>
<th>Laboratories, Lab Support</th>
<th>Retail, Pantry / Kitchenette</th>
<th>Auditorium</th>
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<td>NR</td>
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*NR* means No Rating
*NA* means Adjacency Discouraged
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<td><strong>Office &amp; Educational Spaces</strong></td>
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<tr>
<td>Classrooms &amp; Conference Rooms (&gt; 400 sf)</td>
<td>NC-25</td>
</tr>
<tr>
<td>Rooms Dedicated to Videoconference Technology</td>
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</tr>
<tr>
<td>Classrooms &amp; Conference Rooms (&lt; 400 sf)</td>
<td>NC-30</td>
</tr>
<tr>
<td>Focus Rooms, Huddle Rooms &amp; Private Offices</td>
<td>NC-30</td>
</tr>
<tr>
<td>Open Plan Offices, Workstations, Hotel Stations &amp; Study Carrels</td>
<td>NC-30</td>
</tr>
<tr>
<td>Breakout Rooms</td>
<td>NC-30</td>
</tr>
<tr>
<td>Libraries &amp; Quiet Study Rooms</td>
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<tr>
<td>Wellness Rooms, Mother's Rooms &amp; Meditation Rooms</td>
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<tr>
<td>Computer Lab</td>
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<tr>
<td>Computer Stations</td>
<td>NC-35</td>
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<tr>
<td>Retail, Pantry/Kitchenette</td>
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<tr>
<td>Commons, Reception, Circulation, Locker Rooms</td>
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<td>File Rooms, Storage Rooms, Mail &amp; Copy Rooms</td>
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<td><strong>Unoccupied Areas</strong></td>
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<tr>
<td>Mechanical &amp; Electrical Rooms</td>
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<tr>
<td>Other Unoccupied Areas</td>
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<tr>
<td><strong>Medical &amp; Clinical</strong></td>
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<tr>
<td>Procedure Rooms, Pre-Op &amp; Post-Op Rooms</td>
<td>NC-30</td>
</tr>
<tr>
<td>Exam Rooms, Consultation Rooms &amp; Interview Rooms</td>
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</tr>
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<td>Waiting Rooms</td>
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<tr>
<td>Multi-Occupant Patient Care Areas</td>
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<tr>
<td>Operating Rooms with Typical Air-Flow Requirements</td>
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</tr>
<tr>
<td>Operating Rooms with High Air-Flow Requirements</td>
<td>NC-40</td>
</tr>
<tr>
<td>Medical Laboratories</td>
<td>NC-45</td>
</tr>
<tr>
<td>Medical Equipment Support Rooms</td>
<td>NC-45</td>
</tr>
<tr>
<td><strong>Laboratories</strong></td>
<td></td>
</tr>
<tr>
<td>Laboratories w/ Typical Air-Flow Requirements</td>
<td>NC-45</td>
</tr>
<tr>
<td>Laboratories w/ High Air-Flow &amp; Modest Speech Intelligibility Requirements</td>
<td>NC-50</td>
</tr>
<tr>
<td>Laboratory Equipment Support Rooms</td>
<td>NC-45</td>
</tr>
</tbody>
</table>
## Table G5010.11-A Communications Vault Table

### Inside Dimensions

<table>
<thead>
<tr>
<th></th>
<th>3660-4</th>
<th>38Y-65</th>
<th>38Y-612</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>3.0 ft.</td>
<td>4.5 ft.</td>
<td>6.0 ft.</td>
</tr>
<tr>
<td>Length</td>
<td>5.0 ft.</td>
<td>8.5 ft.</td>
<td>12.0 ft.</td>
</tr>
<tr>
<td>Height</td>
<td>4.0 ft.</td>
<td>6.5 ft.</td>
<td>7.0 ft.</td>
</tr>
<tr>
<td>Area</td>
<td>60.0 cu. ft.</td>
<td>248.6 cu. ft.</td>
<td>504.0 cu. ft.</td>
</tr>
</tbody>
</table>

### Interior Buildout

<table>
<thead>
<tr>
<th></th>
<th>3660-4</th>
<th>38Y-65</th>
<th>38Y-612</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Racking Per Side Wall</td>
<td>(2) Columns</td>
<td>(2) Columns</td>
<td>(2) Columns</td>
</tr>
<tr>
<td>Spacing</td>
<td>2 feet O.C.</td>
<td>2 feet O.C.</td>
<td>2 feet O.C.</td>
</tr>
<tr>
<td>Vertical Racking Per End Wall</td>
<td>(1) Column</td>
<td>(1) Column</td>
<td>(1) Column</td>
</tr>
<tr>
<td>Spacing</td>
<td>Center of End Wall</td>
<td>2 feet O.C.</td>
<td>2 feet O.C.</td>
</tr>
<tr>
<td>Racking on &quot;S&quot; Brackets</td>
<td>No, Flush to Side Walls</td>
<td>Yes, Yes</td>
<td>Yes, Yes</td>
</tr>
<tr>
<td>Ladder</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pulling Irons</td>
<td>4/5/6 Inch</td>
<td>6inch to Columna</td>
<td>8/10 Inch</td>
</tr>
<tr>
<td>Location</td>
<td>(2) Bottom Of Each End Wall</td>
<td>(2) Bottom of Each End Wall</td>
<td>(2) Bottom of Each End Wall</td>
</tr>
<tr>
<td>Sump Indent in Bottom</td>
<td>12&quot; Diameter</td>
<td>12&quot; Diameter</td>
<td>12&quot; Diameter</td>
</tr>
<tr>
<td>Two Part Epoxy Paint</td>
<td>White</td>
<td>White</td>
<td>White</td>
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### Conduit Term-A-Ducts

<table>
<thead>
<tr>
<th></th>
<th>3660-4</th>
<th>38Y-65</th>
<th>38Y-612</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each End Wall, Maximum</td>
<td>4</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Side Walls</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Configuration at End Walls</td>
<td>(2) Columns (2) Conduits per Columns</td>
<td>(2) Columns (2) Conduits per Columns</td>
<td>(4) Columns (6) Conduits per Columns</td>
</tr>
<tr>
<td>Minimum Spacing</td>
<td>36 inches O.C.</td>
<td>36 inches O.C.</td>
<td>54 inches O.C.</td>
</tr>
<tr>
<td>Spacing off Side Walls to First Column</td>
<td>9 inches to Center of Conduit Terminators</td>
<td>9 inches to Center of Conduit Terminators</td>
<td>9 inches to Center of Conduit Terminators</td>
</tr>
</tbody>
</table>

### Cast Iron Cover and Frame

<table>
<thead>
<tr>
<th></th>
<th>3660-4</th>
<th>38Y-65</th>
<th>38Y-612</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum entrance Clearance</td>
<td>N/A</td>
<td>30 Inches</td>
<td>30 Inches</td>
</tr>
<tr>
<td>Minimum Rating</td>
<td>H20</td>
<td>H20</td>
<td>H20</td>
</tr>
</tbody>
</table>

### Hot Dipped Galvanized Tilt Up Cover and Frame

<table>
<thead>
<tr>
<th></th>
<th>3660-4</th>
<th>38Y-65</th>
<th>38Y-612</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum entrance Clearance</td>
<td>30 inches x 60 inches</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Minimum Rating</td>
<td>H20</td>
<td>H20</td>
<td>H20</td>
</tr>
</tbody>
</table>
Table Z1040.30-A Facilities Design Guidelines

(Excerpted)

The following excerpts of the UCSF Mission Bay Campus Facilities Design Guidelines supersede corresponding criteria found in the full document. See (CR Z1040.37 UCSF Mission Bay Campus: Facilities Design Guidelines) for a description for how to use the Guidelines.

C 1010.50 Interior Operable Partitions

a. Acceptable Manufacturers:
   1. Hufcor.
   2. Skyfold.

D.02 Motors

a. Plumbing & HVAC

   1. Unless special characteristics are required, motors shall be NEMA Design B, totally enclosed fan cooled (TEFC), single speed, Insulation Class “F”, 1.15 Service Factor, rated for continuous duty at 40 degrees Centigrade with low slip, low starting current, and normal starting torque. Rotor shall be precision balanced in accordance with NEMA MG 1-1998, “Motors and Generators,” 7.08.

D.03 Variable Frequency Drives

a. Plumbing & HVAC

   1. VFDs shall have dual DC link reactors on the positive and negative rails of the DC bus to reduce the level of harmonics reflected back into the building power system. Link reactors shall not reduce efficiency or cause a voltage loss at the drive input.

D.05 Meters

a. Domestic & Non-Potable Water

   1. Domestic water meters shall be all bronze construction, positive displacement,
Appendix Z1040.30 -A Facilities Design Guidelines

**b. Water Flow Meters for System Metering and Balancing**

1. Fluidic Techniques HRR Flow Tubes, or equal.

**c. Chilled and Heating Water:**

1. **Energy (BTU) Monitoring Stations:**
   
a. Control panel shall be NEMA 4X rated if exposed to unconditioned outside air. Control panel shall have LCD display, keypad, and utilize a MS/TP or RS485 protocol to communicate temperature, flow, and btu points with the energy management system. Each meter shall be factory programmed for its specific application, and be field-programmable using the panel keypad.

b. Follow manufacturer’s written commissioning instructions. Complete manufacturer’s commissioning checklist and submit with project closeout documents.

d. **Compressed Air: (NOT FOR BUILDING 33)**

1. Compressed air meter shall have DDC compatible pulse type attachment for remote registering of flow in cubic feet.

**D.07 Valves**

a. **Gate Valves:**

1. 2 Inches and Smaller: Nibco T134, or equal.
2. 2-1/2 Inches and Larger: Nibco F617-0, or equal.

b. **Globe Valves:**

1. 2 Inches and Smaller: Nibco T235, or equal.
2. 2-1/2 Inches and Larger: Nibco F718B, or equal.

c. **Check Valves:**

1. 2 Inches and Smaller, General Service: Nibco T433B/Y, or equal.
2. 2 Inches and Smaller, Compressed Air Service: Stockham B-322T, or equal.
3. 2-1/2 Inches and Larger, General Service: Nibco F918B, or equal.
4. 2 Inches and Larger Silent Check Valves for Use at Heating Water, Chilled Water, and Tower Water Pump Discharge: Mueller Steam Specialty No. 105M-AP, or equal.

d. Ball Valves:
   1. 1 Inch and Smaller: Nibco T-585-70-66, or equal.
   3. Provide nonconductive polycarbonate sleeved handles (equal to Nibco “Nib-Seal”) for chilled water valves.
   4. For strainer blowdown and line drain valves, provide Model T-585-70-66-HC, similar to above, except with 3/4-inch hose.

e. Butterfly Valves:
   1. 2-1/2 Inches and Larger: Nibco Model LCS-6822 (Class 150), or equal.
   2. Do not provide butterfly valves for whole building isolation. Provide gate or globe valves for this service.
   3. Apply Never-Seez, or equal, lubricant rated for minimum 1800° F on all lug bolts to ease future disassembly.

f. Pressure Regulating Valves:
   1. 2-1/2 Inches and Smaller: Watts 223, or equal. Indicate pressure setting on the Drawings.
   2. 3 Inches and Larger: Watts 2300, or equal.

g. Water System Relief Valves:
   1. Kunkle Series 20, or equal.

h. Valve Operators
   1. Valves 4 Inches and Smaller within 8 Feet of Floor: Provide locking handle with position indicator and memory stop. Galvanized steel handle with minimum of nine positions to lock valve disc, including positive stops at full open and closed positions.
   2. Valves 4 Inches and Smaller for Throttling or Balancing Service: Infinite position galvanized steel handle with position indicator and integral bolted
Appendix Z1040.30 - A  Facilities Design Guidelines

Mission Bay East Campus Phase 1 (Block 33)  
May 28, 2016
University of California, San Francisco, Project No: M4603

D.08 Identification

a. Valves

1. Charts

   a. Charts shall be electronically drafted with minimum 1/8-inch lettering and large symbols, readily legible. Charts shall be prepared in AutoCAD.

   b. Each chart shall be mounted in an aluminum frame with a clear, hardened acrylic plastic front. Charts shall be easily removable for making changes. Charts shall be mounted on mechanical equipment room walls at locations approved by the University's Representative.

D.09 Insulation

a. Jacketing for Exterior Insulation:

   1. For rectangular ductwork in mechanical equipment rooms and in areas where ductwork is exposed to view, provide glass fiber semi-rigid board insulation, three-pound density, FRK jacket, minimum 1-1/2 inch thick.

   2. For round ductwork and rectangular ductwork hidden from view, provide glass fiber duct wrap insulation, minimum one-pound density, FRK jacket, minimum 1-1/2-inches thick.

b. Duct Insulation:

   1. For duct insulation on roof: Glass fiber semi-rigid board insulation, minimum six-pound density, FRK jacket, minimum two inches thick. Cover insulation with foil-backed self-adhering jacket, equal to Polyguard “Alumaguard 60.” Jacket is a laminated waterproof membrane consisting of a peel-and-stick rubberized bitumen adhesive compound with a cross-laminated high strength polyethylene backing film and aluminum foil surface, 60 mils thick, UV
APPENDIX

Table Z1040.30-A Facilities Design Guidelines

resistant, weatherproof and vapor proof. Install with “cold weather activator” by same manufacturer to improve adhesion

D 2020.30 Sanitary Sewage Piping

a. Performance Requirements:

1. No sanitary sewer or sanitary waste systems shall be pumped except as a last resort and then only with permission of the University and backed up by the Emergency Generator. A duplex pump system shall be used if a pumped system is approved.

D 3030.01 Refrigerant Piping

a. General

1. Size refrigerant piping in accordance with recommendations in ASHRAE Refrigeration Handbook Chapter 1 - Halocarbon Refrigeration Systems. For packaged refrigeration systems, such as variable refrigerant flow systems, size piping in accordance with systems manufacturer’s instructions; provide accurate lengths, fitting counts, and vertical offsets to system manufacturers for input into sizing programs.

2. Size liquid and suction lines for maximum 3.0 psi pressure drop. For systems that unload to less than 37% of maximum capacity, provide dual suction risers with tight U-bends at top and bottom of risers, and size risers for proper oil transport back to the compressors.

3. Provide appropriate refrigerant piping specialties, including bull’ s-eyes, thermal expansion valves, solenoid valves, suction and discharge pressure gauges, isolation valves, and filter/dryers as manufactured by Mueller Brass Co., Milwaukee, Sporlan, Henry, or equal. Where needed, provide flexible connectors by Flexonics, American Brass Co., or equal

b. Refrigerant Piping Materials:

1. ASTM B88 Type K or L hard drawn copper tubing conforming to ASTM B280 ACR (air-conditioning and refrigeration) with silver brazed joints. Piping and fittings shall be factory cleaned, deoxidized, dehydrated, and sealed by the manufacturer prior to shipment. Sizes 1/4-inch and smaller shall be annealed (soft).
Fittings: ANSI B16.22 wrought copper, solder joint. All fittings shall be rated for 300 psi working pressure.

Joints: Provide brazing alloy containing minimum 15 percent silver with copper and zinc, and maximum 5 percent phosphorous (BCuP-5), Bellman-Melcor “Silvaloy 15,” J.W. Harris “Stay-Silv 15,” or equal. Dry nitrogen shall be continuously purged through the line during brazing.

c. Refrigerant Piping Installation:

1. Support copper tubing on maximum 6 foot centers and at each elbow and branch takeoff. Insulated pipes shall have minimum 3” long, 16 gauge galvanized sheet metal or equivalent rigid insulation sleeve to protect insulation at pipe supports.

D 3030.10 Central Cooling

a. Chiller Controls, Control Panels, and Gauges.

1. IFM flow meters shall be used for water flow proving.

b. Cooling Towers:

1. Extended-surface fin-and-tube type. Condenser coils shall be constructed of copper tube and copper fins coated with Luvata ElectroFin E-Coat, Heresite, or equivalent coating.

D 3030.70 Decentralized Cooling

a. Condenser Coils (Air Cooled):

1. Extended-surface fin-and-tube type. Condenser coils shall be constructed of copper tube and copper fins coated with Luvata ElectroFin E-Coat, Heresite, or equivalent coating. Coils shall be circuited and sized for a minimum of 5° F sub-cooling and full pump down capacity.

b. Heat Pumps:

1. Provide Variable Refrigerant Flow; Mitsubishi City Multi or equal

D 3050.10 Facility Hydronic Distribution

a. 4 Inches and Smaller:

1. Materials:
Table Z1040.30-A  Facilities Design Guidelines

a. ASTM B88 seamless, Type L, hard drawn copper tubing.

2. Fittings:
   a. ANSI B16.22 wrought copper, solder joint. For fittings not available in copper, provide ANSI B16.18 cast bronze, solder joint. Mechanically formed tee connections are not acceptable.

3. Joints:
   a. Joints 2 inches and smaller shall be soldered with lead-free solder, Canada Metal “Silvabrite 100,” or equal, or 95 percent tin-5 percent antimony (95-5) solder.
   b. Joints 2-1/2 inches and larger shall be brazed with brazing alloy containing minimum 15 percent silver with copper and zinc, and maximum 5 percent phosphorous (BCuP-5), Bellman-Melcor “Silvaloy 15”, or equal.
   c. Use threaded joints for valves and piping specialties in copper piping, 2 inches and smaller.

4. Unions:
   a. Class 250, threaded or soldered/brazed ends. Refer to Flanges, Unions, and Couplings below. Do not provide unions for copper piping 1 inches and smaller unless necessary for installation or future servicing.

5. Flanges:

b. 6 Inches and Larger:
   1. Materials:
      a. ASTM A53, Grade B, Type E or S, Schedule 40, carbon steel, welded.
   2. Fittings:
   3. Flanges:
Appendix

Table Z1040.30 - A Facilities Design Guidelines

a. Class 150. Refer to Flanges, Unions, and Couplings below.

c. Outdoor Piping at Cooling Towers:

1. Discuss with Facilities the possible use of Schedule 80 PVC piping with solvent welded joints for outdoor piping at cooling towers.

d. Miscellaneous Drain and Vent Piping:

1. As required for heating water and chilled water piping above, or as noted below.

2. Pipe (2 inches and smaller):

   a. ASTM A53, Type F, Schedule 40, carbon steel, hot-dip galvanized.

3. Fittings (2 inches and smaller):


4. Unions (2 inches and smaller):

   a. Malleable iron, Class 250, hot-dip galvanized. Refer to Flanges, Unions, and Couplings below.

e. Flanges:

1. 2-1/2 Inches and Larger:

   a. ASTM A105, ANSI B16.5, hot forged steel, welding neck pattern. Slip-on flanges are not acceptable.

2. Use flat face flanges with full-face gaskets for mating with other flat face flanges. Use raised face flanges with self-centering flat ring gaskets only when connecting to equipment, valves, or specialties with raised face flanges.

3. Flange pressure class indicated in respective piping service is minimum required. Mating flange pressure class shall match pressure class of valve or device to which it is connected.

f. Flange Gaskets, General Service:

1. Asbestos free and suitable for pressure, temperature, and fluid of piping system. Provide non-metallic gaskets in accordance with ANSI/ASME B16.21 and ASTM F104. Unless otherwise indicated or recommended by
g. Flange Bolting:
   
   1. Flange Bolts, bolt studs, nuts and washers shall have zinc plated finish, except use hardened stainless steel for galvanized piping and outdoors.
   
   2. For Class 150 flanges, use carbon steel bolts or stud bolts conforming to ASTM A307, Grade B7 with heavy hex heads. Use with ASTM A194, Grade 1, or better, heavy hex series alloy steel nuts.
   
   3. For Class 300 flanges, use stainless steel bolts or stud bolts conforming to ASTM A193, Grade B8, with nuts conforming to ASTM A194, Grade 8.

h. Threaded Joints:
   
   1. Provide paste type soft pipe dope for brush application. Products shall be non-toxic, chemically inert, non-hardening rated for minus 50° F to plus 500° F, bearing UL and AGA approvals. Rector T-Plus 2, or equal.

i. Unions: As noted for individual piping services above and as noted below.
   
   1. Steel Piping, 2 Inches and Smaller:
      
      a. Steam Systems: ASTM A105 Grade 2, ANSI B16.11 forged carbon steel, Class 3000, ground joint, steel-to-steel seat; Grinnell, Van Leeuwen, or equal.
      
      b. Water Systems: ASTM A197/ANSI B16.39, malleable iron, hot-dipped galvanized where necessary to match piping, ground joint, bronze-to-iron seat, Class 250; Grinnell Figure 554, Stockham Figure 794, or equal.
      
      c. Copper Piping, 2 Inches and Smaller: ANSI B16.18 cast copper alloy, or ANSI B16.15 cast bronze, ground joint, Class 250, with threaded or solder joint ends; Mueller Brass "Streamline" No. WC-407, Nibco 733, or equal.

j. Dielectric Couplings:
   
   1. For connections of ferrous piping to copper piping or coils, provide Schedule 40 red brass nipples, minimum length six times pipe diameter; 2 inches and smaller with threaded ends; 2-1/2 inches and larger with flanged connections. Commercial dielectric couplings or unions are discouraged.
Table Z1040.30 - A  Facilities Design Guidelines

2. For connections of ferrous piping systems to copper systems at flanged cast iron valves, specialties, or equipment, provide EPCO Model X, or equal, 125 psi solder joint cast brass or bronze insulating flanges with bolt insulators, dielectric gasket, bolts, and nuts. Van Stone type copper flanges, such as CTS Flanges, are not acceptable.

k. Grooved End Fittings and Couplings:

1. Do not install more than two mechanical grooved joints in any 20-foot composite run of pipe, except at chiller and heat exchanger connections to facilitate disassembly and servicing.

2. Grooved-End Fittings: ASTM A106 or A53, Grade B, carbon steel, full-flow steel fittings designed for use with cut grooved-end pipe and couplings, factory fabricated with combined grooved-ends, flanged ends, welding ends, or threaded ends as required.


4. Grooved-End Finish: Epoxy painted, except where another finish is indicated. Hot-dip galvanized wherever galvanized pipe is specified.

l. Threaded Plugs:

1. Cast bronze.

m. Fittings:

1. Make branch take-offs with reducing tees or line size tees and reducers. Branch connections on steel piping 2-1/2 inches and larger which are less than half the diameter of the main may be made with forged branch welding outlets, Bonney Weld-O-Lets, Thread-O-Lets, or equal.

n. Nipples:

1. Except where space is limited, use minimum 3-inch long nipples. Steel nipples shall be Schedule 80, seamless, except where heavier nipples are required. Close nipples (with less than 1 inch of unthreaded pipe) are prohibited. Where connecting a series of valves and specialties in copper piping, use heavy brass.
Table Z1040.30-A Facilities Design Guidelines

nipples.

o. Welded Joints:

1. Only long radius elbows and full-flow welding fittings for branch connections shall be used. Prohibit cut-in or mitered elbows or welding tees. Branches from welded pipe to screwed pipe shall be made with threaded-welded tee fittings.

p. Chilled Water Storage Tanks:

1. Consider a chilled water storage tank for small chilled water systems where compressors are expected to cycle on and off under low load conditions. Size storage tank volume equivalent to normal system flow rate for the period of time that the system minimum-off-timer will prevent compressor operation (normally 3 to 5 minutes).

2. Storage tank shall be carbon steel, constructed in accordance with ASME Code and stamped for 125 psi working pressure. Provide with a flanged inlet as low as possible, incorporating an internal distribution tree with not less than 24 downward facing holes for low velocity water entry into tank. Provide with flanged outlet on top of tank, inspection opening, 3/4-inch drain and thermometer well tappings, factory welded steel angle support legs, and steel base plates.

3. For large systems, consider stratified storage tanks, such as CBI Strata-Therm, or equal thermal energy storage tanks.

q. Piping Installation – Air Venting and Removal:

1. Bull-head tees are prohibited in mixing or diverging flow.

r. Piping Installation – Sloping and Draining:

1. Provide top flat eccentric reducers in heating water and chilled water piping and at pump connections.

2. Where possible, connect heating water and chilled water branch piping to bottom of mains to allow self-venting of branch piping.

3. Provide 3/4-inch drain valves (ball valves) with 3/4 inch capped hose connections at all low points in piping and at locations where scale or debris could accumulate. Nipples at drain valves and strainer blowdown shall be red.
s. Thermal Expansion Compensation:
   1. Mechanical expansion joints shall be used if expansion loops are not possible.

t. Centrifugal Pumps
   1. Consider basket strainers for open condenser water systems
   2. Provide high strength hardened stainless steel shafts, oversized, with easily replaceable bronze shaft sleeves.
   3. Provide gauge tappings on pump casing to accurately measure pump head.
   4. For centrifugal pumps, provide inside mounted mechanical shaft seals, end-face rubber bellows type, John Crane Type 1, or equal, with carbon rotating washer, tungsten-carbide stationary seat, Viton elastomers, and water flush across face of seal. Springs and other metal parts shall be Type 316 stainless steel.
   5. Provide flush filter with bypass line. Pump discharge shall be piped through a stainless steel cyclone separator, equal to John Crane Abrasives Separator 400 Series.

D 3050.50 HVAC Air Distribution

a. Air Handling Units:
   1. Belts:
      a. Gates Quad-Power II PowerBand 3VX or 5VX, or equal.
   2. Casings:
      a. Minimum 16-gauge panels, channel-formed and fastened together on maximum eight (8)-inch centers.
   3. Coils:
      a. Minimum of 6 diameters of brass piping at coil connections. For improved serviceability (where possible), select coils with no more than 8 rows and no more than 10 fins per inch.
   4. Water Coils:
      a. Minimum 5/8-inch outside diameter, minimum 0.025-inch-thick
5. **Cooling Coil Drain Pans:**
   a. Continuously welded seams and insulation between pans. Drain pans shall extend a minimum of 2 inches upstream and 18 inches downstream of the cooling coil and be sloped in two directions to a minimum 1-1/4 inch MPT stainless steel drain connection, which is welded to the bottom of the pan and extended through the unit base.

6. **Filters (LE N/A) and Filter Holding Frames:**
   a. Filter Gauge shall be mounted approximately 4 feet above the unit base in a sheet metal enclosure with a hinged cover plate so that gauge is not exposed to sunlight. Provide an engraved laminated plastic nameplate on or above cover plate indicating filter bank identification, recommended replacement pressure drop, and quantity, size, and efficiency for replacement filter cartridges. Physically mark and note the face of the filter gauge with clean and dirty filter drops.
   b. Filters shall have a low initial pressure drop that shall not exceed 0.28” w.g. for MERV 13-14 at 500 fpm air flow.

7. **Fan and Air Handler Coatings (Non Stainless Steel Surfaces):**
   a. Interior and exterior surfaces, including the structural base and hidden surfaces, and excluding the stainless steel floor panels and stainless steel fasteners, shall be coated with a dry powder-baked polyester coating similar to Tiger #7035, Drylac Series 49, or equal.
   b. Show maximum 1/16” blistering following a 1500-hour 100% relative humidity test at 100 degrees Fahrenheit per ASTM D2247; remain flexible and unfractured to the point of metal rupture following a direct impact adhesion test per ASTM D2794; show no loss of adhesion between coating and substrate following a cross hatch adhesion test per ASTM D3359 (Method B).
1. Provide heating coils for all supply air terminal units including interior zones unless the terminal unit serves an unoccupied, cooling-only space such as elevator equipment or teledata room. Heating coils for interior zones shall be 1 row unless required to meet the heating load.

c. Balancing Dampers:

1. Multi-Blade Dampers: Provide minimum 16-gauge galvanized steel blades with 6-inch maximum blade width, 1/2-inch diameter steel continuous shafts in bronze bearings, and minimum 1-1/2 inch by 1-1/2 inch by 1/8 inch steel channel frames welded at corners. Provide opposed blade dampers with other details as shown in Fig. 7-5 of the SMACNA Standards.

2. Single Blade Dampers: Provide minimum 18-gauge galvanized steel blade for dampers less than 24 inches in length, 16-gauge for dampers longer than 24 inches, 12-inch maximum width blade, with V-crimp at edge and center of blade. Provide minimum 3/8-inch continuous square steel shafts (1/2-inch square shafts for ducts over 24-inches wide) with operators and end bearing as described below. Provide other details as shown in Fig. 7-4 of the SMACNA Standards. Round dampers shall be similar with V-crimp at edge omitted.

3. Single-leaf dampers shall have no more than 3 percent gaps for edge and end clearance when tightly closed. Operating quadrants be installed in easily accessible locations and orientations.

4. Splitter Dampers: Provide minimum 18-gauge construction, hemmed all four sides, piano hinge with brass pin, minimum length four times width of shorter split unless space is limited, with Ventlok 600 Series, Duro-Dyne, or equal, operators and hardware.

D 3050.90 Facility HVAC Distribution Systems Supplementary Components

a. Strainers

1. Provide permanent magnets in strainers at each pump suction. Magnets shall be removable cast Alnico No. 5 channel magnets and shall create a continuous magnetic field around the entire screen circumference. Magnets shall be secured with stainless steel retaining lugs and threaded rods. 2 Inch and Smaller, Steel Pipe: Y-type, cast iron or ductile iron body, threaded ends, stainless steel or monel screen, maximum 20 mesh, bronze plug, Class 250
b. **Automatic Air Vents**
   
   1. Amtrol No. 720, or equal.

c. **Expansion Tanks**
   
   1. Wessels, Amtrol, Bell and Gossett, or equal.

d. **Pipe Flexible Connectors:**
   
   1. *Braided Metal Flexible Connectors:*
      
      a. Flexonics Series 401M, or equal.

e. **Chemical Pot Feeders:**
   
   a. J. L. Wingert Co., or equal.

f. **Air Separators:**
   
   1. Centrifugal type air separator, Bell & Gossett “Rolairtrol”, or equal.

g. **Solids Separators:**
   
   1. 2 Inches and Smaller: Lakos Series IL-S, or equal.
   2. 2-1/2 Inches and Larger: Lakos Series R-TS, or equal.
   3. Provide each solids separator with a Lakos Model LR, or equal, motorized ball valve and controller.

h. **Temperature/Pressure Test Ports:**
   
   1. Provide Peterson Equipment Company “Pete’s Plug” Model 710, or equal.
   
   For piping with more than 1-inch thick insulation, provide Type XL 3-inch long models so that cap extends beyond pipe insulation.

i. **Pipe Thermometers:**
   
   1. Weksler Type AF, or equal.

D 5010.11 Uninterruptable Power System (UPS)
Appendix

Table Z1040.30-A Facilities Design Guidelines

a. Electrical distribution to server racks in IDF/BDF rooms shall be provided by overhead Starline busway system.

D 5040 Lighting

a. General

1. Lighting circuits shall be loaded to maximum of 15 amps.
2. Lighting levels shall be based on task and location. Refer to the Illuminating Engineering Society of North America (IESNA) publications for illumination quantity and quality guidelines.
3. Luminaires that are 45 feet above finished floor cannot be re-lamped by present University equipment. Provide alternate means of re-lamping luminaires by either lowering luminaires, catwalks, or other approved method.
4. Custom manufactured luminaires shall not be used unless approved or requested by the University.
5. Ceilings heights less than 8 feet 6 inches high shall employ recessed luminaires except as approved or directed by the University.
6. Ballasts/LED Drivers shall be removable through luminaire opening in non-accessible ceilings.
7. All lighting equipment must carry a safety certification by an approved testing laboratory (UL, CE, ETLA, etc.).

b. Interior Illumination Levels

1. Maintained lighting levels shall, at a minimum, include the following Light Loss Factors (LLF):
2. Lamp Lumen Depreciation (LLD): Selected values shall be from manufacturer’s data, at 70% of rated life.
3. Luminaire Dirt Depreciation (LDD)
4. Ambient Temperature Factor (ATF): for t5 and t5ho lamps.

c. Electronic Suppression

1. Provide proper protection for radiated and line transmitted electromagnetic noise to prevent magnetic and radio frequency interference. Suppression techniques shall be included in areas sensitive to electromagnetic interference.

D 5040.10 Lighting Controls
Table Z1040.30-A  Facilities Design Guidelines

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. General:</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Provide automatic lighting controls for all luminaires as required by Code and to minimize lighting energy usage.</td>
</tr>
<tr>
<td>2.</td>
<td>Centralized lighting controls shall be provided which integrate with and can be directly managed by the building Building Automation System (BAS).</td>
</tr>
<tr>
<td>3.</td>
<td>Occupancy sensors shall be provided to save energy in bathrooms, private offices, lecture halls, classrooms, enclosed stairwells, storage rooms, janitor’s closets, and other spaces with intermittent occupancy. If occupancy sensors are used in spaces handling chemicals or hazardous materials such as laboratories, use precautions (time delays, sensor layout) to ensure safe operation.</td>
</tr>
<tr>
<td>4.</td>
<td>Provide dual switching strategies to control inboard/outboard lamps in luminaires or dimming where applicable. Do not switch alternate luminaires unless the uniformity of lighting levels is maintained when alternate luminaires are so switched.</td>
</tr>
<tr>
<td>5.</td>
<td>Motion sensors and daylight sensors shall be shared with building shall be shared with Building Automation system whenever possible to reduce the number of sensor required.</td>
</tr>
<tr>
<td>6.</td>
<td>Switches: Lighting on/off, override, and dimmer switches shall be laid out in a logical and practical manner. Use labels as needed to describe function and circuits controlled by each switch. Pay close attention to layout and labelling for open office and public spaces.</td>
</tr>
<tr>
<td>7.</td>
<td>Wherever possible, control parameters (e.g. time delay settings and schedules) should be capable of being changed remotely.</td>
</tr>
<tr>
<td>8.</td>
<td>Lighting control schedules: lighting controls that utilize time-of-day schedules should be set up with multiple schedules based on the occupancy and use of spaces. It is not acceptable to use one schedule for all lighting zones in the building.</td>
</tr>
<tr>
<td>9.</td>
<td>Primary lighting control manufacturer shall have a minimum of five (5) years continuous experience in manufacturing lighting control products.</td>
</tr>
</tbody>
</table>

D.5040.50  Lighting Fixtures

a. Lamps

1. Incandescent lamps, including low voltage incandescent, shall not be used
Appendix Z1040.30 – A Facilities Design Guidelines (except as approved or directed by the University).

2. In general, linear fluorescent lamps shall be 4 feet nominal, 32 watt, 36,000 hour extended life at 3 hours per start, “super” T8 type. Where required for completing coves, 3 foot matching lamps shall be provided. 2 foot linear lamps shall be provided for nominal 2 x 2 luminaires (U-bend lamps not acceptable unless approved by University).

3. All T8 lamps must meet the CEE specifications, and be found on the CEE list for either the “Low Watt T8” or the “High Performance T8.”

4. Reduced wattage “energy saving” lamps shall not be provided.

5. T5 and T5HO lamps shall only be provided for luminaires and installations that prohibit the direct view of lamp, including cove applications.

6. Linear fluorescent lamps shall have a minimum Color Rendering Index (CRI) of 84, color temperature of 4100 degree Kelvin unless a different color temperature is specifically required for program use.

7. Compact fluorescent lamps shall be 4100 K color temperature with a CRI of 82 and rated average life of 16,000 hours. The wattage shall vary according to the application.

8. Compact fluorescent lamps shall be 4-pin type. 2-pin type and self ballasted screw in type shall not be provided.

9. Fluorescent lamps shall pass the EPA TCLP test for low mercury content.

10. H.I.D. lamps, including high pressure sodium and metal halide, shall have a ceramic arc tube. Probe start lamps shall not be provided.

11. Eight-foot long, “U” shaped or circular shaped fluorescent lamps shall not be used.

b. Luminaires

1. Fluorescent. Luminaires shall meet the following criteria:
   
   a. Coefficient of Utilization (CU): 0.89 minimum for 2’ x 4’ luminaire and 0.79 minimum for 1’ x 4’ luminaire at room cavity ratio of 1.0 and ceiling/wall/floor reflectance of 80%/50%/20%.

   b. Parabolic-type reflector luminaires shall not be used in public spaces except for large open areas with computer screens to provide less reflective glare.

   c. Lensed luminaires shall be provided in service areas. Lenses shall be
Table Z1040.30 - A  Facilities Design Guidelines

virgin acrylic, polycarbonate or Lexan. Within Vivariums provide prismatic tempered glass lenses.

2. Under counter task luminaires shall be stainless steel housing 1” height, one-piece co-extruded clear DR acrylic prismatic bottom lens with opaque front, electronic ballast. Fluorescent lamps shall be T8. Luminaire length shall coordinate with casework for full coverage. Provide with integral On/Off rocker switch. Provide hardwire concealed connection.

3. HID Interior Lighting (NOT APPLICABLE TO 33/34)
   a. High Intensity Discharge (HID) lamps may be used in large indoor areas where frequent switching is not required.
   b. HID lamp ballasts shall provide maximum lamp output energy efficient designed for specific lamp
   c. Utilize Pulse Start lamps and Ballast for all Metal halide applications.

c. Ballasts/LED Drivers:

1. Fluorescent ballasts shall be high frequency, high power factor electronic and reduced harmonic type.
2. For linear lamps, ballasts shall be program rapid start, series wired, maximum 2-lamps per ballast. Ballast factor can be selected to suit design conditions.
3. For compact fluorescent lamps, ballasts shall be rapid start, series wired, maximum 1-lamp per ballast. Ballast factor shall be 1.0.
4. Fluorescent ballasts must meet the CEE specifications, and be found on the CEE list for either the “low Watt T8” or the “High Performance T8.”
5. Dimming fluorescent ballasts:
6. Dimming ballasts shall provide a flicker-free dimming range from 100 percent down to 10 percent. Control protocol shall be 0-10V type.
7. In areas where projection equipment is utilized, the dimming range shall be from 100 percent down to 1 percent. Control protocol shall be 3-wire type.
8. H.I.D ballasts shall be integral to the luminaire and specifically designed for the lamp controlled.
9. For high pressure sodium lamps, ballast shall be high reactance autotransformer (HX-HPF) type. In noise-sensitive areas, ballast shall be fully encapsulated or remote mounted in an adjacent area where noise will not be objectionable.
d. **Light Emitting Diode (LED) Lamps and Fixtures**

1. **General**

   a. LED lamps and fixtures shall be listed by either the Design Lights Consortium (DLC) or Energy Star.
   
   b. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours.
   
   c. LED Boards shall be suitable for field maintenance or service from below the ceiling with plug-in connectors. LED boards shall be upgradable.
   
   d. The color rendition index (CRI) shall be 80 or greater.
   
   e. The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the Luminaires for a period of 5 years after acceptance of the Luminaires. Warranty shall cover all components comprising the luminaire.
   
   f. LED luminaires shall have a color temperature of 3000k or 3500k within a 4-step MacAdam ellipse; dimming performance from 10 – 100 percent without flicker or noise.

2. **Power Supply and Driver**

   a. Driver shall be > 80% efficient at full load across all input voltages.
   
   b. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100% to 5% of rated lumen output with a smooth shut off function. Dimming shall be controlled by a 0-10V signal.
   
   c. Maximum stand-by power shall be 1 Watt.
   
   d. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.
   
   e. Except for screw-in LED lamps, power supply and drivers must be replaceable without having to replace the entire fixture.

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**Emergency Lighting**
1. **General:**
   
   a. One corridor light on each floor level located near each stairwell, elevator and/or exit shall be serviced from and switched at the Building Emergency Panelboard.
   
   b. Egress stairwell lights shall be served from the Building Emergency Panelboard.
   
   c. Home runs for both normal and emergency power shall be in separate conduits.
   
   d. At least one luminaire in a public toilet shall be an emergency luminaire. Rooms over 30 feet deep from exit door shall have two emergency luminaires.
   
   e. Emergency lighting may also serve as night lighting.
   
   f. Exit signs shall be (WOULD WE WANT EXIT SIGNS On E-POWER RATHER THAN BATTERY?? YES) shall be on emergency power. No integral batteries.
   
   g. Provide pathway and/or exterior building lighting on emergency power circuits from exit doors to the adjacent public way, normally 50 feet from the building.
   
   h. Provide switched emergency lighting in mechanical and electrical rooms.
   
   i. In electrical rooms containing generators, inverters, or emergency distribution system panelboards or breakers, luminaires shall be on emergency power.

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**D 8010.50 Integrated Automation Control of HVAC Systems**

   a. **Performance Requirements:**
      
      1. Acceptable Pressure Independent Control Valve (PICV) models are: DeltaP as manufactured by Flow Control Industries, Belimo Energy Valve, or equal.

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**G 4050.10 Site Lighting**

   a. **General:**
      
      1. The University has standardized on LED as the light source for exterior lighting.
      
      2. Exterior lighting circuits shall be multi-staggered circuits to minimize a total
3. Lighting Contactor Control circuits shall be a separate dedicated circuit from lighting branch circuits to minimize disruption.

4. Use central photocell or astronomical timeclock rather than luminaires with individual photocells.

5. Plaza luminaires shall be pole mounted type luminaires that fit with the campus exterior lighting “theme.” The exterior lighting theme is mainly defined by the Bega 8106MH and 8101MH pole-top fixtures.

6. Luminaires set into building exteriors or retaining walls shall be avoided due to difficulty in re-lamping or replacing, and rusting of the luminaire housing. Surface-mounted fixtures are acceptable for exterior walls.

7. Light bollards shall be not be used if possible; if used they shall be located in planting areas where exposure to pedestrian and bicycle traffic is minimal.

8. Outdoor signage shall be placed near luminaires to improve visibility at night.

9. Luminaires that are difficult to change lamps are unacceptable to the University.

10. Document that no more than 5% of the total initial designed fixture lumens (sum total of all fixtures on site) are emitted at an angle of 90 degrees or higher from nadir (straight down).

b. Street Lighting

1. Street lighting shall be concrete standards with eight-foot aluminum davit arm. Ameron Contemporary Series, 1C1 octagonal pole anchor base with anti-graffiti sealer.

2. Minimum set back is 30 inches back from face of curb.

3. Check with the University when adding luminaires of this type to the campus existing power circuits.

4. Each luminaire shall be fused with time delay fuse in a weatherproof holder in the luminaire head. IS THIS NEEDED?

c. Parking Structure Lighting (NOT APPLICABLE FOR BLOCK 33)

1. Provide luminaires with integral occupancy sensors, to reduce light output to 20% or less when area is not occupied for more than 10 minutes.

2. Luminaires shall be specifically designed for use in parking structures.
Luminaires on the top level shall be pole mounted. What is the campus standard parking lot luminaires?

3. Luminaires on the perimeter of above grade open parking structure shall be photocell controlled. Provide a minimum of two photocells to zone by exposure.

d. Parking Area Lighting (NOT APPLICABLE TO BLOCK 33)

1. Luminaries shall be 250 watt, 480 volt self contained, high pressure sodium, manufactured by Gardco, model Hardtop 22 inch CA series, bronze anodized finish or equal by Kim Lighting (no other known equal).
2. Poles should be 5-inch diameter, straight round aluminum, with dark bronze anodized finish, as manufactured by Thomas Lighting.

e. Grounds Lighting

1. Landscape lighting of trees and plants shall be limited. Ground lighting should be avoided and if used, must account for the very corrosive nature of the University’s soil. Do not recess metal luminaire housings in the soil. Provide a concrete pedestal or non-metallic materials.

f. Ring Mall Lighting (Mission Bay Campus Only) (NOT APPLICABLE TO BLOCK 33)

1. Ring mall luminaires are manufactured specifically for the University and known under the general name “XXX Light”. The University shall provide direction on when to add these type luminaires to the Campus system at locations other than ring mall. Details of this luminaire are included with campus standard details.
2. Lighting circuits for exterior lighting in the central ring area are to be connected to panelboards in the tunnel vaults. Existing time switches in the Central plant control the panelboard contactors. Confirm panelboard location and determine that available capacity and circuits are adequate for project requirements.
3. Lighting in areas away from the ring mall area shall be controlled from nearest large building and as directed by the University Building Management system director.

g. Pathway Lighting (NOT APPLICABLE TO BLOCK 33)
Table Z1040.30 - A Facilities Design Guidelines

1. Pathway lighting for major spokes from the ring mall shall use the campus theme luminaire. The University shall determine when a pathway is a major spoke.

G 4050.50 Exterior Building Lighting

1. Exterior surface building mounted lighting in public areas that has been used on campus is Acuity D-Series Wall LED Size 1 and 2.

2. Footcandle Levels: Minimum light levels and uniformity ratios for all categories shall comply with the latest edition of the Illuminating Society of North America (IESNA).

G 4050.90 Exterior Lighting Supplementary Components

a. Lighting Poles and Standards

<table>
<thead>
<tr>
<th></th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mall (theme light)</td>
<td>12 ft</td>
</tr>
<tr>
<td>Pedestrian Paths</td>
<td>10 ft</td>
</tr>
<tr>
<td>Pedestrian Paths / Fire Lane</td>
<td>12 ft</td>
</tr>
<tr>
<td>Fire Lane</td>
<td>18 ft</td>
</tr>
<tr>
<td>Bike Paths</td>
<td>18 ft</td>
</tr>
<tr>
<td>Main Campus</td>
<td>18 ft</td>
</tr>
<tr>
<td>Open Areas</td>
<td>24 ft</td>
</tr>
<tr>
<td>Parking Lots</td>
<td>28 ft</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>30 ft</td>
</tr>
</tbody>
</table>

Note 1: Where cars can contact pole light, provide a 3 foot-4 inch high concrete base. Adjust pole height to provide luminaire head at height above grade as listed above.