

Capital Projects
& Construction

TECHNICAL DESIGN STANDARDS

Revision 4B, February 28, 2020

INTRODUCTION

Revision 4B, February 28, 2020

Dear User,

Portland State University strives to create a quality environment for all students and users of its facilities. The Capital Projects and Construction Department (CPC), as part of PSU's Office of Planning, Construction & Real Estate, manages all renovation and construction projects on the PSU Campus. We approach this responsibility with enthusiasm, which is reflected in our department's mission: "To design and build a modern, sustainable campus that enhances our student learning experience and reinforces the academic mission".

With the goal of clearly and concisely communicating our standards, including preferences and recommendations, to the team of Consultants and Contractors who work on our projects, we composed these Technical Design Standards. The work involved in the creation of this document comprised obtaining information from important stakeholders on campus, including the professionals who manage PSU's daily campus and maintenance activities, as well as the leaders who define PSU's strategic approach and future vision. Their expertise, experience, ideas, and recommendations, in addition to our own knowledge of the best design and construction practices, are incorporated into this document to guide and assist Campus design efforts.

The PSU CPC Technical Design Standards are divided into sections that follow the Construction Specifications Institute (CSI) standards. This format facilitates the use and familiarity by the design and construction professionals. In addition, the guidelines in this document focus on PSU's vision to create facilities which have the following characteristics:

- **Adaptability**

Over the course of their lifetime, PSU buildings, may be re-purposed for uses that were likely not considered at the time of their design. As such, all buildings must be designed in such a way as to allow for changes in purpose and occupancy.

- **Durability**

PSU buildings need to be resilient. As some of the most heavily and intensely used public buildings in the state, they must be designed to meet dense use. This means all materials and systems must be durable, repairable, and easily maintainable. In addition, State funding for deferred maintenance is scarce, making durability especially important.

- **Maintainability**


PSU has limited resources to allocate to the on-going maintenance of its facilities. Therefore, its buildings and components must be designed to be maintainable using the lowest reasonable amount of resources. For example, inaccessible fixtures and equipment requiring constant servicing should not be included in designs.

- **Timeless Design**

PSU buildings must be designed with the highest sense of aesthetics. The University's status as a premier educational institution in the heart of Portland requires that its facilities reflect this philosophy.

- **Sustainability**

PSU intends that its buildings not only meet the highest level of current sustainable design, but also reflect innovation in this regard. Therefore, targeting the highest degrees of efficiency in resources and simplicity of processes is required for all campus design and construction activities.

The “” represents standards, products and any other design or construction related items that show PSU's commitment to building, living, and learning in a sustainable environment.

- **Energy Efficiency**

PSU sustainability goals and efforts to become carbon neutral require that all buildings and major remodels be designed and engineered to be as energy efficient as possible. This should be done while providing the necessary level of comfort for the Campus community.

- **Innovation**

PSU, as a leading community institution, must strive for innovation in all construction projects. It must be at the forefront of advocating for the use of innovative design, construction techniques, and building systems.

- **Environmental Health & Safety**

If possible, toxic and hazardous materials should be eliminated from construction materials and components. Preventing the exposure of building occupants to unhealthy materials is very important to the University.

At CPC we learn from every new project. We believe that the collaboration and input of the in-house team of professionals from various Departments is extremely valuable, and we attempt to constantly encourage their participation. Hence, our Technical Design Standards missive is not a finished and timeless document; it is intended to be reviewed and re-issued every 6 months by our Department as a result of lessons learned from our projects and industry practices, as well as new technologies in construction. In striving for constant improvement, we welcome your feedback.

We are excited about our Department's role in shaping the PSU-of-the-future, while preserving the good things we have today. We are pleased to share this document with our partners and hope it can be used to fulfill our Department's mission.

Sincerely,

The Staff of the Capital Projects & Construction Department

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01.4. PSU Climate Action Plan

<https://www.pdx.edu/sites/www.pdx.edu.sustainability/files/ClimateActionPlan%284mb%29.pdf>

01.5. Custodial and Storage Closet

01.6. Restroom Preferences

01.7. Office Standards

<https://www.pdx.edu/campus-planning/sites/www.pdx.edu.campus-planning/files/PSU%20Office%20Standards%20August%202019%20Update.pdf>

01.8. Classroom Standards

https://www.pdx.edu/campus-planning/sites/www.pdx.edu.campus-planning/files/Classroom%20Standards%20090314%20final_0.pdf

01.9. Furniture Standards

https://www.pdx.edu/campus-planning/sites/www.pdx.edu.campus-planning/files/Furniture%20Standards%2008_2016_0.pdf

01.10. Construction Safety Sign Off & Checklist (Contact CPC For Latest Checklist)

01.11. Healthier Buildings Guide

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01.12. All Gender Restroom Plan

https://www.pdx.edu/campus-planning/sites/www.pdx.edu.campus-planning/files/All%20Gender%20Restroom%20Standard%2006_2018%20%281%29.pdf

01.13 Water Efficiency Assessment Plan

01.14 Solid Waste Management Plan

01.15 Lactation Room Guidelines

https://www.pdx.edu/campus-planning/sites/www.pdx.edu.campus-planning/files/Lactation%20Room%20Guidelines%203_22_2018%20%282%29_0.pdf

01.16 Accessibility and Universal Design Protocol

01.17 Accessibility and Universal Design Standard

10.1. Interior Signage

<https://www.pdx.edu/campus-planning/sites/www.pdx.edu.campus-planning/files/Signage%26%20Wayfinding%20Standards%209-20-19.pdf>

10.2. PSU Identity Standards

<https://www.pdx.edu/university-communications/sites/www.pdx.edu.university-communications/files/PSUStandards9-11Sm.pdf>

26.1 Energy Conservation Guidelines for Portland State

<https://www.pdx.edu/sustainability/sites/www.pdx.edu.sustainability/files/Energy%20Conservation%20Guidelines%20for%20Portland%20State.pdf>

27.1. Instructional Technology Guidelines

<https://www.pdx.edu/oit/policies-standards>

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<https://www.pdx.edu/campus-planning/sites/www.pdx.edu.campus-planning/files/Tree%20Care%20Plan.pdf>

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Section 01 — General Requirements

A. Summary Requirements

1. Standards of Performance

Capital Projects & Construction (CPC) strives to provide and improve access to all for a quality education, including students, faculty, staff, and the general campus community. As such, these standards are to be used as follows:

- These standards are intended for use as guidelines for construction, materials, and installations on campus. Product installations and other related work shall match existing materials, unless approved otherwise by Portland State University (PSU) CPC Project Manager (PM).
- While these standards are approved as department standard, exceptions may be made by PSU CPC PM as necessary.

b. Integrated Design Process

Design Lead (e.g. Architect) shall engage interested parties for programming, coordination, and review processes; Implement Integrated Design Process from early pre-design stage through the entire design process; Identify opportunities for innovative design through synergies across disciplines and building systems to improve building performance, occupant well-being, and environmental benefits.

c. Codes

These standards are in coordination with, and are subject to all latest applicable rules, regulations, and codes. Refer to section 1.B. Regulatory Requirements.

d. General Conditions for Public Improvement Contracts

Contractor shall conform to the applicable PUS General Conditions for Public Improvement Contracts.

e. Submittals

Prior to ordering, Contractor shall submit to PSU CPC PM for review and approval all products / equipment / furnishings samples colors, paint colors and shop drawings. The CPC PM shall route the submittals to the design team.

f. Dimensions

All drawing dimensions shall have preference over scaled dimensions.

g. Structural Engineer Approvals

Penetrations of Structure by Contractor: Any Penetration of Structure, including anchoring, coring, scraping, cutting, or removal is not permitted unless approved by a Structural Engineer that is licensed in the State of Oregon. Upon the Structural Engineer's determination, work shall be

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subject to special inspection and/or certified location services and reports to determine location of steel reinforcing. Any existing irregularities, flaws, or wear of structure that is uncovered or discovered by Contractor during the process of the work shall be immediately reported to Structural Engineer and subject to the Structural Engineer's review and recommendations.

- h. Substitutions
Submit all product substitutions for review within the invitation to bid time line. Refer to Appendix 01.1 – Division 01.
- i. Close-out
Provide PSU-Capital Projects & Construction at Closeout with complete approved permit drawings, including fire sprinklers and alarms. Prior to close out of project, provide PSU-CPC with a "redlined set" of as-built documents (electronic versions preferred), with (1) Operation and Maintenance Manuals (electronic versions required). Refer to Appendix 01.1 – Division 01. For projects that includes BIM please provide the additional close-out documents per the BIM execution plan.
- j. Building Information Modeling
BIM will be required for all full building renovations or new buildings with a value greater than \$5 Million.
- k. Construction Impact Schedule and Coordination
At the start of the project the contractor shall provide a tentative schedule of outages, utility interruptions, and tie-ins for the entire projects. This schedule shall be continuously updated throughout the project. For each individual impact the contractor shall notify PSU CPC PM in writing of any activities that will create noise, cause utility shut down, or impact parking, waste disposal, access, and security a minimum of 2 weeks before the anticipated activity. Refer to Appendix 01.1 – Division 01.
- l. Parking
All parking is to be arranged and paid for by the Contractor. Please note that PSU Transportation and Parking Services will no longer issue parking permits for design firms and contractors (company vehicles or personal vehicles) for any PSU parking lots. In all cases use of public transportation and/or carpooling is strongly encouraged.
- m. Keys-Locks
Contractor to order keys for spaces that he or she needs to access via PSU Key Request Form. Contractor to provide payment, deposit, and processing of PSU key request forms to receive PSU keys.
- n. Contractor Etiquette
Refer to Appendix 01.1 – Division 01.
- o. Design Strategies

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Security: Design of new buildings and major renovations shall consider safety and visibility in order to limit the need for security cameras. Consider principles from Crime Prevention Through Environmental Design - Refer to Appendix 01.2 - Exhibit A: City of Portland CPTED Definition and Policy Strategies

- p. If under any circumstances an accidental discharge to the storm system occurs EHS (503-969-8677) and the CPC PM shall be called.
 - q. PSU strives to incorporate universal design in the physical layout of PSU buildings and accessibility of the university as a whole coordination with the design team and the contractors, the CPC PM shall consult with the PSU Disability Resource Center and PSU Global Diversity and Inclusion on all matters related to physical accessibility of campus buildings and spaces. For major renovation and new buildings, the design team shall employ an independent consultant.
 - r. Provide safe access to all equipment associated with operations and maintenance. Whenever feasible, access should not require maintenance personnel to use ladders, lifts, or fall protection equipment.
 - s. Provide fixed stairs or a ships ladder where access to different roof elevations is required for maintenance and when carrying tools or equipment by hand is normally required.
 - t. Where ships ladders provide access to a roof hatch, provide a top landing with enough space for a worker to set down tools and supplies while opening the hatch to the roof.
 - u. Provide sufficient working space around all equipment to allow safe operation and maintenance of the equipment. Vertical clearance shall be 6'5". Minimum width of exit ways and access path shall not be less than 28 inches.
 - v. Steps need to be installed for access and egress onto/from rooftops at stairwells and from penthouses.
2. Execution
- a. Coordination
Contractor to review all documents and coordinate all work with subcontractors including other PSU contractors and consultants and PSU crews involved in the project.
 - b. Existing Conditions
 - i. Contractor to field-verify all existing conditions including, but not limited to, dimensions prior to fabrication and installation.
 - ii. For all existing structures for which concrete test data is not available, testing of existing concrete strength is required.
 - c. Verify/Protect Existing
Prior to starting field work, contractor to verify and document all existing conditions including compiling digital photographs. Contractor to protect



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existing building, property, structure, and utilities from damage, and replace to existing condition if damaged during construction.

- d. Recycling Plan
Contractor to complete and submit the Pre-construction recycling plan/applications as required by the City of Portland and provide a copy to CPC PM. For additional requirements refer to Section 01.C.2 of the Technical Design Standards
- e. Safety During Construction
Contractor to provide building safety for tenants and pedestrians to include complete fire, fume, dust, noise control, protection, and temporary signage as required during construction. For additional information, please refer to Appendix 01.3 - Environmental Health & Safety.
- f. Noise/Quiet Hours
Contractor to conform to all quiet hours required for tenants by CPC PM and noise requirements for the City of Portland.
- g. Installation
All equipment, appliances, furnishings, cabinets, and product items to be installed according to manufacturer's specifications and recommendations for installation, and to meet all codes for a finished workable product assembly which includes ADA, structural, fire, and safety regulations.
- h. Clean-up
Contractor to provide for complete cleanup of work site at regular intervals. For additional requirements, please refer to Appendix 01.1 – Division 01.
- i. Project Completion Quality
All work shall be completed to provide a new, clean, patched, repaired, painted or finished, working and watertight installation per industry standard for Institutional Facilities. Include finishing /cleaning of carpet, walls, ceilings, equipment, exposed mechanical/electrical items, fixtures and furnishing, and final treatment of floors.
- j. Final Working Installation
Contractor to reconfigure and reconnect existing and new items including utilities, controls, detectors, alarms, exit lighting, strobes, electrical lights, power, switches, mechanical diffusers, ducting, sprinklers, data, plumbing, water, sewer, and venting for a complete working installation.

B. Regulatory Requirements

All Design and Construction shall conform to the most recent adopted laws, codes, rules, ordinances, amendments, requirements, as well as Environmental and Waste Management regulations for all pertaining Government jurisdictions, University authorities, and documents including but not restricted to the following:

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1. 2014 Oregon Structural Specialty Code and all updates
2. City of Portland Codes and Ordinances
3. State of Oregon Codes and Ordinances
4. 2010 ADA Standards for Accessible Design
5. EPA (Environmental Protection Agency)
6. Oregon Department of Environmental Quality
7. Oregon Occupational Safety and Health Administration
8. The Portland State University General Conditions for Public Improvement Contracts
9. SHPO State Historical Preservation Office.
10. Technical Design Standards, Portland State University
11. Portland State University Environmental Health and Safety (EHS) Standards
12. PSU Physical Facilities Space Planning and Inventory Manual – PSU Office of Campus Planning and Design.
13. Contract Documents.
14. City of Portland Parks and Recreation Urban Forestry Divisions
15. Oregon OSHA Hazard Communication Standard




C. Sustainable Design

1. Standards of Performance
 - a. Portland State University (PSU) is committed to economic, social, and environmental sustainability. That commitment is acknowledged through our preference for sustainable products including those that are made from rapidly renewable resources, durable, non-toxic, manufactured and sourced locally, harvested sustainably, contain a high percentage of post-consumer recycled content, are comprised of recyclable components, and verified as a sustainable option through industry guidelines or third party organizations such as: Carpet and Rug Institute's Green Label program, Forest Stewardship Council (FSC), Energy Star, or Green Guard.
 - b. Portland State University requires all major new construction and renovation projects to achieve LEED Gold minimum certification through U.S. Green Building Council under the most current version of LEED. All other new construction and renovation work shall incorporate LEED and other sustainable design philosophies to the greatest extent possible.
 - c. In accordance with PSU's Climate Action Plan (Appendix 01.4), materials with low "embodied emissions", the emissions associated with the extraction, production, transport and use of a given product, are strongly encouraged. Where possible, PSU seeks Environmental Product Declarations and Health Product Declarations for materials which outline life cycle and Health related impacts as well as sustainable attributes.



2. Waste Management

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- a. All decisions regarding waste, recycling, and compost containers, placement, and/or design of storage areas for indoor or outdoor waste receptacles require approval by and input from the Waste Management Coordinator in the Campus Sustainability Office.
 - b. Recycle construction materials per City of Portland standards and in accordance with a LEED certified waste management plan for major remodel and construction projects. Complete and submit the Pre-construction recycling plan/applications as required by the City of Portland. All landfill and recycling weight tickets and/or hauler invoices should be copied and routed to PSU CPC PM and Waste Management Coordinator to verify waste management methods and include totals in PSU's diversion rate.
 - c. Minimize waste as much as possible by using the four preferred strategies to waste reduction, in this order: source reduction, reuse, recycling, and waste-to-energy.
 - d. Ensure inclusion of approved indoor infrastructure, waste storage dock, or containment bay for all waste management activities. Selection, placement, and sizing of compactors and waste containers will be determined by the Waste Management Coordinator. These spaces will also prioritize proper ventilation and odor control strategies. Additionally, input from operational and service provider stakeholder groups (e.g. custodial services and waste haulers) will be sought during the design process. Coordinate with PSU CPC PM and Waste Management Coordinator.
 - e. For Projects that generate light ballasts and lamps containing polychlorinated biphenyl and mercury; or other hazardous waste contact EHS.
-  3. Sustainable Products / Material Handling / Sustainable Design
- a. See Appendix 01.11 Healthier Buildings for additional best practices.
 - b. Daylighting shall be the primary lighting strategy with electric lighting supplementing, as needed. Design for daylighting harvesting in as much of the building footprint as possible.
 - c. All new light fixtures/ lamps to be energy efficient, LED fixtures, and contain low levels of mercury (refer to Electrical Section 26.B).
 - d. Lighting installations must meet or exceed Oregon Energy Code.
 - e. No urea-formaldehyde resins or adhesives permitted.
 - f. To every extent possible, materials and adhesives to avoid the “Red List of Chemicals and Materials” as designated by the [International Living Building Institute](#).
 - g. All fixtures and appliances should be as water efficient as possible, be [WaterSense](#) certified where applicable, and should assist in achieving Water Efficiency credits in the LEED rating system
 - h. Include at least one bottle refill station on each floor in new construction and major renovations and in conjunction with other remodels where

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feasible. Bottle refill stations may include combo bottle refill station and drinking fountain, retrofitted kits for water fountains, or other solutions that allow users to easily refill water bottles (see division 22-Plumbing section C.2 for preferred products).

- i. All electronics and appliances shall be Energy Star rated and EPEAT certified as applicable.
- j. All materials and finishes should contain the highest percentage of recycled content wherever possible, including concrete, carpet, tiles, flooring, paint, etc.
- k. Carpet tiles are to be used wherever carpet is necessary or requested.
- l. Locally and regionally sourced finishes and materials within 500 miles are encouraged.
- m. Coordinate all work including discovery, demolition, removal, or storage of hazardous or environmentally sensitive materials with PSU EHS and CPC PM.
- n. Use materials from salvaged sources, where feasible and appropriate.
- o. Use finishes such as flooring or millwork materials from rapidly renewable sources whenever possible.
- p. Use certified wood, wood finishes, or wood products that are considered to have environmental qualities that meet or exceed those of FSC certification whenever possible.
- q. Select paints, coatings, sealant, adhesives, composite wood, carpet, and agrifiber products that have low or zero VOC content.
- r. Use a natural linoleum over vinyl composite tile or other sustainable flooring options (recycled rubber flooring, etc.) whenever possible.
- s. In cases of renovation, consider salvage and reuse of existing hardware and structures wherever possible. Work with community partners to salvage architectural materials that are usable but not able to be reused on site.
- t. Consider maintaining-in-place existing products in lieu of replacing with new if in good condition.
- u. Choose high-speed energy efficient hand dryers over paper towel dispensers in all restroom facilities.
- v. Choose paper towel dispenser over hand dryer in a single stall restroom.
- w. Preserve and/or integrate green space and tree canopy wherever possible. Refer to City of Portland Parks and Recreation's Urban Forestry Division's list of recommended species and The Campus Tree Care Plan (Appendix 32.1).
- x. Develop and implement a tree protection plan during construction phase. Refer to SECTION 32 – EXTERIOR IMPROVEMENTS and the attached Tree Care Plan for details
- y. Implement storm water controls during the construction phase and include storm water management infrastructure in design of campus spaces.
- z. Choose drought tolerant and regionally appropriate landscaping that is suited for existing climate and future climate changes. Choose

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landscaping that is biologically diverse and provides habitat for natural pollinators.

- aa. Incorporate metering and sub-metering standards set by PSU. See division 23 Heating, Ventilating, and Air Conditioning and division 26 Electrical for more information.
- bb. All retail space utilities shall be metered. Natural gas and electrical utilities shall be metered by the utility company. Water, chilled water, and heating water utilities shall have flow meters installed for each retail space and cumulative flow rates shall digitally report to the University's DDC control system. See division 23 Heating, Ventilating, and Air Conditioning and division 26 Electrical. All Retail tenant space to have their own utility services or sub meters tied to PSU's Building Automation System for monitoring.
- cc. Where applicable, the use of permeable pavers is encouraged.
- dd. In new construction, the incorporation of visible, usable, accessible to occupants, and maintainable green roofs must be pursued and implemented when operationally and financially feasible. In major renovations, this design strategy should also be considered. Green roofs shall meet ecosystem services such as habitat promotion, filtration capabilities, and run off mitigation. Green roofs shall be designed to have limited irrigation requirements. It is preferred that all green roofs are provided with an integral handrail.
- ee. Hand dryer's shall not be recessed and shall be installed with splash plate.
- ff. To every extent possible, products with EPD'S should be selected. All new projects pursuing LEED certification should pursue MR credits Option 1 – Material Ingredient Reporting and Option 2 – Material Ingredient Optimization points.
- gg. When renovating existing buildings, explore opportunities to add bird friendly glazing with a frit or film. Where windows are not being replaced, the addition of a film should be considered. In all cases, if the pattern is visible to the human eye it should support the architectural expression of the building

D. Existing Conditions and Environmental Assessments



1. Topographical Surveys

- a. Match all new work to existing survey maps to provide topographic continuity.
- b. Represent all 1-foot ground surfaces on the drawings by means of contours and spot elevations. Show spot elevations at all tie-in locations.
- c. Note all ground floor elevations of existing buildings and slab structures on the drawings to the nearest hundredth of a foot.



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- d. Verify and show all storm and sanitary sewer inlet and outlet invert elevations at manholes by field measurement as well as grated elevations. Show underground storm, water, and sanitary pipes.
- e. Identify all buildings shown wholly or partially on the finished drawings by name and accented by shading or crosshatching. In tabular form show all major building corner coordinates.
- f. Field-locate, record the location, and identify on map, all surface improvements, and natural conditions.
- g. Field-locate all trees and major vegetation and record location on the map. Identify tree size and type on the map. (Protect existing shrubs, trees, and lawn areas during the progress of fieldwork; under no circumstances will their removal be permitted.)
- h. Locate all tunnels and manholes, and show floor elevation of tunnels and tunnel coordinates.
- i. Include a general vicinity map, small scale, on the finished drawings. The University will furnish appropriate background.
- j. Provide to the University an electronic copy of each file in AutoCAD, PDF, and one physical copy of the drawing. Provide typed labels completely identifying the contents of each disc.
- k. Prior to construction all sanitary and storm laterals surrounding the project area shall be inspected via camera. Coordinate who will be conducting inspection with PSU CPC PM.

2. Demolition

-  a. Where feasible, coordinate and practice “deconstruction” instead of demolition. Deconstruction refers to the dismantling a building where reuse, recycling, and salvage are maximized instead of clearing a site by the most expedient means.
- b. Remove existing walls, doors, frames, finishes, electrical, mechanical, and other building items as required to accommodate new construction.
- c. Remove all abandoned mechanical, electrical, and plumbing lines.
- d. Verify and protect all existing structure. Protect existing lobby areas, restrooms, and elevators. Protect gardens and soils
- e. Generally, the abandonment of existing equipment and material in place is not acceptable. Abandoned systems become a liability since it becomes difficult to determine what is active and what is not. The correction of existing underground utility problems and removal of abandoned underground utility features, while maintaining the operation of the building, should all be addressed in the contract documents. Immediate disposal of removed materials shall be required.
-  f. Salvaged materials – well in advance of project launch, work with CPC PM and Waste Management Coordinator to walk premises and identify items which may be reusable by PSU or community partners. Management Coordinator. Arrange to have them moved to a location to be identified by PSU CPC PM.

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- g. At the beginning of any remodeling work, cover all return air grilles with filtering material to prevent accumulation of dust in existing duct system.
 - h. PSU Post Demolition Certification shall be completed at conclusion of all demolition work (Appendix 01.10).
 - i. Coordinate all work including discovery, demolition, or removal of hazardous materials (including asbestos lead and silica) with PSU EHS and CPC PM.
3. Air Assessment 
- a. Installation of equipment that produces air emissions, such as paint spray booths and bag filters, may require a "Notice of Intent to Construct" from Oregon Department of Environmental Quality. For further information, contact PSU Environmental Health & Safety (EHS) at 503.725.3738.
 - b. Take precautions to prevent visible dust emissions; water trucks and street sweepers, for example, may be required. For further information, contact PSU EHS at 503.725.3738.
 - c. Prevent odor emissions that could result in complaints and compromise indoor air quality. When odor is unavoidable, communicate in advance the cause and timeline to those potentially affected and coordinate with PSU's EHS and CPC's PM.
4. Asbestos and Lead–Assessment and Remediation
- a. All state and federal requirements to be followed as well as any PSU specific requirements. Refer to provisions in the Environmental Health and Safety Specifications and Documents (Appendix 01.3).
 - b. Signage to be placed on building material that is known to have ACM but was not abated as a part of the project.
5. Mold Assessment, Remediation and Restoration 
- a. Assessment
Discovery and Analysis:
 - i. Upon discovery or question of possible mold material, notify the PSU CPC PM and EHS immediately. Areas of the suspect material shall be posted, isolated, and avoided. Safety and containment procedures shall be initiated.
 - ii. EHS will initiate preliminary observation and testing as required to determine nature of the material.
 - iii. In coordination with the PSU CPC PM, EHS will contact an approved and certified testing lab to observe, test, and provide a prompt analysis report of sample materials from site, if applicable.
 - iv. Results of Lab report with analysis and recommendations will be reviewed by PSU. EHS will provide recommendations to the PSU CPC PM, including safety precautions for all project personnel, visitors, and surrounding public.

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v. A separate consultant and report may be required to determine the cause of the mold for purposes of incorporating into final restoration.

b. Remediation and Restoration

Process of Notification, Removal, Treatment, Cleaning, and Build-back.

i. Upon instructions to provide remediation by EHS, the PSU CPC PM shall notify the Contractor appropriately with regards to possible changes to the Contract due to mold remediation requirements.

ii. The PSU CPC PM may elect to retain a remediation contractor outside the project Contract or retain the project Contractor to provide services including remediation specifications, demolition work, remediation work, build-back restoration work, and coordination with existing and on-going project contract work and timeline.

iii. Required safety and containment precautions shall be initiated, including personal protective equipment.

iv. Contractor shall isolate remediation area from remainder of project and remove mold material.

v. Air handling, drying, and monitoring shall be scheduled and contained.

vi. Areas of remediation shall be cleaned and treated with EHS approved materials and methods.

vii. The Testing Lab shall review the remediation areas in a timely manner and provide analysis to determine schedule of build-back restoration. Recommendations shall be given to PSU and EHS and issued to the PSU CPC PM to safely start the Contractor's build back restoration of the remediated areas.

viii. Build-back restoration of remediation area shall include correction of cause of mold.

6. Water Remediation



a. Construction projects sometimes generate wastewater, which must be disposed of properly and in consultation with EHS, BES Disposal Permit maybe required. Two common activities that generate wastewater are Masonry Cleaning and Potable Water Flushing. For more information about wastewater disposal, call EHS at 503.725.3738.

i. Concrete & Masonry Cleaning

ii. Only wastewater from water-only washing of surfaces that do not contaminate the wash water may be discharged to storm drains. Contact EHS for more information before planning to discharge to a storm drain.

iii. Do not allow wastewater or rinse water to soak into the landscaping unless prior arrangements have been made with PSU's Facilities and Property Management (FPM) staff. Some landscaped areas are under a strict watering schedule to minimize plant diseases.


iv. When using cleaning products or washing contaminated surfaces, waste water must be collected for discharge to sanitary sewer. At the job site,

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berms must be set up to prevent wash water from reaching storm drains. Sweep the area to minimize the rinsing of dirt and other solids into the storm sewer.

- v. Wastewater may have to be collected and treated to meet the pH limit of 5.5-12. Agricultural lime has limited effectiveness as a neutralizer. Test the pH of the waste water after treatment and adjust treatment or disposal methods accordingly.
- vi. Lead, asbestos, and other hazardous materials cause the wash water to violate sewer discharge limits. If hazardous materials could be in the wash water, samples must be collected and analyzed for the concentrations of those materials. If the water violates local sewer discharge limits, it must be disposed of as hazardous waste.
- vii. Avoid the use of strong cleaners and solvents, which can cause the waste water to be hazardous waste even after use and dilution with rinse water.
- viii. Potable Water Flushing
 - ix. Potable water may be discharged to the storm drainage system. However, because potable water contains residual chlorine, select a storm drain at least 100 feet away from the point of use to allow chlorine to dissipate into the air before the water enters the storm drain.

7. Removal and Disposal of Contaminated Soils

-  a. Many locations on University property have the potential for soil and/or ground water contamination. Sources of contamination include industrial activities such as fuel storage or dispensing or hazardous material spills prior to University acquisition of the property. It is not uncommon to find soil and groundwater contamination where fuel stations, fuel storage tanks, heating oil tanks, emergency generator tanks, industrial activities and landfills are located. EHS will assist with the compliance of Federal and State requirements.
- b. Contact EHS immediately at 503.725.3738 if environmental contamination is discovered or disturbed.
- c. Develop a Work Plan during the design phase to address site contamination issues. Allow enough time for EHS and regulatory agencies to review the work plan.
 - i. Disposal of Contaminated Soil and Water
 - ii. Pre-plan for site contamination: Contact EHS at 503.725.3738 to discuss environmental assessments and historical information about the site.
 - iii. Hire an environmental consultant familiar with site assessment and cleanup issues. Pre-characterize soils and water for cost estimates; collect enough samples to adequately define the extent of the contamination. Address costs to sample, analyze, manage, and dispose of contaminated soil, groundwater, and storm water in the

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contract documents. Additional costs may include worker protection and environmental consulting.

- iv. All excavated materials must be contained or stockpiled on plastic sheeting and covered with plastic sheeting. Representative samples must be taken for waste designation and disposal at PSU authorized disposal sites. Analytical test results must be transmitted to EHS for waste determinations prior to disposal. If any of the wastes designate as hazardous waste, EHS will manage the containment, transport, and disposal of that waste through PSU's hazardous waste contract. Petroleum-contaminated soils are not Hazardous Waste but must be disposed at solid waste handling facilities. Solid Waste Handling Facilities classify and manage petroleum-contaminated soils by the concentration of gas, diesel, or heavy oil-hydrocarbons present in the waste. Petroleum contaminated soils above certain hydrocarbon concentrations must be thermally-treated.
- v. Contain water that has been in contact with contaminated soils in Baker tanks. Contact EHS for assistance with the proper treatment and disposal of potentially contaminated water. EHS will assist with obtaining sanitary sewer discharge permits if appropriate.

d. Cleanup Requirements

- i. EHS will assist PSU CPC PM in determining the extent of cleanup requirements, based on pre- and post-assessment data. Cleanup requirements vary from site to site and depend on the extent and location of the contamination. In some cases, removal and offsite disposal of contaminated soils is necessary, while in other cases, the installation of groundwater treatment systems may be required. In some instances, there is no choice but to leave environmental contamination behind. When environmental contamination remains at a site, the University implements institutional controls to protect human health and the environment

ii. Institutional Controls

Contact EHS for guidance on protecting institutional controls that may already be in place at a known contaminated site. Institutional controls limit or prohibit activities that may result in human exposure to contamination. They may include protective asphalt or a concrete cap over a contaminated site, a restrictive deed or covenant on the property, a vapor barrier, a vapor collection system, groundwater monitoring wells, or a groundwater treatment system.



iii. List of Contaminated Sites

Provide a list that addresses type of contamination and location

E. Facility Shell Performance Requirements

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Portland State University has a wide variety of buildings of differing architectural styles, age, and material construction. Because of this PSU does not have a single material specified for exterior treatment. When selecting materials for the exterior of all new projects the design team must consider the following when selecting these materials:

1. Materials must be durable and must be able to withstand weather and pollution with minimal maintenance. Cleaning of the surfaces once every decade with power washing is the norm. Acceptable materials include brick, concrete, and some metals.
2. Materials must be aesthetically compatible with adjacent buildings.
3. Metal elements such as trim, exposed structural elements, door, and window frames must be designed so as not to need refinishing for at least 50 years. Such metals may include aluminum, copper, and galvanized metals.
4. Materials requiring significant and constant upkeep must be avoided and are to be approved by the PSU CPC PM prior to specifying. These include items such as wood, painted metals, EIFS, and plastics.
-  5. Locally sourced materials will be given preference over materials manufactured at locations distant from the PSU campus.
6. Materials with low embodied emissions are preferred. Where possible, PSU seeks Environmental Product Declarations for materials.
-  7. All designs must make use of good architectural practices for shedding water and protecting against weather. Flashings and other design features must be the primary source of weather protection. Sealants, while important elements in good design, must not be used as the primary source of weather and water protection.
8. All roof with a slope less than 1:12 shall be designed to provide parapet or guardrail for safety. If a parapet is provided, then the top of the parapet shall be a minimum of 42" above finish surface of roof at all points. If a guardrail is provide then it should be sufficiently in-board from the edge of the roof so as not to be visible from the ground. The guardrail shall be designed as required by code. Where feasible, the roof guardrail or parapet height shall meet OSHA requirements so maintenance workers can perform their work without fall protection. Provide fall protection systems where roof guards or parapets are below required heights.
9. For all new buildings and major renovations, secured interior bike storage areas shall be required. Providing secure storage within one block of project may be considered - verify and coordinate with PSU campus' shared bike shelters plan.
10. In new buildings that include secured interior storage area, shower facilities shall also be considered.
11. PSU encourages the use of the following materials when within 10 vertical feet of a sidewalk: glazing, stainless steel, concrete and brick or other forms of masonry.
12. Fall protection should be considered when re-roofing will decrease parapet height to <42".

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F. Custodial Requirements

1. Standards of Performance

Portland State University aims to provide its facilities users with a clean, safe, and healthy environment. As such, all building design, space design, and construction shall consider the following:

a. Design Strategies

Consider design strategies that minimize building cleaning and maintenance.


- i. When possible and on a case-by-case basis, consider segregating office areas from classroom areas. Ideally, from a cleaning and security standpoint, offices should be designated to upper floors and classroom to lower floors. This allows custodial services to securely clean offices during off hours and restrict general public access.
- ii. Avoid open grid ceilings where mechanical ducts, pipes and structural members can collect dust.
- iii. If designing multi-story curtain walls, design a means for periodic structure and window maintenance and cleaning. Avoid high curtain walls where dust can collect on top of horizontal mullions and access for cleaning is restricted, or else coordinate and assure that the facility has budgeted for specialized cleaning services.
- iv. Doorless entries to restrooms are encouraged. This type of access is less prone to vandalism and other criminal activity. If restroom is located near quiet areas, discuss this strategy with PSU CPC PM and building committee.
- v. In restrooms, design hand wash area to avoid accumulation of water on floor and sink counter.
- vi. See requirements for all gender restrooms in Appendix 01.12.
- vii. Avoid locating bulletin boards behind trash and recycling containers. Residues from trash and recycling materials may stain bulletin boards.
- viii. Provide custodial closets according to design guidelines in Custodial and Storage Closets standards (Appendix 01.5). Provide electrical outlets, constant forced ventilation, and chemical dispensers' need backflow prevention.

b. Materials, products and surfaces selection

Minimize cleaning by selecting materials, products, and surface finishes that are easy to maintain. In addition, vandalism is a concern at PSU. Select materials, products, and surface finishes that are resistant to damage.

- i. Minimize finishes (e.g. ceramic tile) that require joints in areas where sanitation is a high concern (e.g. restrooms). Joints (e.g. grout) can stain and grow bacteria. Continuous surfaces are preferred.

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- ii. Select surfaces that do not stain, especially in wet areas. Avoid dark colors on surface finishes. Prefer neutral colors, see Section 09 Finishes.
- iii. Prefer flooring products that are seamless and stain resistant. Prefer dark colors.
-  iv. PSU uses Green Seal certified or comparably certified surface cleaners with no solvents. When selecting materials, products and surface finishes, consider ones that are easily cleanable with these types of cleaners.
- v. For restroom fixtures, stalls, specialties and special preferences, refer to Appendix 01.6 - Restroom Preferences and coordinate with PSU CPC PM.

G. Percent for Art Programs

1. Oregon's Percent for Art legislation guides the acquisition of the state's public art collection. The program began in 1975 and requires that all state agencies, upon legislative approval of construction budgets, subject to certain specific exemptions, must devote no less than 1% of funds for the acquisition of public-facing artwork. The Percent for Art program is administered by the Oregon Arts Commission (OAC). The PSU CPC PM assigned to manage a large PSU capital project coordinates with the Arts Commission's Visual Arts/Public Art Coordinator and the PSU liaison to the Arts Commission on the process of forming a committee, selecting, acquiring, and installing artworks.
2. Artwork is selected and commissioned by a committee that typically includes the project architect, PSU CPC PM, art professionals, community members, and stakeholders from PSU including students, faculty, staff, and administrators. Artwork for the public art collection is acquired in different ways. Existing work can be purchased or a request for proposals can be generated through an open call or by invitation. The committee reviews proposals and selects artwork or artists after a thorough discussion and evaluation process.
3. For more information about the Percent for Art program, please click here: <http://www.oregonartscommission.org/programs/public-art/percent-for-art>
4. For more information on the applicable OAR 123-475 1% for Art in Public Buildings, please click here: <https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=6900>
5. For more information on Percent for Art at PSU, please click here: <http://www.pdx.edu/pcre/percent-for-art-projects>


END OF SECTION

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Section 03 - Concrete

A. Concrete


1. General

-  a. The manufacturing process of concrete creates up to 5% of worldwide CO₂ emissions and needs to be considered when planning for the use of concrete in building design. For this reason and others, the use of recycled concrete aggregate at the highest percent possible is encouraged where appropriate and structurally allowed.
- b. All installation of structural concrete shall be designed and/or reviewed by a structural engineer.

2. Documentation

- a. Due to concrete's use as a structural component, all calculations used in the development of structural drawings shall be submitted to PSU and archived with project submittals.
- b. As-built documents, including photographs, will show accurate actual locations of embedded utilities, mechanical, electrical and plumbing chases, and other components concealed from view in finished construction
- c. As-built documents will accurately reflect the location of footings and all subsurface concrete.
- d. Environmental Product Declarations [EPD's] are required and should be provided for all concrete.

3. Products

- a. ASTM C150, Type II concrete shall be used in all subsurface and exterior applications.
- b. Unless otherwise specified in structural calculations and structural drawings, the 28 day compressive strength of exterior concrete shall be a minimum 4000 psi for sidewalks and other flatwork. Verify City of Portland requirements for public sidewalks.
-  c. All sealers and coatings for concrete slabs shall be water based low VOC LEED/Green Building Certified and compatible with future treatments.
- d. Edges of low concrete such as planter boxes and benches shall have skate-board deterrents either integral to the form of concrete or metal deterrents installed on the edge surface.
- e. The use of use of Supplementary Cementitious Materials [SCM's] should be specified with the intent to reduce the global warming potential to the greatest extent possible. Since these can impact schedule and

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performance of the concrete, these issues should be discussed during the Design Development phase.

4. Execution

- a. All Steel columns shall be supported on a level grout filled base and not directly supported on concrete slabs or footings
- b. Mechanical areas and areas susceptible to flooding shall have floor drains installed.
- c. Housekeeping pads shall have shrinkage and temperature steel reinforcement conforming to ACI 318 Section 7.12.2.1 at a minimum and be appropriately anchored to the underlying slab with steel doweling.
- d. For non-engineered applications, the use of wire mesh is discouraged in sidewalks and other exterior flat work. Preference is for well compacted $\frac{3}{4}$ "- 0" gravel base and the appropriate use of crack control scoring or saw-cuts and/or appropriately placed rebar.
- e. Exposed concrete in dust-sensitive areas such as labs shall be sealed.
- f. For penetrations into existing concrete a GPR (ground penetrating radar) scan shall be performed to determine location of existing rebar and or utilities. All efforts will be made to avoid cutting rebar/utilities with new penetrations.
- g. Concrete finish including polishing, staining, and sealing is preferred.
- h. When penetrating a concrete wall consider adding an additional hole & conduit as a spare. It shall be of a similar diameter to the one installed and have fire-stopping to temporarily seal the penetration & empty conduit as required for wall rating.

END OF SECTION

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Section 04 – Masonry

A. Masonry

1. General
 - a. All installation of masonry units and masonry walls shall be designed and/or reviewed by a structural engineer.
2. Description
 - a. The structural engineer is required to design all structural masonry. Fabricator or contractor designed details are not allowed without approval of the structural engineer of record.
 - b. The structural engineer is required to design all the structural masonry anchors.
 - c. Detail non-bearing walls to allow for vertical deflection of members above. Provide positive connection at top of wall at 4'-0" on center maximum spacing.
 - d. Detail non-bearing/shear walls to allow for seismic inter-story drift at both top and each end of walls where adjacent to structural members.
 - e. Extend vertical reinforcing up to top of parapet walls. Provide horizontal reinforcing at the top of the wall.
 - f. Provide vertical and horizontal reinforcing in CMU walls.
 - g. Provide control joints in CMU walls and expansion and contraction joints in brick walls where masonry abuts other surface materials. Joints shall be sealed to prevent penetration of water or moisture in the interior of the wall cavity.
 - h. Provide weep holes at all exterior walls or masonry cladding near the wall base every 3'-0".
 - i. All masonry shall be above grade.
 - j. Masonry units shall be obtained from a single source and/or manufacturer in order to guarantee uniform texture and color or uniform blend.
 - k. Use of stack bond is discouraged. If used for architectural reasons, provide a minimum of one vertical reinforcing bar in each stack of block, and horizontal reinforcement throughout.
 - l. Provide stainless steel thru-flashing at wall caps, window heads, ledger angles, base bearing, etc.
 - m. Provide efflorescence tests with brick submittals for approval. Contractor shall be responsible for removal of all efflorescence that appears on surfaces within 3 years of project completion.

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3. Products
 - a. Masonry
 - i. Submit samples of surface finish textures and color to be approved by PSU Project Manager.
 - ii. In remodel and addition projects, masonry color shall match existing.
 - b. Grout and mortar
 - i. Submit samples and colors for approval by PSU Project Manager.
 - ii. In remodels and additions, color shall match existing.
 - iii. No calcium chloride allowed.
 - c. Reinforcing Steel
Consider specifying reinforcing steel with a high recycled content.
 - d. Sealer
Provide sealer on all exterior masonry.
 - e. Weather Repellent
Provide water repellent coating on all exterior masonry.
 - f. Anti- graffiti coating
Provide anti-graffiti coating on all exterior masonry.
4. Installation
 - a. Prior to installation on major construction projects, provide a 48" x 48" vertical mock-up to verify selection made on submittals, design and execution of wall panel.
 - b. Storage of masonry units shall be such to avoid staining and damage of surface. Provide storage in a dry location. If units are not stored in an enclosed location, cover top and sides of stacks with waterproof sheeting, securely tied. The contractor shall be responsible for any damages that occur to the product.


END OF SECTION

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Section 05 – Metals

A. Structural Metals

1. General

- a. A structural engineer is required for the design of all structural steel framing for remodels and new construction and for all metals and fasteners used in the seismic bracing of equipment.
- b. Fabricator/contractor designed details are not allowed unless approved and stamped by an engineer or structural engineer of record on larger projects.
- c. The use of deformed steel reinforcing bars is preferred over the use of welded wire mesh in exterior concrete flatwork if steel is used at all in this application. (See Concrete Standard)
- d. All structural or ornamental exterior steel exposed to weather shall be hot dipped galvanized, aluminum or stainless steel.
-  e. Consider specifying structural steel with a high recycled content.
- f. Structural steel shall be delivered to any construction site with a factory applied coat of primer and be protected from weather until installation.
- g. Metal covered walkways shall not be used.

2. Installation

- a. All Steel columns shall be supported on a level base of non-shrinking, non-metallic grout and not directly supported on concrete slabs or footings.
- b. Housekeeping pads shall have shrinkage and temperature steel reinforcement conforming to ACI 318 Section 7.12.2.1 at a minimum and be appropriately anchored to the underlying slab with steel doweling.

B. Architectural Metals

1. General

- a. Contractor shall conform with and provide the following:
 - i. Conformance to all current standards including ASTM, AAMA, AWA, and SSPC.
 - ii. Conformance to paint or coating manufacturer's recommendations and specifications for all finish products including priming, galvanizing, painting, and coatings. All materials to be factory-primed by manufacturer, unless specified otherwise.

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- iii Submittal of LEED documentation for recycled content, distance, and VOC coating content.
 - b. Structural Engineer to review all shop drawings and welding certificates.
 - c. Stairs: Welded Metal Stairs, Treads, and Risers
- C. Stair risers are preferred for safety reason where not explicitly required by code.
- D. Stair treads with visually evident nosing or other step change indicator is required.
- a. Metal surfaces, corners, and edges should be deburred, rounded, or if no other means existed, protected with smooth edging.
 - b. When using steel pipe or tubing for railing, provide minimum wall thickness of 0.14"
2. Products
3. Architectural metals include exposed steel, aluminum, or other metal for shapes or manufactured units or products including screens, mesh, grille-work, ship ladders, railings, platforms, catwalks, and connectors.

END OF SECTION

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Section 06 – General Carpentry



A. Architectural Wood Casework

Prefer Institutional quality to meet American Woodworkers Institute specifications and standards for AWI custom grade or better, all plywood construction. Encourage use of certified wood, wood finishes, or wood products that are considered to have environmental qualities that meet or exceed those of FSC certification whenever possible.

B. Finish Carpentry

Similar to Architectural Wood Casework.


END OF SECTION

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Section 07 – Thermal and Moisture Protection

A. Roofing

1. Description

- a. Adhere to standards and details of latest editions of National Roofing Contractors Association (NRCA) handbook and the Sheet Metal & Air Conditioning Contractors Association (SMACNA) manual.
- b. Provide a minimum ¼” per foot slope to drain.
- c. Provide overflow scuppers and overflow drains per code requirements.
- d. Via PSU PM consult with EHS and FPM regarding design of fall protection systems for working on mechanical, electrical, and other rooftop items. All fall protection devices to be engineered by Oregon licensed structural engineer and must meet all code and OSHA requirements.
- e. PSU requires that the roof perimeter of all new construction projects have railings or parapets that are at least 42” high at their lowest point. Where feasible, the roof guardrail or parapet height shall meet OSHA requirements so maintenance workers can perform their work without fall protection. Provide fall protection systems where roof guards or parapets are below required heights.
- f. All Skylights shall meet the OSHA requirements for fall protection.
- g. Prior to any construction the contractor is to provide complete Material Safety and Data Sheets for all roofing components.
- h. Contractor is required to provide submittal information for all roofing products and components.
- i. The Contractor shall provide an Installer’s Warranty of at least 5 years and a Manufacturer’s Warranty of 20 years. On a project by project basis, CPC Director, FPM Director and Assistant Director of Operations and Maintenance, and Associate Vice President for Planning, Construction, and Real Estate will meet to determine any additional extended warranty requirements for roofing duration, building life, and major mechanical equipment (e.g. chillers and cooling towers).
- j. When designing a roof consider that PSU staff, faculty and students may be allowed access to the roof for the performance of maintenance and/or experiments. Work closely with PSU staff to design the roof to accommodate anticipated traffic and use via the installation of approved traffic pads.
-  k. PSU has limited resources to maintain its roofs. Select roofing material that is durable, has built-in redundancy, and requires minimal maintenance. 5-ply built-up roofing and 2 ply - SBS Modified Bituminous

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Membrane Roofing are good examples of durable roofing systems. Single ply roofing membranes will be considered on a project by project basis.

- l. If applicable, considerations should be made regarding the installation of a white roofing material.
 - m. For roofs with flat substructure provide tapered insulation to slope for drains. Minimum ¼" per 1'-0" slope
 - n. Roof hatches shall be lockable and not accessible from public areas. Ship ladders that lead to roof hatches shall have a landing where possible.
 - o. Roof anchors or other means of fall protection shall be installed to allow full coverage of roof for maintenance, including vegetated roof installations.
2. Installation
 - a. All roofing and repair work to be done by Manufacturer approved roofing contractor.
 - b. All existing material and labor warranties must be maintained when doing repair or modifications to existing roofing installations.

B. Traffic Coatings

1. Product
Traffic Coating product shall be discussed with PSU Project Manager prior to construction to ensure system meets current design intent.
2. Installation
Applicator must be certified to install coating system selected.

END OF SECTION

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Section 08 – Door, Frame, Hardware, and Window

A. Doors, Relites, & Frames

1. Description

- a. Metal doors shall be a minimum 1 ¾" thick heavy-duty, insulated, pre-primed, 16 gauge metal.
- b. Wood doors shall be a minimum 1 ¾" thick solid core with wood veneer to match adjacent or as specified, approved by PM.
- c. Provide blocking for door closers and tubular latches or mortised locksets, and panic hardware locations.
- d. All door frames and relite frames shall be 16 gauge, pre-primed, welded steel frames. All corners to be mitered, welded and ground smooth.
- e. Exterior door frames shall be galvanized or approved exterior finish.
- f. Interior door frames, at wet lab or sound proofing applications, shall be reinforced with a basecoat plaster such as Structo-lite for additional strength and durability. Knock down door frames are not allow to be use in new construction.
- g. Fire rated doors and frames shall have appropriate labeling when delivered to the job site and label shall not be painted over, covered at any point. Do not paint labels.
- h. All rooms with windows, including offices, located along the perimeter of a building shall have doors, relites, and other treatments that allow the penetration of natural light into inner spaces (e.g. corridors and inner rooms).
- i. The design of door lites and relites shall follow specifications in PSU Office Standards (Appendix 01.7) and PSU Classroom Standards (Appendix 01.8).
- j. Door lites and relites shall have a minimum ¼" thick tempered glass or other glazing as specified for doors with fire ratings.
- k. Door lites and relites coverings (e.g. blinds) shall be specified according to PSU Office Standards (Appendix 01.7) and PSU Classroom Standards (Appendix 01.8).
- l. Provide flush wood stops at exposed wood unrated doors.
- m. "Not an exit" signs should be installed where people may mistake a door for an exit. (This may be most important at doors leading to equipment rooms or similar).

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- n. Walls and floors that are within the closure path for fire curtains or fire doors shall be left clear of furniture and any other obstructions. Labels or signage may be required.
- o. Doors and hatches for roof access should not be located next to the roof edge. Roof hatches should be lockable from inside and should not be accessible from public areas.

B. Door Hardware

1. Standards of Performance

- a. All doors to be a complete and functioning, installation approved per code, City of Portland bldg. dept., and the ADA.
- b. Standard hardware finish is ANSI 626 or US26D.
- c. Supply and install all door hardware including temporary lock cylinders; temporary cores (also known as “construction cores”) to be Schlage large format interchangeable temporary cores.
- d. Deliver keys to PSU Project Manager.
- e. Coordinate with PSU all required card access control system installations.
- f. Contractor to remove, box, label and deliver all existing hardware on demolished doors, as shown on the demo plan, in coordination with direction received from PSU Project Manager.
- g. If existing office, restroom, or exit doors that remain in area of work don't have approved ADA hardware installed, then replace with new ADA lever/closer hardware.
- h. All hardware to be manufactured, specified, and installed per specifications and standards of the Steel Door Institute and Door & Hardware Institute.
- i. Review all hardware operation settings with PSU locksmith prior to final city permit inspector review.
- j. Provide to PSU Project Manager complete hardware submittal and hardware schedule on all projects for review and approval prior to ordering and construction.
- k. Provide to PSU at Closeout complete hardware instructions, operations and service manuals and warranty information.
- l. Verify existing conditions where hardware is to be installed on existing doors & frames, on existing walls, or connected to existing power or signal systems in a building.
- m. Verify electrical boxes and conduit runs as required.

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- n. Confirm doors with ADA operators have adequate mounting areas for opener, switches, latches, motors, and will clear Exit signage.
- o. Floor closers shall not be specified.
- p. All doors accessing roof tops shall have restricted access.
- q. Verify that mechanical, boiler, or similar rooms have door hardware with 'Storeroom' function for added safety and security. I.e. door is always locked from public side and always free to exit from interior of room.
- r. As designs are modified, pay particular attention to occupancy changes, such as for patios, to ensure appropriate hardware is specified for final use.

2. Products

- a. Acceptable lock type, manufacturer, and trim

LOCK TYPE	MANUFACTURER	TRIM or SPA
Cylindrical Lockset	Schlage ND W/Vandelguard	RHO or SPA
Mortise Lock	Schlage L series	06B or 17B
Exit Device #1	Von Duprin 99/98 series for Standard width Jamb	996L 06 or 17 347T EO (no outside trim)
Exit Device #2	Von Duprin 33A /35A for Narrow Width Jamb	388 or 360L-06/-17 360T EO (no outside trim)
Delayed Egress Exit	Von Duprin Chexit	996L 06 or 17 EO (no outside trim)
Dead Bolt	L series	
Electric Strikes	Von Duprin, HES	
Temporary Lock/cylinder TD	Schlage large format interchangeable core housing	
Door Closer	LCN 4040 series	
Door Opener	LCN Senior Swing, LCN 4600 Electric Auto Equalizer, LCN 4800 Pneumatic Equalizer	
Hinge, Ballbearing, NRP	Hager, Stanley, Mckinney	

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Hinge, Plainbearing, NRP	Hager, Stanley, Mckinney	
Manual Flush Bolts	Ives FB457, FB458	
Auto Flush Bolts	Ives FB30/40 series	
Drawer Lock	Olympus 888icp-dw Olympus 920 lm/dm	
Cabinet Door Lock	Olympus 777icp-dr Olympus 920 lm/dm	
Access Panels Lock Cylinders	Olympus 920 lm/dm	
Cylinders	Schlage	
Butts	Stanley, McKinney, Lawrence	
Electric transfer hinge	Von Duprin	
Key switch	Von Duprin/Schlage	
Exit devices	Von Duprin	
Locksets and latches	Schlage	
Standalone access control	Schlage AD 200 series, Schlage CO 200 series	
Astragal	Pemko	
Door Stops	Glen Johnson, Ives	
Push Pull	Builders Brass	
Kickplates	Builders Brass, Trimco	
Thresholds and weather stripping	Pemko	
Door operators (ADA)	LCN	
Automatic door sensors (ADA)	B.E.A.	
Door actuators (ADA)	BEA, LCN, Camdeu, Curran	

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Door holders	LCN SEM Series magnetic hold open, 7800 Series	
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- b. Finish
Match existing building standard or ANSI 626 or US26D, brushed chrome plate finish or similar brushed finish.
- c. Locks and Handles
 - i. Manufacturer: Schlage or approved equal
 - ii. Match existing lever style and color where applicable.
 - iii. Use Schlage "ND Vandelguard series" NDXX92
 - iv. ND80, Storeroom Lock
 - v. ND10, Passage Lock
 - vi. ND53, Entrance Lock
 - vii. ND40, Privacy Lock
 - viii. ND70, Classroom Lock
 - ix. Pocket door latch 990 series.
 - x. Exit rim and panic bar devices by Von Duprin 98 series for panic or fire exit hardware, vertical rods are not preferred on metal doors, but okay for use on wood doors.
- d. Card Access Doors
 - i. Card access systems to coordinate with existing PSU access control system in buildings and on campus. Systems to include swipe pads, transformers, electronic strikes, connection back to control panels. Coordinate hardware with PSU building access control subcontractors. Card Access system to be compatible to existing access control software.
 - ii. Strikes shall be ANSI Type 10-025,
- e. Butts/Hinges
 - i. Manufacturer: Lawrence, Stanley, McKinney or approved equal
 - ii. Hinges to be concealed ball bearing type in public areas, standard ball bearing hinges in utility-type areas, non-removable pins, 4 1/2", and brushed chrome plated brass or steel (use brushed SS at exterior & high humidity locations). 3 hinges per door unless 4 are recommended by mfr. due to size, weight, or frequency of use.
 - iii. All other doors, use plain bearings, (3) hinges per door, min. with non-removable-pin.
 - iv. Ball bearing hinge are required where door openers and closer are installed.
- f. Door Stops

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- i. Manufacturer: Ives, Glen Johnson or approved equal
 - ii. Wall mount type WS 407 - 2-1 /2" dia.
 - g. Smoke Gaskets
 - i. Manufacturer: Pemko or as approved equal.
 - ii. AM 88, black, at all doors where required by code.
 - h. Bi-Fold Hardware
 - i. Manufacturer: Bi-Fold Hardware, Johnson, or approved equal
 - ii. Use complete hardware model #200 FD including track, pivots, butts, ball bearing roller guides, and brackets.
 - iii. Door handles -- 7" wire pulls Baldwin or approved equal
 - i. ADA Power Door Opener
 - i. Manufacturer: Preferred LCN Senior Swing. LCN 4600 Electric Auto Equalizer, LCN 4800 Pneumatic Auto Equalizer or approved equal.
 - ii. Complete electric opener mounted at interior of exit doors to include ADA logo actuator buttons at each side of door - coordinate with key card access at exterior. Retro-fit for ANSI 10-025 electric strike. Actuators ADA wall mount each side of door. Satin chrome finish or brushed aluminum finish UON.
 - iii. ADA buttons to be hardwire in new construction.
- 3. Execution
 - a. Install all hardware per manufacturer's installation instructions, templates, and recommendations.
 - b. For installation of locks, use manufacturer's fasteners that come with the hardware.
 - c. For installation of door closers, use manufacturer's wood/metal fasteners pack; **do not use self-tapping sheet metal screws.**
 - d. For electric locks, supply a wiring and a schematic diagram, show locations of power supplies and wire runs.
 - e. Spring hinges and continuous hinges not allowed.
 - f. Prefer door assembly installation of welded 16 gauge door frames for break-in deterrent.

C. Exterior Windows

- 1. When renovating existing buildings with a significant extent of exterior glazing, consider adding a bird friendly film to existing glazing. Where patterns are visible to the human eye, they should support the architectural expression of the building.
- 2. When working on historical buildings, windows shall be replaced to match existing.

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3. Energy efficient windows should be specified to conform to the minimum requirements of the Oregon Energy Code and have thermal pane glazing units, low-e coating, sun control glass or tinting as appropriate for energy efficiency and daylighting concerns in the design.
4. Windows shall be accessible for cleaning & maintenance. For hard to access windows, accommodations shall be made, or building elements installed, in order to make window cleaning and maintenance to be performed safely.
5. First floor operable windows shall have security screens.







END OF SECTION

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Section 09 – Finishes

A. Standards of Performance





PSU has several key goals when approving and specifying flooring & paint materials. These goals are:

-  1. Finish products must be easy to maintain and clean. No special cleaning or proprietary maintenance products must be required. It is preferred that installed materials do not need to be waxed or sealed or otherwise treated to maintain a clean look.
-  2. Durability is of prime importance. All finish products must be appropriate to the use of the space.
-  3. All materials and finishes should contain the greatest percentage of post-consumer recycled content as possible, including concrete, carpet, tiles, flooring, paint, etc. Use finishes such as flooring or millwork materials from rapidly renewable sources whenever possible. In addition, specified finish products (e.g. flooring) should be recyclable at the end of their life.
-  4. Where possible locally manufactured products should be used.
-  5. Paints, coatings, sealant, adhesives, composite wood, carpet and agrifiber products must have low or zero VOC content.
6. PSU will consider the installation of new products on the market if they meet the above criteria. If new products on the market are proposed, the benefits of using these products must be fully documented and may be installed only if approved by PSU Project Manager.
-  7. To the greatest extent possible, avoid using chemicals, adhesives & materials that are included on the “Red List of Chemicals and Materials” as designated by the International Living Building Institute.
<https://ilbi.org/lbc/LBC%20Documents/LBC2-0.pdf>



B. Flooring

-  1. Description
 - a. Flooring products should be easy to repair or replace. Modular tile products are preferred where applicable.
 - b. Walk-off carpet in sheet or tile format shall be considered at main building entries.
 - c. Walls and floors that are within the closure path for fire curtains or fire doors shall be left clear of furniture and any other obstructions. Labels or signage may be required.
2. Products
 - a. Carpet
 - i. In general, carpet materials shall be kept to a minimum.

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-  ii. Carpet and adhesives should be certified by the Carpet and Rug Institute's Green Label program.
 - iii. Carpet should never be used in the following locations:
 - Laboratories
 - Restrooms and kitchens
 - Stairwell
 - iv. In all other spaces, carpet may be used upon approval of PSU Project Manager.
 - v. Where carpet is approved, modular tiles are preferred where applicable. Sheet goods are preferred at stairs when specified.
- b. Walk Off Carpet
At building entry ways, consider durable walk off carpets designed to collect dirt and moisture from foot traffic. A length of 10'-20' in the direction of travel is preferred. Use of sheet goods is acceptable; modular tiles is preferred where heavy wear may require replacement of individual tiles. Use of formed walk off mats should only be used to extend a walk off area during heavy weather and not as a permanent or long term solution. Typical products may include Forbo-Coral Brush or similar.
- c. Resin Floor
Prefer epoxy flooring, cove bases, and wall systems in restrooms. Manufacturers include Silikal, Stonhard or approved equal.
- d. Sheet Flooring
-  i. Natural Linoleum and other sustainable sheet products are preferred in the following locations:
 - Areas where food and drink are served or allowed
 - Elevators, entryways or vestibules
 - Wet lab locations
 - Kitchens and kitchenettes
 - Corridors and Hallways
 - Classrooms
 - ii. Avoid linoleum in high-use restrooms, unless approved by PSU project manager
 -  iii. Avoid vinyl based products unless approved by PSU project manager. (eg VCT, LVT)
-  e. Rubber Flooring
Rubber flooring is acceptable throughout facilities with exception of restrooms. Prefer rubber product with recycled content. Prefer dark color. Manufacturers include Nora Flooring or as approved by PSU Project Manager.
- f. Tiles and other refractory (e.g. brick, clay or terracotta tiles) materials
- i. Tiles and other refractory materials are preferred the following locations

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- Kitchens
- Entryways and vestibules
- ii. Do not use ceramic and clay tiles in restrooms, unless approved by PSU Project Manager. Stone and terrazzo flooring
- g. Stone and terrazzo flooring
Stone and terrazzo flooring may be used only if approved by PSU Project Manager.
- h. Wood Flooring
 - i. Wood should only be used in areas where wood is required by specific needs such as:
 - Sports, dance or other recreational spaces
 - Where matching adjacent wood flooring materials as may be present in residential units
 - ii. Wood flooring is to be used only when specifically approved by the PSU Project Manager.
 -  iii. In all locations where wood is used, FSC Certified wood products are preferred wood, unless approved by PSU Project Manager.
- i. Concrete Flooring
 - i. Exposed Concrete flooring (regular or colored) are acceptable in high traffic areas (e.g. hallways).
 - ii. Avoid use where there is a potential for heavy staining or chemical exposure.
 - iii. Exposed concrete shall be sealed with an anti-stain coating or sealer and have seams sealed with epoxy or similar materials.
 -  iv. The use of recycled concrete aggregate or other recycled ingredients, such as fly ash, is encouraged when available.
 - v. If concrete flooring is used, it needs to be burnished or polished. Concrete finish including polishing, staining, sealing should be considered by project & situation.
 - vi. Concrete may also have an epoxy coating.
- j. Wall Base
 - i. 4" coved rubber base is preferred in all locations except as noted below. Rubber base shall be grey or brown in color unless the PSU Project Manager approves otherwise. Vinyl base is not permitted.
 - ii. 4.5" or 6" rubber base is allowed in locations where existing base has been removed and 6" base is required to cover wall damage or to match existing higher materials.
 - iii. 6" rubber base is to be used in kitchen, restroom and other wet areas or areas that receive frequent wet mopping.
 - iv. Ceramic tile base is to be used in conjunction with ceramic tile flooring installations.
 - v. Wood base is to be used only when matching existing wood base or upon approval of the project manager.

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- vi. With sheet flooring at wet areas, the sheet should be covered up the wall 4"-6" and capped.
- vii. With epoxy floor coatings such as Silkal, Stonehard, or similar, coating shall be used to form the wall base and be contiguous.
- k. Exceptions
 - i. Exceptions to the above flooring installations must be approved by the PSU Project Manager. Some examples of possible exceptions are:
 - ii. When matching an existing installation.
 - iii. Special uses such as in anti-static flooring situations, for special labs, clean labs, machine rooms, etc.
 - iv. Unavailability of alternative product options

C. Other Surfaces

1. Products

a. Solid Surfaces

Solid surface materials are encouraged for use at areas requiring durable, maintainable, heat & chemical resistant surfaces. Materials include: plastic resin solid surfacing, quartz sheet, concrete, stone or granite - available in sheets or tiles. PSU project manager to determine appropriate use.



b. Plastic Laminate

Plastic laminate is approved for use at dry areas or low use wet areas for counter tops, vertical surfaces, and wall panels. Not for use with undermount sinks. Specify durable core material appropriate to the use. FSC and Greengard certification preferred.

c. Stainless Steel

Where specifying stainless steel surfaces, specify satin or brushed finish. High polished finishes can stain and require increased maintenance.

d. Wood

Wood finish doors tend to get dirty around handles and locks areas. When wood finish doors are specified, specify protective coating to facilitate cleaning.

e. Ceramic Tile

Any ceramic tile installation shall be discussed with PSU Project Manager for approval.

f. Metal surfaces, corners, and edges

Metal surfaces, corners, and edges should be deburred, rounded, or if no other means existed, protected with smooth edging.

D. Paint

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1. Description



- a. All paint must be low or no VOC products. VOC level to be 50 g/L or less.
- b. Interior Paint Finish: Satin finish at high traffic, common areas (Restrooms, Hallways) Eggshell at general areas. Satin or Gloss finish in other areas as approved.
- c. Exterior Paint Finish: Satin finish and/or semi-gloss at exterior as appropriate.
- d. Dry erase wall paint finish where specified to include adjacent washable surfaces. A clear line or color change at dry erase areas should be included to denote surface change.
- e. Provide first coat of primer/sealer or self-priming paint for new gypsum board.
- f. Provide 1-2 finish coats in color & sheen specified.
- g. Label surplus paint: At a minimum, Contractor shall clearly label surplus paint products with: Date, location of use, brand, color name or code, paint type, sheen, & formula if available.
- h. Provide washable paint surfaces adjacent to dry erase marker boards in classrooms, Conference rooms, and study areas. Coordinate finishes with location of dry erase boards or painted dry erase wall areas.
- i. The use of intumescent paint shall be avoided. Confirm with Project Manager.

2. Products/Location

- a. Manufacturer
As noted or approved equal by PSU Project Manager.
- b. Products (Type and Location):
 - i. Clear coatings
Manufacturer: Target Coatings, Inc., Minwax, Old Masters, and Howard.
 - Emtech EM6000 WB Water based acrylic lacquer, Satin or Semi-gloss. Designed to replace flammable nitrocellulose-based finishes on furniture, cabinet, interior architectural and custom woodworking applications.
 - Emtech EM8000cv WB Pre-catalyzed waterbase conversion varnish for an Ultra-low VOC, HAPS-free, water-reducible, one part coating system.
 - Minwax: Polyurethane satin or semi-gloss.
 - ii. Primers
Manufacturer: Zinsser, Corrseal, Rust-Oleum, and Miller.

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- Zinsser: Water base Drywall Primer, low VOC, for new drywall
 - Zinsser: B-I-N Advanced Synthetic Shellac Primer White
 - Zinsser: Odorless Oil-base stain blocker, primer, low VOC, seals stains from water, smoke, & fire damage.
 - Zinsser: Cover-Stain, Oil-base Primer, odorless.
 - Zinsser: Gardz problem Surface Sealer.
 - Corrseal: Rust conversion to metal water-base.
 - Miller: Builder prep-coat primer for drywall: Miller Exterior paint Acro-lite, Evolution, and Satin Sheen.
 - Miller Paint: Builder acrylic primer or similar as appropriate to base materials.
 - Zinsser: B.I.N. Interior Multi-purpose, advanced synthetic shellac primer, sealer, stain blocker, White or Clear.
 - Rust-Oleum: various primers for metal and wood
- iii. Wall Finish, Gypsum Board
Manufacturer: Miller Paint “Acro-Pure” satin, low VOC, PPG Rust Oleum, and approve equal.
- iv. Specialty
Manufacturer: PPG, Rust-Oleum, Sherwin Williams, and approve equal.
- PPG: Deft Polyurethane water based for wood surfaces.
 - PPG: Deft lacquer nitrocellulose, sanding sealer, and finish brushing lacquer for clear wood finish coats.
 - Dry Erase Walls: Rust-Oleum Specialty, Dry Erase Paint kit, water based 2-part Polyamine Epoxy Blend.
 - High Temp: Sherwin Williams: Silver-Bright Aluminum Paint, Oil-based, high heat to 400F such as for heat radiators.
- v. Prep-paint.
Manufacturer: Jasco, Simple Green, and approve equal.
- Jasco – TSP Substitute, no-rinse one-step formula for surface prep before painting.
 - Simple Green, all-purpose cleaner
- vi. Exterior Paint
Manufacturer: Miller and approve equal.
- Miller Paints: Evolution 100% Pure Acrylic Exterior Coating
 - Miller Paints: Acrimax, exterior waterborne acrylic coating.
 - Miller Paints: Acrimetal DTM rust inhibitive exterior acrylic coating for metal or tight rusted metal as primer/finish.
- vii. Interior Paint
Manufacturer: Miller, PPG, and approve equal.

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- Miller Paints: Acro-Pure, ultra-low VOC acrylic, water based
 - PPG: PPG Break-Through 50. Ultra-durable, water-borne acrylic interior/exterior paint, for wall & door trim, plastics, wood and concrete floors. Low VOC, low odor.
- viii. Painted Metal Doors, and Metal Door & Relite Frames
100% Acrylic for use on metal, PPG “Break-Through” or as approved by PSU Project Manager, water base, satin sheen. Primer and (2) finish coats. Must be cleanable VOC level spec 50 g/L.
- ix. Dry Erase Walls
Rust-Oleum Dry erase water based, 2-part urethane or other manufacturer as approved by PSU Project Manager. Water based preferred over high-VOC oil based products.
- x. Interior Wood Clear Finish
Miller Paint “Nu-Wave” or as approved equal, water based, satin sheen, clear natural coating for wood; (4) coats.
- xi. Interior Wood Finish & Stains
Manufacturer: Target Coatings, Minwax, Old Masters, Deft, and approve equal
- Minwax: oil stains.
 - Old Masters: Gel Stain for nonporous surfaces and wood.
 - Deft lacquer nitrocellulose for clean coats.
 - Minwax: Polyurethane satin or semi-gloss.
- xii. Linseed Oil
Valspar or as approved by PSU Project Manager.
- xiii. Wood floor coatings
Natural clear coating, brush applied, water based polyurethane.
Products: Impax epoxy floor coating, Bona, Mega Seal WB, Varathane, and Deft or approved equal.
- xiv. Parking Stripes and Painted Signage on Parking Deck
Miller Paint, Setfast Waterborne pavement marking paint, or as approved by PSU Project Manager.
- xv. Paint Colors
The following paint colors are approved PSU colors. Wall and ceiling colors must be limited to these, unless approved by PSU Project Manager.
- Beryl Pearl 0509W
 - Composed CW048W
 - Apple Peel CW030W
 - Crystal Ball 0158
 - Wafer E0119

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- Sterling Coin E0159
 - Burbury Beige E0118
 - Popular E0140
 - Fossil 0152
 - Hot Chocolate 0145
 - Thai Silk 0107
 - Deep Waters 0025
 - Spring Tulip Red 0101
 - Cupola Yellow 0076
 - Savannah 0059
 - Caliente 0097
 - Hazel 0024
 - Alfalfa Sprouts 0054
 - Serenity 0045
 - Haven 0046
 - Tranquil 0036
 - Aloe 0058
 - Showers 0030
 - Temper 0005
 - Rapids 0017
 - Pale Organza H0018W
 - September Leaf 7744M
 - Lil Melon 06M1909
 - PSU Green 06M2612
 - PSU Accent Green 583U
 - PSU Brown 469U
 - PSU Sienna 1675U
 - PSU Red 173U
 - PSU Orange 7408U
 - PSU Yellow 460U
 - PSU Tan 7502U
 - PSU Gray 7497U
 - PSU Purple 261U
 - PSU Blue 7468U
 - PSU Light Blue 629U
- xvi. Paint Accessories: Interior Joint Sealers
Silicone GE, Dow, DAP or as approved by PSU Project Manager. Use sanitary type in bathrooms.
3. Installation
- a. In all cases paint to be applied with primer and minimum two finish coats of final paint color & sheen.

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- b. Paint all areas/surfaces that are part of renovation or new work. At patching and tie-in work, extend new paint to nearest corner of wall.

E. Metal Stud/Walls & Partitions

1. Description

- a. Prefer min. 20 gauge x 3- 1/2" wide metal studs at 16" on with 5/8" Type X gypsum board on each side.
- b. It is standard PSU practice to acoustically insulate all new walls and partitions with Roxul or approved equal batt insulation to match wall thickness. Verify acoustical insulation requirements according to room use (e.g. offices, classrooms, bedrooms) and consult with project architect or engineer for additional sound attenuation measures. Follow guidelines in ANSI S12.60-2002, "Acoustical Performance Criteria, Design Requirements and Guidelines for Schools" and LEED.
-  c. The use of modular wall systems such as demountable wall surfaces are allowed and must be discussed with PSU Project Manager before specification.
- d. Acoustic treatment shall be durable and repairable within the touch zone uses of perforated gypsum board is prohibited.
- e. Add corner guards at high traffic locations.

1. Location

- a. Standard Common Walls.

END OF SECTION

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Section 10 – Signage, Specialties, and Furniture

A. Exterior Signage

1. Description

- a. Conform to PSU Campus Planning Office requirements (Appendix 01.7).
- b. Precision fabricated from sheet or plate in the thickness and sizes indicated on drawings. Edges shall be square to face of letter and free from cut marks or other imperfections. Corners and kerfs shall be square, or as indicated on the drawings.

2. Location

All campus property.

3. Installation

a. General

- i. Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
- ii. Locate signs and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer instructions. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance. Notify PSU Project Manager of installation conflicts.
- iii. Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
- iv. Install per manufacturer guidelines, preserving manufacturer warranty where applicable.

b. Mechanical Fasteners:

- i. Install signs securely to wall with fasteners and anchoring devices. Do not use metals which are corrosive or otherwise incompatible with metals joined.
- ii. Fastening devices between dissimilar materials shall be 300 Series non-magnetic stainless steel.
- iii. Material: Galvanically compatible with adjacent materials.

c. Adhesives:

Generally low or no VOC adhesives.

i. Very High Bond (VHB) Adhesive

3M Company, product as recommended by manufacturer appropriate for type of use, materials, and fabrication. 3M 4941 VHB is appropriate for most wall mounted signs on painted

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surfaces or glass. Use 3M product as specified for mounting signs to smooth, non-porous surfaces as indicated on the drawings. Do not use this method for vinyl-covered or rough surfaces.

- ii. Foam Tape
Double faced pressure sensitive foam tape, 3M Company, or equal.

4. Material Standards

- a. Refer to CPO Signage & Wayfinding Standards appendix or approve by CPC PM.
- b. Polished Bronze letters on Charcoal Granite
- c. Painted Wood
- d. Fabric
- e. Stainless Steel Cut Letters with Brushed Finish
- f. Anodized Aluminum with Clear Satin Finish
- g. Pressure Sensitive Vinyl on Glass (white)
- h. Solid color Photopolymer Plastic (white on black)
- i. Non-Glare Matte clear Acrylic
- j. 20% Cool Grey Vinyl Wrap
- k. Aluminum Finish
Fine satin, clear anodized.
- l. Acrylic Signs
Face: Clear, non-glare, optically corrected, cast virgin acrylic sheet. Edges and surfaces to be straight, smooth, and true. Substitute for extruded acrylic as approved by PSU Project Manager.
- m. PVC Signs
PVC materials may not be used in new construction or in existing construction in a LEED rated building
- n. ADA/Tactile Signs
(Refer to Section IV of PSU Signage & Wayfinding Standards for signage templates technical specifications)
 - i. Thermoformed Tactile signs (PSU Preferred method)
Thermoform using solid acrylic Messages to comply with ADA Guidelines. Contractor shall be responsible for all text translation from English to Grade II Braille.
 - ii. Photopolymer Tactile signs (as approved by PSU Project Manager)
Photochemically etch to create message to comply with ADA Guidelines using JET USA LSL148AB Photopolymer or equivalent. Contractor shall be responsible for all text translation from English

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to Grade II Braille. For exterior sign locations fabricate using exterior grade photopolymer Jet#388EX, or equal.

- iii. Raster Method Tactile signs (as approved by PSU Project Manager)
Precise laser cut or engraved acrylic (or equivalent) letters bonded to sign face. Messages to comply with ADA Guidelines. Contractor shall be responsible for all text translation from English to Grade II Braille
- o. Aluminum and Steel
Coat with Matthews Acrylic Polyurethane (MAP) or equivalent, Ultra Low VOC product. Match colors and gloss as indicated.
- p. Acrylic and Photopolymer
Coat with Matthews Tie Bond, 74-777SP or as per manufacturer's recommendations. Followed by Matthews Acrylic Polyurethane (MAP), Ultra Low VOC product. Match colors and gloss as indicated.
- q. Painted material
Provide protective clearcoat over all painted surfaces. Use Matthews Acrylic Polyurethane (MAP), Super Satin Clear 290 228SP, or equivalent.
- r. Minimum Coating Thickness
To preserve finishes support longevity of material. Dry film thickness and application procedures to be in strict accordance with manufacturer's recommendations. Apply each material at not thinner than manufacturer's recommended spreading rate. Provide a total dry film thickness of entire coating system as recommended by manufacturer, unless otherwise indicated.
 - iv. Silicone
FS TT-S-001543B, Class A, silicone sealant #1200, General Electric Company; or equal. Use liquid silicone adhesive as specified to attach sign units to irregular, porous, or vinyl-covered surfaces.
 - v. Epoxy
Epoxy shall be two-component thermosetting epoxy adhesive with 100% solids content. Acceptable products include #NP-428, Miracle Adhesives Corporation; Chemlok #304, Hughson Chemical Division of Lord Corporation; or equal.
- s. Pressure Sensitive/Vinyl Graphics
 - i. All lettering shall be executed in such a manner that all edges and corners of letter forms are true, clean, and photographically precise and accurately reproduce the typeface. Messages shall be smooth and free of air bubbles, open cuts, bulging and foreign matter between message and application surface.

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- ii. 3M vinyl sheeting; or equal. DM 7125 or 3M 7725 are preferred cut vinyl, other as approved by PSU Project Manager.
- iii. 3M Fasara Milano (SH2MAML, milky white) for frosted vinyl applications to windows. Other as approved by PSU Project Manager.
- iv. Avery A9 “Olive Green” may be used to represent PSU Green (Pantone 7496U) when a solid color vinyl is required.

B. Interior Signage

1. Description

- a. Conform to PSU Campus Planning Office and Classroom requirements (Appendix 01.7 and 01.8).
- b. New construction shall conform to PSU Campus Planning Office requirements (Appendix 01.7). Any deviation must be approved by the Campus Planning Office.
- c. Existing construction shall conform to existing building sign standard when it exists.
- d. Existing signage may need to be replaced if not fully compliant with ADA or other code requirements.
- e. Innovative site specific directional, wayfinding, and placemaking signage is encouraged and must be approved by the Campus Planning Office.
- f. Precision fabricated from sheet or plate in the thickness and sizes indicated on drawings. Edges shall be square to face of letter and free from cut marks or other imperfections. Corners and kerfs shall be square, or as indicated on the drawings.

2. Location

- a. Sign location plan and message schedule shall be submitted to PSU Project Manager.
- b. ADA compliant tactile sign is required at all entrances to interior spaces where a functional door is present. Spaces shall be marked with proper room number with the exception of RESTROOMS, LACTATION ROOMS, and exit routes, which shall be marked appropriate to their use.
- c. All rooms with permanent features, such as kitchens, electrical, mechanical, telecom, etc. shall be marked with ADA compliant tactile signs that contain both the room number (first) and the room function(s).
- d. Within stairwells a code compliant sign indicating the level and additional required information is required at each stair landing.

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Additionally a separate ADA compliant tactile sign shall be placed at all doors leading off the stairwell. A tactile star shall be included at the exit level.

- e. Room numbers will be determined by the Campus Planning Office.
- f. Floor maps and floor directories shall be placed near elevators on all publically accessible levels.
- g. Building directories shall be placed near all major building entrances or near elevators on all levels where building entrances exist.
- h. Maps specifying emergency egress routes shall be located near all egress stairways, in elevator lobby, and as specified by code.
- i. Directional signage shall be placed at any major decision point. Classrooms, office suites with reception area, restrooms, elevators, and stairs are the priorities on this signage.
- j. Include “Do not block exit” signs where there is a likelihood that people will move furniture and block required exits.
- k. Include “roof access” signage at roof doors and hatches.

2. INSTALLATION

- Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
- Install per manufacturer guidelines, preserving manufacturer warranty where applicable.
 - a. General
 - i. Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
 - ii. Locate signs and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer instructions. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance. Notify PSU Project Manager of installation conflicts.
 - iii. Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
 - iv. Install per manufacturer guidelines, preserving manufacturer warranty where applicable.
 - b. Mechanical Fasteners
 - i. Install signs securely to wall with fasteners and anchoring devices. Do not use metals which are corrosive or otherwise incompatible with metals joined.
 - ii. Fastening devices between dissimilar materials shall be 300 Series non-magnetic stainless steel.
 - iii. Material: Galvanically compatible with adjacent materials.

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c. Adhesives

- i. Generally low or no VOC adhesives.
- ii. Very High Bond (VHB) Adhesive: 3M Company, product as recommended by manufacturer appropriate for type of use, materials, and fabrication. 3M 4941 VHB is appropriate for most wall mounted signs on painted surfaces or glass. Use 3M product as specified for mounting signs to smooth, non-porous surfaces as indicated on the drawings. Do not use this method for vinyl-covered or rough surfaces.
- iii. Foam Tape: Double faced pressure sensitive foam tape, 3M Company, or equal.
- iv. Silicone: FS TT-S-001543B, Class A, silicone sealant #1200, General Electric Company; or equal. Use liquid silicone adhesive as specified to attach sign units to irregular, porous, or vinyl-covered surfaces.
- v. Epoxy: Epoxy shall be two-component thermosetting epoxy adhesive with 100% solids content. Acceptable products include #NP-428, Miracle Adhesives Corporation; Chemlok #304, Hughson Chemical Division of Lord Corporation; or equal.

d. Pressure Sensitive/ Vinyl Graphics

- i. All lettering shall be executed in such a manner that all edges and corners of letter forms are true, clean, and photographically precise and accurately reproduce the typeface. Messages shall be smooth and free of air bubbles, open cuts, bulging and foreign matter between message and application surface.
- ii. 3M vinyl sheeting; or equal. DM 7125 or 3M 7725 are preferred cut vinyl, other as approved by PSU Project Manager.
- iii. 3M Fasara Milano (SH2MAML, milky white) for frosted vinyl applications to windows. Other as approved by PSU Project Manager.
- iv. Avery A9 "Olive Green" may be used to represent PSU Green (Pantone 7496U) when a solid color vinyl is required.

3. Material Standards

- Refer to CPO Signage & Wayfinding Standards appendix or approve by CPC PM.

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- Section not complete, contact PSU Project Manager for detailed requirements
- All materials for permanent signage should have a minimum durability of 5 years and an ideal durability of at least 10 years.
 - a. Acrylic Signs
Face: Clear, non-glare, optically corrected, cast virgin acrylic sheet. Edges and surfaces to be straight, smooth and true. Substitute for extruded acrylic as approved by PSU Project Manager.
 - b. PVC Signs
PVC materials may not be used in new construction or in existing construction in a LEED rated building.
 - c. Aluminum Finish
Fine satin, clear anodized.
 - d. Vinyl
 - i. 3M 7125 or 3M 7725 are preferred cut vinyls, others as approved by PSU Project Manager.
 - ii. Avery A9 “Olive Green” may be used to represent PSU Green (Pantone 7496U) when a solid color vinyl is required.
 - iii. Printed materials should be chosen for the appropriate surface and duration of install, as approved by PSU Project Manager.
 - iv. Only manufacturer approved overlaminates may be used.
 - e. Adhesives
 - v. 3M VHB tape appropriate to the surfaces being adhered
 - vi. 3M 4941 VHB is appropriate for most wall mounted signs on painted surfaces or glass.
 - f. Acrylic Signs
Face: Clear, non-glare, optically corrected, cast virgin acrylic sheet. Edges and surfaces to be straight, smooth, and true. Substitute for extruded acrylic as approved by PSU Project Manager.
 - g. ADA/ Tactile Signs
(Refer to Section IV of PSU Signage & Wayfinding Standards for signage templates technical specifications)
 - i. Thermoformed Tactile signs (PSU Preferred method):
Thermoform using solid acrylic Messages to comply with ADA Guidelines. Contractor shall be responsible for all text translation from English to Grade II Braille.
 - ii. Photopolymer Tactile signs (as approved by PSU Project Manager): Photochemically etch to create message to comply with ADA Guidelines using JET USA LSL148AB Photopolymer or equivalent. Contractor shall be responsible for all text

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translation from English to Grade II Braille. For exterior sign locations fabricate using exterior grade photopolymer Jet#388EX, or equal.

- iii. Raster Method Tactile signs (as approved by PSU Project Manager): Precise laser cut or engraved acrylic (or equivalent) letters bonded to sign face. Messages to comply with ADA Guidelines. Contractor shall be responsible for all text translation from English to Grade II Braille

4. Temporary Construction Signs

a. Description

- i. Temporary signs, if posted for less than seven days, related to construction may be exempt from PSU Sign Standard, as approved by PSU Project Manager.
- ii. Temporary signs that will be in place longer than seven days shall conform to all applicable ADA guidelines and City of Portland codes, including tactile requirements.
- iii. Temporary signs that will be in place fewer than seven days should meet ADA visual requirements whenever possible.
- iv. Temporary signs shall be promptly removed when no longer required.
- v. Repurposed, recycled, recyclable, and other sustainable materials are highly encouraged for temporary signage.
- vi. Conform to PSU Campus Planning Office requirements (Appendix 01.7).

b. Location

All campus property.

c. Installation

i. General:

- a) Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
- b) Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
- c) Locate signs and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer instructions. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance. Notify PSU Project Manager of installation conflicts.

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- d) Install per manufacturer guidelines, preserving manufacturer warranty where applicable.
- ii. Mechanical Fasteners
 - a) Install signs securely to wall with fasteners and anchoring devices. Do not use metals which are corrosive or otherwise incompatible with metals joined.
 - b) Fastening devices between dissimilar materials shall be 300 Series non-magnetic stainless steel.
 - c) Material: Galvanically compatible with adjacent materials.
- iii. Adhesives
 - a) Generally low or no VOC adhesives.
 - b) Very High Bond (VHB) Adhesive: 3M Company, product as recommended by manufacturer appropriate for type of use, materials, and fabrication. 3M 4941 VHB is appropriate for most wall mounted signs on painted surfaces or glass. Use 3M product as specified for mounting signs to smooth, non-porous surfaces as indicated on the drawings. Do not use this method for vinyl-covered or rough surfaces.
 - c) Foam Tape: Double faced pressure sensitive foam tape, 3M Company, or equal.
 - d) Silicone: FS TT-S-001543B, Class A, silicone sealant #1200, General Electric Company; or equal. Use liquid silicone adhesive as specified to attach sign units to irregular, porous, or vinyl-covered surfaces.
 - e) Epoxy: Epoxy shall be two-component thermosetting epoxy adhesive with 100% solids content. Acceptable products include #NP-428, Miracle Adhesives Corporation; Chemlok #304, Hughson Chemical Division of Lord Corporation; or equal.
- d. Material Standards
 - i. Corrugated Plastic
 - ii. Acrylic Signs
 - Face: Clear, non-glare, optically corrected, cast virgin acrylic sheet. Edges and surfaces to be straight, smooth, and true. Substitute for extruded acrylic as approved by PSU Project Manager.
 - iii. PVC Signs
 - PVC materials may not be used in new construction or in existing construction in a LEED rated building.

C. Temporary Signage, Flags, and Banners

Conform to PSU Campus Planning Office and Classroom requirements (Appendix 01.7 and 01.8), PSU Policy, and City code.

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1. Location

All campus property.

2. Installation

a. General

- i. Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
- ii. Locate signs and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer instructions. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance. Notify PSU Project Manager of installation conflicts.
- iii. Conform to latest City of Portland codes and standards and latest ADA standards for installation locations.
- iv. Install per manufacturer guidelines, preserving manufacturer warranty where applicable.

b. Mechanical Fasteners

- i. Install signs securely to wall with fasteners and anchoring devices. Do not use metals which are corrosive or otherwise incompatible with metals joined.
- ii. Fastening devices between dissimilar materials shall be 300 Series non-magnetic stainless steel.
- iii. Material: Galvanically compatible with adjacent materials.

c. Adhesives

- i. Generally low or no VOC adhesives.
- ii. Very High Bond (VHB) Adhesive
3M Company, product as recommended by manufacturer appropriate for type of use, materials, and fabrication. 3M 4941 VHB is appropriate for most wall mounted signs on painted surfaces or glass. Use 3M product as specified for mounting signs to smooth, non-porous surfaces as indicated on the drawings. Do not use this method for vinyl-covered or rough surfaces.
- iii. Foam Tape
Double faced pressure sensitive foam tape, 3M Company, or equal.
- iv. Silicone
FS TT-S-001543B, Class A, silicone sealant #1200, General Electric Company; or equal. Use liquid silicone adhesive as specified to attach sign units to irregular, porous, or vinyl-covered surfaces.
- v. Epoxy
Epoxy shall be two-component thermosetting epoxy adhesive with 100% solids content. Acceptable products include #NP-428, Miracle

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Adhesives Corporation; Chemlok #304, Hughson Chemical Division of Lord Corporation; or equal.

3. Material Standards

a. Acrylic Signs

Face: Clear, non-glare, optically corrected, cast virgin acrylic sheet. Edges and surfaces to be straight, smooth and true. Substitute for extruded acrylic as approved by PSU Project Manager.

b. PVC Signs

PVC materials may not be used in new construction or in existing construction in a LEED rated building.

D. Restroom Accessories

1. Description

Some accessories shall be Owner Furnished, Contractor Installed (OFICI). Their locations, dimensions, and clearance shall be clearly indicated on the plans. These items may include toilet seats, grab bars, shower curtains and hooks, toilet tissue dispensers, shower bath curtain rods, mirrors, medicine cabinets, towel bars and hooks, soap dispensers, paper towel dispensers, shelving, seat cover dispensers, and coat hooks. PSU uses certain vendor provided paper products. These products may require the installation of vendor provided dispensers that are unique to that product. Confirm with the PSU Project Manager prior to specifying restroom specialties to confirm that the specified dispenser is compatible with the vendor provided products. Refer to Appendix 01.6 – Restroom Preferences. Additional signage should be added to all-gender multi-stall. Refer to Appendix 01.12-All Gender Restroom Policy.

2. Products



a. Choose energy efficient hand dryers over paper towel dispensers in all restroom facilities

b. Restroom partitions shall be made of scratch and vandal resistant material. Install Bobrick Sierra 1090 series or as approve by CPC PM. Choose that can be easily cleaned, easy to remove graffiti from, and can be sanded and refinished (for example, see composite partitions in second floor restroom in Smith Memorial Student Union).

3. Location

a. Shop drawings must include heights and locations of all specialty items and must be reviewed and approved by PSU Project Manager.

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4. Installation
 - a. Conform to ADA standards, Universal Design standards, and City of Portland Codes, Standards and Requirements. If there is a question about the location, please confirm with PSU Project Manager prior to installation.
 - b. Contractor to install fire retardant or noncombustible metal blocking and backing as required at specialty items.
 - c. Partition panels for All-Gender Restrooms shall be 8' tall & shall be installed so that a 9" gap is maintained between the bottom of the partition & the floor. All gender restrooms shall also have zero sight line compartment joints and door stiles.

E. Miscellaneous Specialty Items

1. Clocks
Clocks should be installed as follows:
 - a. Location
 - i. Install in all general public spaces
 - ii. Public conference rooms, student lounges, libraries, recreation centers, etc.
 - iii. Classrooms.
 - b. Clock Type
 - i. Design
Wireless, analog with molded plastic case.
 - ii. Features
Synchronized clock systems to work with PSU wireless network, i.e. SiteSync IQ Wireless Clock System.
 - iii. Time Sync
Include automatic daylight savings time adjustment.
 - iv. Power
Battery operated preferred; i.e. Lithium batteries with ~5 year life.
 - v. Color Scheme
Black with red second hand, with option for PSU logo on surface of white background.
 - vi. Mounting
Wall, surface mount. Alt. Mounting: Ceiling mounted, double sided where needed, i.e. Corridors and linear rooms.
 - vii. Size
10"-12"-15"

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- viii. Case
Heavy-duty steel or molded plastic.
- ix. Clock crystal
Glass face on steel case; polycarbonate safety crystal on molded plastic case.
- x. Available Manufacturers
Basis of Design - American Time & Signal, or approved equal.

2. Whiteboards or Writeable Wall Surfaces

- a. Whiteboards shall be used where required (classrooms and conferences, may be considered in other locations. Refer to PSU Classroom Standards – Appendix 01.8
- b. Whiteboards shall be 12’ or less.
- c. In public areas, especially student lounges, consider selection of writeable wall surfaces in lieu of whiteboards. Provide signage and/or frames that clearly communicate to users the surfaces where writing is allowed in order to avoid writing on non-writable surfaces. Discuss locations and applications methods with PSU Project Manager.
- d. The use of modular partition systems with writable surfaces such as demounted wall surfaces is allowed and must be discussed with PSU Project Manager before specification.
- e. Chalkboards shall not be installed.
- f. Walltalker white board film is preferred.
- g. Rustoleum prograde dry erase writeable wall surface kits or approved equal will be considered.

3. Student Lockers

Student lockers should be considered on a case by case basis. Contact PSU Project Manager for project specific locker requirements.

F. Furniture

Refer to Campus Planning Office for classroom, office, furniture standards (Appendix 01.7, 01.8, and 01.9).

G. Trash and Recycling Containers



- 1. All decisions regarding waste, recycling, and compost containers, placement, and/or design of storage areas for indoor or outdoor waste receptacles require approval by and input from the Waste Management Coordinator in the Campus Sustainability Office.

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5. Provide approved, free-standing, Clean River Midpoint waste and recycling stations for common areas on each floor. Common areas include, at a minimum, break rooms, kitchens, and hallways. Provide one waste and recycling station per 200 linear feet of corridor or hallway. Other shared spaces (study lounges, lobbies, etc.) will be evaluated on a case by case basis. Please refer to the PSU Solid Waste Management Plan in appendix 1.14 for container standards and placement guidelines. Coordinate with PSU CPC PM and Waste Management Coordinator.
6. Contact PSU's Waste Management Coordinator before making any compost container decisions or designing spaces for compost containers. Provide approved, Simple Human compost containers for departmental break rooms and kitchen areas. Alternatively, when space allows, an approved free-standing Clean River Midpoint waste station that includes a fourth compartment for compost may be used in these areas. Please refer to the PSU Solid Waste Management Plan in appendix 1.14 for container standards and placement guidelines. Coordinate with PSU CPC PM and Waste Management Coordinator.
7. Provide approved recycling "Slim Jim" container for shared copier spaces. Please refer to the PSU Solid Waste Management Plan in appendix 1.14 for container standards and placement guidelines. Coordinate with PSU CPC PM and Waste Management Coordinator.
8. With approval by Waste Management Coordinator, exterior waste and recycling containers may be used in hardscaped spaces on a case by case basis. Trash containers should always be paired with a recycling container. Please refer to the PSU Solid Waste Management Plan in appendix 1.14 for container standards and placement guidelines. Coordinate with PSU CPC PM and Waste Management Coordinator.

H. Lactation Rooms

1. Description
 - a. Lactation rooms shall be included in major renovations and new buildings. Locations of lactation rooms will be determined by PSU Project Manager using [PSU's Lactation Room Guidelines](#) in appendix 1.15.
 - b. Any Lactation rooms shall be equipped with a wall plug, keypad lock, latch and dead bolt and appropriate wayfinding signs.
2. Products
 - a. All furniture and additional amenities need to be approved by PSU Project Manager.

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- b. Typical lactation rooms are furnished with a glider and ottoman, side table with bottom rack, bulletin board, and clock.
- c. Additional amenities such as dimmable lights, sinks, and mini fridge shall be included, unless PSU project manager indicates otherwise.

END OF SECTION

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Section 11 – Miscellaneous Equipment

A. Appliances

1. Description
 - a. PSU discourages the purchases and installation of dishwashers and garbage disposals. Purchase and installation of these products must be approved by PSU Project Manager.
 -  b. All appliances to be Energy Star rated and/or EPEAT certified as applicable. Refer to Energy Conservation Guidelines (Appendix 26.1).
 - c. All permanently installed appliances shall be structurally secured and fixed in place.
2. Vending Machines
 - a. Vending machines shall be located near high traffic areas such as, elevator(s), bathroom(s), main corridor(s) and open break areas.
 - b. Vending machines shall be installed within a "nook" or "space" that includes the following characteristics:
 - i. Space shall accommodate for two to three vending machines with a minimum 48" depth.
 - ii. Space should only be programmed and dedicated for vending machines and no other future uses, e.g. office space, storage space, etc.
 - iii. Space shall not be enclosed and vending machines shall not be placed behind doors or inside a private/lockable space.
 - c. Power shall be provided for machines.

B. Loading Docks

1. Install Dock Bumpers in accordance with manufactures instructions.
2. Loading Dock Bumpers are preferred for all new construction and remodels.
3. PSU may request that railings be installed on loading dock drop offs. Discuss necessity with PSU Project Manager and EHS. Any railings installed shall be OSHA approved. OSHA approved removable railings should also be considered.
4. Lifts shall be installed if ADA ramp is not provided at loading dock.
5. All required permanent safety measures shall be considered for mobile equipment such as forklift wheel stops.

C. Casework/Metal Work Furnishing

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1. Projection Screens

- a. Provide manual pull down screens where possible, electronic screens over 120"+/-Surface, size, case (white or opt. veneer), other key features. Da-Lite Model C with CSR is Controlled Screen Return to save on damage from a quick snap return when released. Lots to consider.
- b. Metal surfaces, corners, and edges should be deburred, rounded, or if no other means existed, protected with smooth edging.

2. Lockers:

- a. Provide Emperor Series Corridor Knockdown Lockers or approved equal are preferred.
- b. Lockers to be installed in buildings with heavy academic and classroom use.
- c. Locker hardware shall be able to accommodate hanging "Master" locks or similar.
- d. A minimum 10% of lockers need to be non-latch locks for ADA compliance. Project design team to increase amount of non-latch lockers based on any regulatory requirements.
- e. Lockers to be installed adjacent to or near main building stairwells.

D. Specialize Tools

1. For major plumbing remodels that utilizes PEX piping, contractor shall provide an extra set of specialized crimping tool to owner at the conclusion of the project. If there are any additional specialized tools required for PEX piping or their valves, hangers and components contractor shall notify owner.
2. For any project that installs raised flooring, contractor shall provide to owner at the conclusion of project a tile puller or equivalent tool that is approved by flooring manufacturer in order to access below raised floor.
3. For projects installing variable refrigerant flow (VRF) systems and its components that are manufactured in Japan a Japanese Industrial Standard screwdriver shall be provided to owner at the conclusion of the project in order to perform future maintenance on the electrical components within the equipment.

END OF SECTION

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Section 12 – Site Furnishing

A. Bicycle Parking

1. General
 - a. Provide reinforcing, backing and sleeves in surfaces to receive site items.
 - b. Metal surfaces, corners, and edges should be deburred, rounded, or if no other means existed, protected with smooth edging.
2. Bike Racks

See Section 33 Parking.

B. Skate, Skateboard, & BMX Deterrents

1. General

Provide stainless steel or aluminum deterrents for reduce wear & damage to outdoor benches, metal rails, and concrete or brick edges in the landscape, public walkways or plaza areas around campus. Signage alone has not proven to be an adequate deterrent to skate & skateboarding activities.
2. MFR:
 - a. Barrett Robinson (www.barrettrobinson.com) Intelliccept "Skate Stoppers" or (www.skatestoppers.com) Cut or grout joint inserts, or surface mount including architectural or artistic series.
 - b. Grind to a Halt (www.grindtoahalt.com) Threaded "Grind Minders". Also, round or flat edge "Handrail Minders" to attach to metal rails.
3. Deterrents
 - a. At handrails in areas subject to skate activities, provide top of rail mounted deterrents at 1/3 or mid-points of the rails. Handrails that stand alone away from a wall and set at the required 36" height are vulnerable to skate activities.
 - b. At concrete or brick edges within 36" of grade plane, with a long lead-in area, provide deterrents along the edges ~3'-0" O.C.
 - c. Material to be non-staining bronze, stainless steel, or cast / shaped aluminum that can be placed to overlap or interrupt the wall edge.
 - d. Utilize edge mounting for use in minimizing edge scraping. Utilize top mounted units for use in minimizing skating along the top surface if it provides a wider, smooth surface. Top surface alone is not adequate if edges are appealing and within 36" of grade.

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- e. Utilize bench edge bumps to minimize edge damage at wood or masonry benches.
- f. Products to consider: Architectural styled units are preferred or products integral to brick grout joints that protrude above the top surface and beyond the front face or edges.

C. Fountains

- 1. Installation of new fountains on campus is not allowed.
- 2. If fountains are approved, product and materials shall be as specified by architect or project manager in consultation with PSU Facilities and Property Management (FPM) staff. Pumping system for fountains must be solar operated. A separate waterproofing plan with details must be provided and approved by PSU Project Manager.

END OF SECTION

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SECTION 14 – CONVEYING SYSTEMS

A. Elevators

1. General

- a. For new construction, provide traffic analysis showing projected capacity and elevator speed requirements.
- b. Provide traction elevators for all lifts and hoist-ways. The installation of hydraulic elevators is discouraged and is only allowed with PSU project manager approval.
- c. For buildings with two or more elevators, size and outfit one elevator as a dual purpose elevator freight and passenger. (e.g. PSU Engineering Building)
- d. Acoustical treatment for elevator machine rooms shall be provided as necessary to be compatible to the surrounding building usages.
- e. Provide written energy control procedures (provisions for lock-out tag-out) for any new equipment installation. When making modifications to existing equipment, require revisions to the written energy control procedures.

2. Products

- a. All elevators to be composed of non-proprietary equipment. Examples of non-proprietary manufacturers include:
 - i. MCE and EC – Elevator Controllers.
 - ii. Hollister-Whitney – Elevator Machinery.
 - iii. (NOT RECOMMENDED) Proprietary Manufacturers include: Otis, Schindler, Kone, and ThyssenKrupp.
 - iv. T-Rail preferred
- b. “Bruiser Elevator Accessories” by Innovation Industries Inc. is the preferred manufacturer of hall fixtures and call buttons, Innovation 500 series keys shall be used. Provide discrete wiring rather than serial link.
- c. Wall finishes shall consider maintenance and cleanability. Avoid surfaces that can scratch easily.

3. Execution

- a. Provide stops at all floors with substantial mechanical equipment including rooftops and subbasements.
- b. Provide a dedicated temperature controlled machine room for all elevators to house elevator equipment, controller, and electrical disconnects.
- c. Provide a shunt trip breaker to protect elevator equipment in the event of sprinkler system activation.

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- d. Provide phase 1 and phase 2 fire alarm recall functionality and testing for every new elevator.
- e. Refer to Section 28 Electronic Safety and Security for additional integration requirements.
- f. Provide cabling within the traveler to support future access control within each cab refer to section 28.
- g. All new or renovated elevators shall not have the nudging feature.

END OF SECTION

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Section 21 – Fire Suppression

A. Fire Suppression Systems Material, Equipment, and Design

1. Standards of Performance
 - a. Compliance with the design standards listed in this section is required unless otherwise noted by the PSU Project Manager.
 - b. All work to conform to applicable NFPA and Oregon Fire Code for a complete code compliant installation.
 - c. Ease of accessibility to systems/equipment for repair, maintenance, or replacement must be considered in design and construction.
 - d. PSU prefers non-proprietary equipment.
 - e. At the end of the project, submit to PSU all CAD files and calculations (ex. Battery, current draw, etc.). Provide all equipment start up reports, testing reports, and approvals from AHJ (Authority Having Jurisdiction).
 - f. When feasible, fire suppression system systems shall be commissioned by 3rd party after installation on systems valued over \$100,000.
 - g. Fire systems shall be tied into PSU BAS on systems when economically feasible.
 - h. Fire sprinkler systems must be installed on major remodels, new construction, or per code.
 - i. Notify and obtain permit from Fire Marshal for any fire alarm/sprinkler installation, alteration, or removal.
 - j. Observe all code and regulations for Fire Watch procedures including notifications to the Fire Marshal.
 -  k. All construction shall meet PSU Environmental Health & Safety (EH&S) Hot Work Program.
 - l. PSU's insurance carrier is to be consulted on all major and/or high risk fire system modifications.
 - m. For modifications to the system or to put systems into "Test", obtain PSU Insurance Carrier Impairment Permit through PSU EH&S.
2. Fire Suppression Materials and Methods
 - a. Black steel pipe is preferred. Piping shall be 2-inch in diameter or smaller, or piping exposed at 8' or less above finished floor shall be schedule 40. Piping 2-1/2 inch in diameter or larger shall be schedule 10. Provide factory applied anti-microbial coating.
 - b. Threaded, flanged, welded, and mechanical fittings are approved.

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- c. System shall be drainable; drains shall be equipped with a locking mechanism. When feasible, locate drain ports to the exterior of the building. When draining system inside the building, all drains shall be able to accept the demands of fire-systems testing.
 - d. Test headers for wet, dry, and combination systems shall be located per code. Provide means to test, drain, and monitor for flow. Provide locking plate, lock and keys.
 - e. Piping shall be seismically braced per code and/or by the structural engineer recommendations.
 - f. Test headers and stand pipes shall be installed and located per code. Test headers need to be monitored for flow.
 - g. Provide a shut off valve on every floor with pressure gauges. Provide tamper proof devices.
 - h. Provide back flow prevention that is UL listed and approved by PSU Insurance Provider. Provide butterfly valves on inlet and outlet with Wilkins 350ASTDA, or approved equal, backflow with Victaulic on top for monitoring switch and strainer on inlet.
 - i. Contact AHJ for heat tracing and insulation requirements for fire protection piping. Refer to Section 22 and Section 26 for additional requirements.
 - j. When designing additions to existing fire protection systems, verify extent of existing Sprinkler System including above ceilings and in walls.
 - k. When routing wet system piping through electrical and server rooms, containment system must be provided underneath wet pipe (e.g. sheet metal gutter). Provide leak detection.
3. Fire Pumps
- a. Manufacturer: Peerless (Fire Pump); Firetrol (Fire Pump Controller's); Grundfos (Jockey Pump); Metron; or as approved by PSU Project Manager.
 - b. Fire pumps must have automatic weekly exercise capability.
 - c. A dedicated fire pump room is preferred.
 - i. The room shall be restricted to authorized personal only
 - ii. The room shall be kept between 40 F – 104 F.
 - iii. All lighting serving the room shall be on emergency power
 - iv. The room shall be rated for 2-hour protection
 - v. Suction piping shall have city water bypass.
 - vi. Identification via signage is require on door exterior.

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- d. Floor drain shall be provided in fire pump room. Drain piping shall not cross the path of travel. Slope floor to drain.
 - e. Fire pumps must have data storage capability at panel and soft start on the motor.
 - f. Provide 100% shut off valves on both ends of test loops.
 - g. Provide pressure gauges on suction and discharge of pump.
 - h. New fire pumps shall be installed on inertia base.
 - i. Provide seismic bracing where applicable.
 - j. Fire pump and jockey pump shall be wired into emergency generator with a dedicated transfer switch when applicable.
 - k. Fire pump shall be tested in accordance with NFPA and (AHJ).
 - l. Fire Pump and panel shall be tied into building's main fire panel. Refer to section 28 for additional information.
 - m. All power and controls associated with fire pump shall be a 2-hour rated assembly approved by AHJ.
 - n. Raceway for conductors shall be as approved by PSU Project Manager.
 - o. Provide written energization, de-energization and testing electrical control procedures (provisions for lock-out tag-out) for any new equipment installation(s). When modifications to existing equipment, require revisions to any written electrical control procedures.
 - p. Provide written energy control procedures (provisions for lock-out tag-out) for any new equipment installation. When making modifications to existing equipment, require revisions to the written energy control procedures.
4. Pre-Action Systems
- a. Manufacturer: Potter, or as approved by PSU Project Manager.
 - b. Dry systems shall be used when system is exposed to freezing conditions or in sensitive areas (e.g. server rooms, research labs, etc).
 - c. Compressor shall be heavy duty or commercial rated. Compressor will be sized to fill the appropriate system within half an hour. Provide an auxiliary tank. Systems must have auto-bleed.
5. Rain Water Collection Tanks for Fire Suppression Systems
- a. Tank must be located in basement.
 - b. Provide chemically treatment and/or filtering system for rainwater entering tank.
 - c. The filling of the tank shall be automatic with redundant shut-offs and supplies.

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- d. Provide low/high level alarms and low-low/high-high level alarms.
 - e. Provide secondary containment and leak detection system tied into BAS.
 - f. Provide information to Section 22 designer so that a room drain is provided that can handle the tank capacity.
 - g. When required, provide an OSHA-approved ladder system in order to access tank.
6. Fire Suppression Stand Pipes
- a. Fire suppression hose valves shall be located on floor level landings of stairwells. Provide additional drains as required to achieve proper drainage.
 - b. For roof hydrant connections, provide control valve that is freeze proof and connected to building alarm system.
 - c. Fire department connections shall be located to ensure proper clearance from walls, free of obstructions, to allow full swing of fire department wrench handle. Provide method for pipe draining.
7. Test Headers / Fire Department Connections
- a. When planning for system testing, take precautions to avoid creation of exposed low points in the system or areas which may later freeze creating hazards.
 - b. Appropriate clearances must be maintained (e.g. clear path to test header, circulation space, not creating trip hazard, etc) in accordance with relevant regulations.
 - c. Coordinate placement of test headers with the Fire Department. Test headers must have proper clearance around the header, and avoid being placed in front of landscaping.
8. Auto-Fill Valves
- a. Auto-fill valves must have mechanical and electrical redundancies to shut off systems when needed.
 - b. Auto-fill valves must have the ability to manually shut off and manually fill.
 - c. Auto-fill valves must have bypass installed on the auto-fill assembly.
 - d. Auto-fill valves must be alarmed/monitored via PSU Building Automation System.
9. Flow Switches
- Provide necessary flow switches PSU Project manager and PSU Fire Prevention Manager to approve locations.

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10. Sprinkler Heads

- a. Minimum 20 pounds water pressure to be maintained at top floor in sprinkler heads.
- b. All new heads shall be UL listed, quick-response type, with chrome finish or easily identifiable and recessed.
- c. Sprinkler heads older than 20 years must be replaced or as required by AHJ.
- d. If necessary install new heads and adjust locations for new construction.
- e. Recessed sprinkler heads shall be used in gymnasiums, residence units, public corridors, and in any place where the ceiling is exposed to impact.
- f. Sprinkler heads shall be caged in mechanical and electrical rooms, janitorial closets, where installed lower than 7 feet above floor and/or similar vulnerable spaces.

11. Fire Hose Cabinets


If required by AHJ, existing fire hose cabinets shall be removed.

12. Fire Extinguishers

Fire extinguishers to be installed as required by code and as requested by PSU Project Manager & PSU Fire Prevention Manager.

B. Installation

1. Fire Suppression Materials And Methods

- a. All piping shall be cleaned, capped, and flushed prior to install completion.
-  b. Disposal of hazardous materials from manufacturing and on-site fabrication shall comply with regulations for disposal of such material.
- c. When extending an existing fire protection system or performing construction near an existing fire protection system, take measures necessary to protect existing system during construction.

2. Pre-Action Systems

Install pre-action control panel located within sight of the pre-action valve. Panel must be accessible and have the code required clearances.

3. Rain Water Collection Tanks for Fire Suppression Systems

- a. Provide adequate access and clearance for cleaning.
- b. All tank penetrations shall be sealed water tight.

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- c. Tank shall be lined. Upon completion of curing time of liner, tank shall be filled and tested for seven consecutive calendar days demonstrating compliance with NFPA 22.

END OF SECTION

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Section 22 – Plumbing

A. Plumbing Piping Systems

1. General
 - a. Ensure as much as possible adequate clearance for ease of accessibility to systems/equipment for repair, maintenance or replacement.
 - b. All items in this section shall comply with code and industry standards, unless otherwise noted.
 - c. All devices installed in the potable water system of building to be lead free and meet NSF Standard 61 and EPA's "3Ts for Reducing Drinking Water in Schools" Remediation requirements. Replacement fixtures shall meet Section 9 of the NSF Standard and be labeled per NSF requirements.
 - d. Unless approved by building official routing new piping over electrical equipment is not allowed.
 - e. At a minimum one hose bib shall be provided on building roof tops for maintenance purposes. The consultant design team and PSU project manager shall determine if more than one is needed based on the size, amount/type of equipment and physical complexity of the roof.
2. Expansion Fittings and Loops
 - a. For copper, steel, and gas piping, stainless steel braided hose shall be used for flexible pipe connections.
 - b. Install expansion joints in accordance with EJMA (Expansion Joint Manufacturer's Association) Standards.
 - c. Attach pipe bends and loops to anchors.
 - d. Install guides on piping adjoining expansion fittings and loops. Attach guides to pipe and secure to building structure.
 - e. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
 - f. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting.
3. Hangers and Supports for Plumbing Piping and Equipment
 - a. Loop hangers are preferred with the exception of no hub pipe. For no hub pipe, clevis hangers are preferred.

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- b. Metal insulation shield shall be installed with hangers in order to protect insulation.
 - c. For horizontally hung piping, provide a minimum of 2 hangers per pipe section.
 - d. Provide steel backing, including pre-manufactured carriers, in walls to support fixtures and piping hung from steel stud walls.
 - e. Do not support piping from other piping.
 - f. Group parallel runs of horizontal piping shall be supported together on trapeze-type hangers.
 - g. When dissimilar metals come in contact with each other, select materials which are compatible to prevent electrolysis, or provide means of isolation between the materials.
 - h. Provide prefabricated pipe curb assemblies for roof membrane and insulation penetrations related to equipment.
 - i. Piping above roof to be supported with freestanding roof pipe supports.
 - j. Install escutcheon plates around horizontal and vertical piping at visible locations through walls, partitions, floors, or ceilings.
 - k. Wall and floor sleeves below grade or subject to moisture shall have neoprene gasket links bolted together around an interior sleeve forming a watertight seal.
 - l. Wall and floor sleeves shall be UL rated assemblies when needing to maintain fire rating of pipe penetrations through fire-rated assemblies.
 - m. Provide riser clamps at floor penetrations. Install foam pad between clamp and piping. Floor penetrations must be sleeved and sleeve must extend a minimum of 1" above finished floor.
 - n. No zip ties shall be used to secure Pex-A piping.
4. Meters, Devices and Gauges for Plumbing Systems
- a. Manufacturers
 - i. Gauges: Precision Plumbing Products or as approved by PSU Project Manager;
 - ii. Digital Domestic Water Meters: Cadillac CMAG or as approved by PSU Project Manager
 - iii. Turbine Domestic Water Meter: Carlon (lead free) or as approved by PSU Project Manager.
 - b. Place gauges at inlet & outlet in each piece of equipment (boiler, expansion tank, storage tank, etc.).

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- c. Positive displacement (liquid) meters and gauges are preferred.
 - d. For pressure reducing valves, provide manual temperature, and pressure gauges directly downstream and upstream of valve.
 - e. Digital meter to be installed on incoming water main from City or PSU domestic water loop. Turbine meters are considered for City make up and process water metering (e.g. cooling towers).
 - f. Shut-off valves are required on all gauges.
 - g. Provide instruments with scale ranges selected according to service with largest appropriate scale.
 - h. Provide water hammer arrester when applicable and per the recommendations of Plumbing and Drainage Institute PDI-WH201.
 - i. Hammer arrester shall be installed with ball valve for maintenance purpose.
 - j. Install gauges and meters in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
 - k. Where adequate space is not available, use meters specifically designed for short pipe lengths.
 - l. Install meters per manufacturer's instruction. Provide recommended upstream and downstream strait pipe length for accurate reading.
 - m. Locate test plugs adjacent to thermometers and thermometer sockets, adjacent to pressure gauges and pressure gauge taps, adjacent to control device sockets, or where indicated. Install trap primers per code. Tie into DDC controls if feasible. No electronic trap primers.
5. General Duty Valves
- a. Manufacturer: Apollo, Zwick, or as approved by PSU Project Manager.
 - b. For isolation, ball valves are preferred over butterfly valves. No gate valves for lines below 3".
 - c. Mechanical domestic water mixing valves are preferred over digital. Provide Symmons or approved equal.
 - d. Use Outside Stem & Yoke (OSY) shut-off valves for pipes 4" and larger.
 - e. Avoid use of pressure regulating valves (PRV), for domestic applications boost water to upper floors and have city water pressure serve lower floors. If PRV's are needed ensure that inlet, outlet, and bypass isolation valves are provided.
 - f. When possible, provide one set of isolation valves in order to completely isolate all fixtures per space (e.g. classroom, dormitory, bathroom, etc.).

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- g. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping.
 - h. Locate valves so as to be accessible; install with chain operators as required. Extend chains to 5-feet above floor and hook to clips to clear aisle passage.
 - i. Provide hand wheels fastened to valve stem for valves other than quarter-turn. Provide lever handle for quarter-turn valves 6-inches and smaller.
 - j. Provide quarter-turn freeze-proof hydrants at various locations on exterior building walls.
 - k. Manufacturer's name and pressure rating to be clearly marked on valve body.
6. Balancing Valves
- a. Manufacturer: Bell & Gossett, CircuitSolver, and Griswold or as approved by PSU Project Manager.
 - b. Balancing valves shall be installed on all pumping systems downstream of pump. This applies only when a VFD is not installed.
 - c. Balancing valves shall be installed on all branch loops that serve fixtures/equipment (e.g. hot water recirculation loops, hot water heating loops, etc.).
 - d. Install balancing valves with flow in the direction of the arrow on the valve body. Allow enough distance away from any fitting as recommended by manufacturer.
7. Cleanouts
- a. Provide cleanouts under every kitchen sink and at the base of all waste and drain stacks.
 - b. Provide raised head brass cleanout plug for no hub piping.
 - c. Provide ABS cleanout when installing ABS piping; do not provide brass cap.
 - d. Cleanout must be accessible. Install removable floor and wall covers or access panel for concealed piping. Select type to match adjacent building finish.
 - e. Cleanouts in underground sanitary or acid waste systems shall be line size for mains up to 4" Ø. For mains having a diameter greater than 4", cleanouts shall be 4" Ø.
8. Back Flow Prevention / Check Valves

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- a. Manufacturer
 - i. For line sizes less than or equal to 2", use Conbraco or as approved by PSU Project Manager.
 - ii. For line sizes greater than 2", use Wilkins with Victaulic opening to check valve or as approved by PSU Project Manager.
 - a) Zurn-Wilkins 950XL double check valve assembly - 3/4" up to 2"
 - b) Zurn-Wilkins 975XL2 reduced pressure principle backflow assembly - 1/4" up to 1/2"
 - c) Zurn-Wilkins 975XL2 reduced pressure principle assembly - 3/4" up to 2"
 - d) Zurn-Wilkins 375AST reduced pressure principle assembly - 2 1/2" up to 10"
 - e) Zurn-Wilkins 350ASTDA double check detector assembly - 2 1/2" up to 10"
 - b. For main building backflow assembly, install bypass one pipe size smaller than main. Bypass shall be equipped with means for backflow.
 - c. Install Y strainer at main building backflow device and ensure clearances.
 - d. Avoid locating valve(s) in vaults or confined spaces.
 - e. For 2" and larger, provide OS&Y or butterfly shut off valves with tamper switches on each side of valve.
 - f. Spring check valves, Wafer check valves, and Lift check valves are acceptable for low hazard applications (e.g. pump discharge).
 - g. Vacuum breakers are acceptable for lab sinks, hose bibs and low hazard applications.
 - h. Where practical, locate valve in the same room as equipment being protected.
 - i. Chemical/soap dispensers are to be treated as a high health hazard and are not preferred and must be approved by project manager. If installed for janitorial closets or kitchen they must have a Reduced Pressure Principle Device backflow device.
 - j. Seek review and approval of exact location and type of valve with Authority Having Jurisdiction (AHJ) prior to purchase and installation. Provide all required testing after installation per AHJ requirements and provide appropriate documentation to PSU.
9. Electrical Heat Tracing
- a. Install electrical heating tracing system when piping is exposed to freezing conditions.

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- b. Piping shall be labeled accordingly. Label piping indicating circuit and panel locations.
- c. Plumbing designer to provide projected load information contractor to coordinate with design

10. Vibration and Seismic Control for Plumbing

- a. Consider installing vibration control when equipment is above, below, or near noise sensitive area.
- b. Steel equipment bases shall have the lowest possible mounting height with not less than 1" clearance above floor.
- c. Set floor-mounted equipment with steel base rails on 4" high concrete housekeeping pads. Extend pad 6" beyond footprint of equipment in each direction.
- d. Provide mounts for equipment installed outdoors for wind loads of 30 lbs. psf applied to any exposed surface of isolated equipment.
- e. Do not install equipment or pipe that makes rigid contact with building slab, beams, studs, walls, etc.
- f. Support water and gas piping, connected to rotating equipment within equipment rooms, on spring and neoprene hangers.
- g. Fill pump inertia bases with concrete. Support heels of suction and discharge elbows from base.

11. Identification for Plumbing Piping

- a. Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- b. Provide stickers for identification rather than stenciling. Mechanic fastening is also acceptable.
- c. Include flow direction for both air and water systems.
- d. Notify if polypipe or plastic pipe is being used.
- e. Provide a valve schedule as part of a submittal package. Upon approval from owner, valve shall be framed and installed appropriately in building mechanical spaces by completion of project. Valves shall be tagged in the field per schedule.
- f. Provide ceiling tile labels for Plumbing equipment (labeled orange) and plumbing valves (labeled Green). Labels shall be machine generated, with adhesive backed with black letters and clear tape.
- g. Coordinate with PSU facility maintenance personnel to ensure consistency with the existing piping identification system.

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- h. Tag balancing valves with GPM or CFM. Valve position after balancing is completed.
- i. Identify plumbing equipment and control panels with plastic nameplates riveted to equipment body.
- j. Provide stenciled signs on each access door and housing, indicating purpose of access.

12. Insulation

- a. Manufacturer: Copper/Steel Piping, Fiber Lock; Polypipe, Armaflex
- b. Do not apply insulation until pressure testing, heat tracing, and general inspections have been completed and approved:
- c. Insulation shall be continuous through walls, floors and partitions except where otherwise noted.
- d. For piping and equipment, install insulation over clean, dry surfaces with adjoining sections firmly butted together and covering surfaces. Repair all voids and tears. Lap seal insulation with water proof adhesive. Do not use staples or other methods of attachment which may penetrate vapor barrier. Provide blankets over valves or components that require access.
- e. For ADA lavatories/sinks provide insulation kit.
- f. For piping that is exposed to weather, cover insulation with aluminum or stainless steel jacket. Seal water tight jacket and provide heat tracing where piping is exposed to freezing.
- g. Provide full size diameter hangers and shields (18 gauge minimum).
- h. For roof and/or overflow Drains above grade, cover horizontal storm drains and overflow drain piping with sectional pipe covering. Cover underside of drain body with insulation, attached with adhesive and supported by structure with strapping anchor.

13. Plumbing Piping

- a. Manufacturers:
 - i. Polyethylene pipe: WIRSBO
 - ii. Flexible gas piping: WARDFLEX
 - iii. Below grade waste piping: SCH. 40 SOLID CORE PVC or CAST IRON SCHEDULE 40 PIPING
- b. For all applications, copper piping shall be Type L minimum and shall be solder or brazed.
- c. Condensate piping for drainage of condensate from combustion. Fuel sources shall be polypropylene pipe with fusion weld fittings.

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- d. The use of WIRSBO is allowed for piping 3" or less. Use manufacturer provided fittings. The fitting manufacturer shall match the piping manufacturer.
- e. Gas piping shall be carbon steel schedule 40. Flexible piping is acceptable for smaller diameter applications of 1" or less.
- f. Install pipes and pipe fittings in accordance with recognized industry practices.
- g. Locate piping runs as indicated, vertically and horizontally insulated (pitched to drain). Avoid diagonal runs whenever possible. Allow space for insulation and jackets.
- h. Whenever possible in finished and occupied spaces, conceal piping from view.
- i. Do not run piping through transformer vaults, telephone, elevator, electrical or electronic equipment spaces or enclosures.
- j. Sleeves are required through all penetrations with fire caulking. Provide nickel or chrome finished escutcheon rings as specified in order to completely cover pipe penetrations.
- k. Provide vents and drains for piping, coils, and equipment/vessels which contain water. Provide isolation valves. Provide hose connections and caps on drain lines.
- l. Piping connections to equipment shall be made up with unions.
- m. Piping shall be cut squarely, free of rough edges, and reamed to full bore. Piping shall be fully inserted into fittings. Press fittings are not accepted.
- n. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Cap all abandoned pipes.
- o. Welders performing work shall be certified and qualified in accordance with tests prescribed by the National Certified Welding Bureau.
- p. Provide flanges for steel and copper piping at valves and equipment, unless specified otherwise.
- q. In order to prevent electrolysis, provide dielectric unions/flanges with high temperature gaskets as required. Avoid contact with dissimilar metals, including contact with Architectural framing. Provide rubber pads in order to isolate piping from floor penetrations, hangers, clamps, and other potential sources of electrolysis.
- r. For sanitary and storm sewer, use cast iron, ABS, or as approved by PSU Project Manager. Fittings to be no hub, use 4-band fittings.
- s. For sanitary and storm sewer, piping shall be graded per drawings. Extend piping to discharge. For indirect waste, maintain minimum air gap and provide traps as required.

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- t. Backwater Valves: For residential applications valve shall be ABS. Provide access two times the lid size.
- u. Pressure-test all piping per code or per engineer's recommendations. Testing shall be witnessed by PSU Project Manager or PSU facility maintenance staff whenever possible. Provide report to PSU and architect.
- v. Sterilization of domestic water system: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping per method outlined by engineer. Provide final certification and reports to owner.
- w. For major remodels, prior to turn over all waste piping shall be snaked/unclogged by applicable contractor in order to remove sediment that hardens over time due to non-use.

14. Floor Drains

- a. Manufacturer: Zurn or as approved by PSU Project Manager.
- b. Install drains to suit floor finish. Arrange for flooring to be sloped to floor drain or sink, including restrooms and labs. P-traps shall match material of piping and be provided with a trap primer assembly. Heat trace and insulate p-traps exposed to freezing conditions.
- c. Floor drains are recommended in restrooms, janitor's closets, near safety showers, commercial kitchens, laundry facilities, mechanical rooms, and main electrical rooms (if sprinkled). Body of drain shall be cast iron and epoxy coated, plastic may be considered for retrofit applications.
- d. Unless function of a particular laboratory necessitates inclusion of dedicated floor drain, include a floor drain or floor sink to be located in the adjacent corridor, no further than 25 feet from the laboratory entrance. This allows for a single drain to serve multiple laboratories.
- e. Strainer shall be stainless steel, brass or cast iron. Plastic will not be accepted.
- f. Floor drains shall be equipped with trap primer per code if drain is rarely active.
- g. Drains in parking structure shall be manufactured for this application. Strainer shall be selected to avoid debris build-up and tripping hazard.
- h. Area drains in parking structure shall be of steel grate style.
- i. All drainage from parking structure shall be connected to sanitary system or other, per the direction of the City of Portland.
- j. All floor drains shall be vented.

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- k. Design and provide roof drains per City of Portland's Plumbing code. All electrical vaults shall have drains or be equipped with a sump. Consult with PSU CPC during design phase to determine direction.
- l. Provide overflow requirements per the City of Portland Plumbing code.
- m. Provide collar and dome for all roof top drains.
- n. Roof drains shall be cast iron body and epoxy coated.
- o. All drainage from roof shall be connected to sanitary system or other, per the direction of the City of Portland

15. Laboratory Piping Systems


- a. Manufacturers
 - i. Emergency Showers: HAWS or as approved by PSU Project Manager.
 - ii. Mechanical Fitting's/Piping: ORION or as approved by PSU Project Manager.
 - iii. Laboratory Faucets: Chicago or as approved by PSU Project Manager.
 - a. Chicago laboratory faucet - 895-317GN2BVBE7CP
 - iv. Chicago DI water deck mounted faucet - 838-CP
- b. Domestic Potable and Non-Potable, Hot and Re-Circulation Water
Provide polyethylene pipe or copper tubing.
- c. Laboratory Natural Gas
Schedule 40 and 80 black or hot dipped zinc coated galvanized copper.
Provide welding and seamless pipe. Piping installed in plenums or shafts shall have welded joints.
- d. Laboratory Gas Piping
Anaerobic Oxygen, Nitrogen, Carbon Dioxide, Compressed Air, and Vacuum shall be type "K" hard drawn seamless copper or stainless steel piping. Do not use soft drawn copper tubing.
- e. DI Water
Piping, fittings, and valves shall be schedule 80 Type 1 homopolymer polyethylene or stainless steel piping. Use socket fusion heat method. Schedule 80 PVC is allowed as an alternate material.
- f. Laboratory Sinks
Provide stainless steel single compartment with ledge, 18 gauge type 316 drop in type. Provide type 316 strainer with tail piece. Provide epoxy resin sinks or stainless steel compartment.
- g. Laboratory Faucets
Provide deck mount Chicago Faucets with mixing valve and gooseneck with vacuum breaker. Provide four arm color coded handles, serrated nozzle, and single hole punch.

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- h. Emergency Showers/Eyewash
 - i. Provide emergency shower at door, barrier free emergency shower unit, and eye wash at laboratory sink when applicable. Mixing valve shall mount under sink or recessed in cabinet. Drains are required near locations; consider installation away from equipment. Bradley faucet-mount eyewash model: S19-200B is not allowed to be installed at PSU.
 - ii. An emergency eye wash should also be installed in janitor closets when a chemical dispenser is present or installed.
- i. Acid Waste
Use ORION with fuseal or mechanical fittings. Acid waste floor drain shall have sediment basket, acid resistant, polypropylene with heavy duty strainer and weep holes. Provide heat fusion joint.
- j. Pipes and piping systems
Those which contain or transport hazardous substances, including compressed air, must be labeled to meet Oregon OSHA regulations. This is to be adhered to regardless of the aesthetic impact it may have in a finished space

B. Plumbing Equipment

1. General

- a. Ensure adequate clearance for ease of accessibility to systems/equipment for repair, maintenance or replacement
- k. All items in this section shall comply with code and industry standards, unless otherwise noted
- b. Provide valves and flanges at appropriate locations to accommodate maintenance and future replacement.
- c. Provide concrete housekeeping pads when applicable.
- d. Contractor to provide required equipment data for PSU deferred maintenance software.
- e. Ensure that replacement parts and components are available locally.
- f. All equipment shall be started up by factory representative. Documentation shall be provided to owner.
-  g. All equipment shall be as water efficient as possible, be WaterSense and EnergyStar certified where applicable, and shall assist in achieving Water Efficiency credits in the LEED rating system.
- l. All devices installed in the potable water system of building to be lead free and meet NSF Standard 61 and EPA's "3Ts for Reducing Drinking Water

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in Schools" Remediation requirements. Replacement fixtures shall meet Section 9 of the NSF Standard and be labeled per NSF requirements.



2. Identification of Plumbing Equipment
For identification purposes, stickers shall be used in lieu of stenciling.
3. Domestic Expansion Tanks
 - a. Domestic expansion tanks shall be tested and stamped in accordance with ASME boiler and pressure vessel code. Pressure shall match the maximum pressure the system is designed for.
 - b. Provide support floor mounted tanks with steel legs. Diaphragm shall be removable and inline. Provide pressure gauge and air-charging fitting and drain-fitting.
4. Domestic Circulation Pumps
 - a. Manufacturer shall be Grundfos or as approved by PSU Project Manager.
 - b. Pressure rating shall match maximum working pressure of system.
 - c. Body shall be bronze or stainless steel construction. Shaft shall be stainless, ground, and polished.
 - d. Motor shall be non-overloading at any point on pump curve, be open, drip-proof, and quiet operating. Motor shall have sleeve bearings, rubber mounted construction, and built-in thermal overload protection.
 - e. Pump may be controlled off of aquastat or via the building automation system.
5. Sump Pump/Sewage Ejector Pump
 - a. Provide grinder on the impeller. This is not required for elevator sump pumps.
 - b. Provide check valve and shut off valve on discharge of the pump.
 - c. Provide perforated 24" x 24" steel basin cover and frame.
6. Packaged Domestic Booster Pump System
 - a. Manufacturer: Grundfos or as approved by PSU Project Manager.
 - b. Minimum pressure setting shall be 4 feet above top of highest roof level
 - c. Design System to balance pressures on each floors.
 - d. Skid to be furnished with VFD and pump controller located in same panel. Control panel shall accommodate seamless connection to PSU building automation system.
 - e. Flowtherm skids are only allowable with Grundfos motors and pumps.

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- f. System shall be factory assembled and tested, and shall be delivered with complete operating controls.
- g. Common discharge header shall be equipped with purge valve which will divert water to drain in the event of pump failure.
- h. Pump controller, at a minimum, shall provide low suction cut out, high system pressure cut out, and a no-flow shut down when the hydro pneumatic tank can handle demand.
- i. System shall be equipped with separate hydro-pneumatic tank to provide low flow demands to the building. Tank shall be equipped with replaceable bladder.
- j. Pump Seals shall be Unitized EPR/SiC/SiC. Rated for 1000 ppm undissolved solids.
- k. Requirement for a booster pump for any new construction or major construction.

C. Plumbing Fixtures

1. General

- a. Ensure adequate clearance for ease of accessibility to systems/equipment for repair, maintenance or replacement.
- b. Fixture Connections: Provide threaded ¼ turn angle stops without any loose keys, sweat male adapter, or brass nipples, escutcheon rings and stainless steel braided hose for hot water and cold water connections to fixtures; Chrome p-trap for lavatories, ABS acceptable when p-trap is not exposed.
- c. Hot water knob shall be on the left hand side and cold water knob shall be on the right hand side unless otherwise noted.
- d. Accessible fixtures shall be provided per code; meet all barrier free requirements.
-  e. All new fixtures shall be as water efficient as possible, be WaterSense certified where applicable, and should assist in achieving Water Efficiency credits in the LEED rating system.
- m. All devices installed in the potable water system of building to be lead free and meet NSF Standard 61 and EPA's "3Ts for Reducing Drinking Water in Schools" Remediation requirements. Replacement fixtures shall meet Section 9 of the NSF Standard and be labeled per NSF requirements.
-  n. For all plumbing fixture replacements or additions reference the Uniform Plumbing Code 2006 Table A-2 (table is also provide on the last page of

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this division) and "Water Efficiency Assessment Policy." All fixture selections shall be based on adherence to this policy and the chart.



2. Hydration Locations / Bottle Refill Stations

- a. Bottle refill stations may include hydrations stations, retrofitted kits for water fountains, or other solutions that allow users to easily refill water bottles. Install at least one refilling station on each floor of new construction projects and at least one station per building in existing buildings.
- b. Manufacturer: HAWS, Elkay, Chicago, or as approved by PSU Project Manager.
 - i. Elkay Enhanced EZH2O Bottle Filling Station - Model LZSTL8WSSP
 - ii. Haws Recessed-Mount Bottle Filler - Model 2000S
 - iii. Elkay Two-Level Drinking Fountain - Elkay Soft Sides Heavy Duty Bi-Level Fountain Non-Filtered, Non-Refrigerated Stainless EHW217C Elkay Cane Apron for EHW Stainless Steel LKAPR2. Accessory - In Wall Carrier (Bi-Level) for EHW217 models - MPW200
 - iv. Chicago Deck Mounted Glass and Bottle Filler - 712-ABCP
- c. Pentek filters with quick disconnect, or as approved by PSU Project Manager, are preferred for hydration stations and combo drinking fountain / hydration stations. Provide adequate access for cleaning.
- d. Provide combination drinking fountain and hydration station for all new buildings and major remodels. These shall be recessed in walls and splash-proof.

3. Drinking Fountains



- a. If drinking fountains are approved and installed, fountains shall include Chicago bottle filler infrastructure for filling water bottles.
- b. Manufacturer: HAWS or as approved by PSU Project Manager.
- c. Do not specify refrigerated drinking fountains.
- d. New installations shall be recessed in wall and be bi-level.

4. Mop Sinks



- a. Mop sinks shall be flush to the ground and installed with stainless steel backing. Rounded base is preferred.

5. Commercial/Public Kitchen Sinks

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- a. Manufacturer: Stainless steel Kohler and Chicago or as approved by PSU Project Manager.
 - i. Chicago Kitchen Sprayer - 510-GCLABCP
 - ii. Kohler "Toccata" top-mount kitchen sink K-3348-3
 - iii. Chicago kitchen faucet - 1100-E35-317XKABCP
 - b. Faucet shall have means to prevent HW and CW cross-over (e.g. check valve).
 - c. Provide Chicago Dual Handle with wrist blade handle and quarter turn ceramic cartridges.
6. Commercial/Public Lavatories
- a. Manufacturer: Kohler, Lavatories; Chicago, Faucets; or as approved by PSU Project Manager.
 - i. American Standard "Lucerne" wall-hung lavatory
 - ii. Chicago lav faucet - 802-E70-317XKABCP
 - iii. Chicago metering lav faucet - 857-E2805-665PSHAB
 - iv. Chicago DI water deck mounted faucet - 838-CP
 - v. Chicago wall mounted janitorial faucet - 445-LESXKAB
 - b. Wall hung and countertop installs are acceptable.
 - c. Single handle faucets not allowed; provide two handle wrist blades with quarter turn ceramic cartridge.
 - d. Vandal proof faucets not allowed.
 - e. Electronic faucets are not allowed, only in lieu of electronic faucets are when metering faucets are allowable and shall be Chicago model: 857-E2805-665PSHAB or approved equal.
7. Commercial/Public Water Closets and Urinals
- a. Manufacturers
 - i. Water Closets: Kohler or as approved by PSU Project Manager.
 - a) American Standard "Cadet Right Height" elongated pressure-assisted toilet 1.6gpf/6.0Lpf
 - b) Kohler "Kingston" bowl - K-4325
 - c) Kohler "Wellworth" pressure-assisted toilet - K-3505
 - ii. Urinals: Sloan WES Water Free Series or as approved by PSU Project Manager
 - a) American Standard "Trimbrook" urinal
 - b) Kohler "Dexter" urinal - K-5016-ET

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- iii. Manual Flushometers: Sloan Upper Cut or as approved by PSU Project Manager.
 - a) Sloan “Uppercut” Dual-Flush Flushometer - WES-111
 - b) Sloan “Royal” model flushometer - 186
 -  b. For new construction waterless urinals are not preferred but if selected allow future conversion to wet urinals in case necessary. Provide ½” cold water stub out adjacent to waterless urinal.
 - c. Provide additional backing for wall hung water closets and urinals in order to support additional load.
 -  d. Dual flush flushometer is preferred. Motion detection is acceptable for urinals. Confirm plumbing flushometer design with PSU Project Manager prior to specifying.
 - e. Water closet seat shall be commercial grade, open front, anti-microbial, solid white or black.
 - f. Water closets shall be as water efficient as possible and use 1.28 gallons per flush or less.
 - g. For each major bathroom group (3 stalls or more), provide one bariatric water closet and carrier. The carrier and water closet assembly shall be able to hold up to 1000 pounds. If bariatric 1000 pounds carrier is not feasible than a 750 pound will work.
 - i. WC Carrier: Zurn for bariatric toilets, with 1000# capacity: Model Z1203-NL4. (750# Z1203-N-XH)
8. Commercial Sink Garbage Disposers
- a. Garbage disposers are discouraged. Garbage disposers should only be used if approved by PSU Project Manager.
 - b. Manufacturer: InSinkErator or as approved by PSU Project Manager.
 - c. Provide switches, controls, solenoid and flow control valves, vacuum breakers and appropriate sink or cone attachments.
9. Non-Residential Individual Shower Units
(Work in development)
10. Recreation Shower Units
(Work in development)
11. Residential Laundry Sinks
- a. Manufacturer: Mustee or as approved by PSU Project Manager.
 - b. Two bowls are preferred.

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12. Residential Lavatories

- a. Manufacturer: Kohler, American Standard Lavatories; Faucets - Symmons S-20-2, Chicago; or as approved by PSU Project Manager.
- b. Faucet shall have means to prevent HW and CW cross over, i.e. check valve.
- c. Provide InSinkErator, stainless steel

13. Residential Tub-Shower Units

- a. Manufacturers
 - i. Tub and shower: Fiber-Fab or as approved by PSU Project Manager.
 - ii. Drain and overflow: Watco or as approved by PSU Project Manager.
 - iii. Shower drains: JackRabbit or as approved by PSU Project Manager.
 - iv. Mixing valve: Delta Universal R10000 or as approved by PSU Project Manager.
 - v. Trim: Delta T3020 or as approved by PSU Project Manager.
 - vi. Tub spout: Delta RP5834 or as approved by PSU Project Manager.
- b. Mixing valve shall have integral service stops.

14. Residential Accessible Tub-Shower Units

- a. Manufacturers:
 - i. Shower system: Symmons Temptrol II or as approved by PSU Project Manager.
 - ii. Roll-in and Transfer shower: Fiber Fab or as approved by PSU Project Manager.
- b. Shower system shall include mixing valve, shower head with arm and flange, lever diverter, wall/hand shower with flexible metal hose, and slide bar.
- c. Mixing valve shall have integral service stops

15. Residential Accessible Water Closet Units

- a. Manufacturers
 - i. Water Closet (Tank Type): Niagara Stealth, American Standard Pressure Assist or as approved by PSU Project Manager.
 - ii. Water Closet (Non-tank) and Urinals: Kohler or as approved by PSU Project Manager.
 - iii. Flushometer Valve for Non-tank toilets: Gerber Top Spud or as approved by PSU Project Manager.

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- iv. Flushometer Valve for Urinals: Sloan or as approved by PSU Project Manager.
- v. Toilet Seat: Church 100ec and 585ec or as approved by PSU Project Manager.

b. Provide Solid vs liquid type flushometer

16. Residential Sink Garbage Disposers

Residential sink garbage disposers are discouraged. Residential disposers should only be used if approved by PSU Project Manager.

17. Residential Washer Boxes

- a. Manufacturer: Wirsbo, Sioux Chief or as approved by PSU Project Manager.
- b. 1/4 turn valves, angle stops, and lead free.

18. Residential Ice Makers

- a. From wall to fridge, use stainless steel braided or copper hose.
- b. Aqua pure filters are preferred.


END OF SECTION

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SECTION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

A. MECHANICAL SYSTEMS

1. GENERAL

- a. Ensure code required and adequate clearance for ease of accessibility to systems/ equipment for repair, maintenance, or replacement.
- b. Select equipment and supplies that are locally available when possible.
- c. Vibration and noise must be considered in design. Install systems where it causes the least disturbance. Otherwise use noise and/or vibration dampening. If duct boots between spaces are necessary, include adequate offset and insulation.
- d. Install ample valves and unions to isolate equipment, main lines, and branch lines for unobtrusive maintenance operations. Bypasses shall also be provided at incoming water service entry and at items requiring maintenance.
- e. Testing and Balancing of air and water systems shall be performed prior to the conclusion of each project. All filters shall be replaced, strainers cleared, and equipment started up prior to balancing.
-  f. All systems shall be designed to optimize energy efficiency, improve indoor environmental quality, and assist in achieving credits in the LEED rating system. Refer to Energy Conservation Guidelines (Appendix 26.1).
- g. PSU's standard temperature range is 68-76 Degrees Fahrenheit.
- h. Vertical clearance in mechanical space shall be 6'-5" minimum where possible.

2. NON-MOTORIZED VALVES

- a. Manufacturer: Zwick or as approved by PSU Project Manager. Zwick valves should be only used for campus loop piping 3" or bigger.
- b. If Mueller butterfly valves are installed, a three-year parts and labor warranty needs to be provided.
- c. Valve tags are required for all valves. Valve tags shall be "System ID - Valve ID". System ID identifies what type of system it is e.g. Well Water Supply / Return, Condenser Water Supply / Return, Domestic Cold Water, etc. etc., Valve ID is the type of valve e.g. ball valve (BV), Check Valve (C1). For example "CDS-BV" this would mean a ball valve on a condenser water supply piping.
- d. Valve operations must be verified by contractor with PSU Project Manager prior to project closeout.

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2. METERS AND GAUGES

- a. Manufacturers:
 - i. Steam Meter: Cadillac Vortex Shedding Meter or as approved by PSU Project Manager.
 - ii. Chilled Water Flow Meter: Onicon (non-turbine type) or as approved by PSU Project Manager.
 - iii. Gas Meter: Sensus or as approved by PSU Project Manager.
 - iv. Digital Electrical Sub-Meter: Siemens DEM or as approved by PSU Project Manager.
 - v. Condensate Meter: Carlon Hot Water Turbine, or approved equal.
 - vi. Make-up water meters for cooling towers and other mechanical closed / open loop systems shall be Carlon JSJ, Cadillac or approved equal.
- b. All piping components shall be rated for the service, pressure, and temperature as called out by design engineer.
- c. Provide manual temperature and pressure gauges directly in the piping on the inlet and outlet of hydronic equipment. Provide additional gauges as required.
- d. All gauges to have shut-off valve in order to remove/replace/test.

3. HANGER SUPPORTS AND HANGERS

- a. All hangers, rods, clamps, protective shields, components, and hanger accessories shall be hot dipped galvanized.
- b. Seismic restraints, anchorage, and reinforcements shall be provided for all piping and designed to withstand forces generated by earthquake movements.
- c. Support all vertical risers/piping per floor. Support all horizontal piping per code and schedule. Floor penetrations must be sleeved and sleeve must extend a minimum of 1" above finished floor.
- d. Provide roller guides, anchors, and expansion joints as specified by structural/mechanical engineer.
- e. Link seal, or equivalent product shall be used on each end of penetration when penetrating campus loop tunnels, basements, or between different building's and structures with utility piping.

4. INSULATION

- a. For steam, condensate return, and boiler, feed water piping insulation shall be molded glass fiber with aluminum jacket. Provide reusable insulation blanket around valves, pumps, and piping specialties.

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- b. For chilled water piping, provide polyisocyanurate foam insulation with PVC jacket. Provide blue jacket color for chilled water systems. For smaller diameter piping within buildings, fiberglass insulation is acceptable. Underground direct bury piping shall be doubled walled with the outer carrier pipe to be constructed of factory prefabricated HDPE jacketed system of factory pre-insulated pipe with all necessary fittings. For steam, condensate return insulation shall be high temperature foam insulation capable of withstanding continuous temperatures of 400 Degrees Fahrenheit. For chilled water, provide polyurethane foam insulation.
 - c. Provide reusable insulation blanket around valves, pumps, and piping specialties.
 - d. Pre-manufactured insulation elbow shall be used for piping insulation. Foam fill of elbow is unacceptable.
 - e. Underground direct bury piping shall be doubled walled with the outer carrier pipe to be constructed of factory prefabricated HDPE jacketed system of factory pre-insulated pipe with all necessary fittings. For steam, condensate return insulation shall be high temperature foam insulation capable of withstanding continuous temperatures of 400 Degrees Fahrenheit. For chilled water, provide polyurethane foam insulation.
 - f. Outdoor piping shall be insulated with aluminum jacket.
 - g. Insulation shall be sized correctly with no air gaps and per manufactures recommendations.
5. ELECTRIC HEAT TRACING
- a. Electric heat tracing shall be installed on exterior piping that is subject to freezing.
 - b. Label pipe indicating heat tracing as well as which circuit and panel it is fed from.
 - c. For large systems provide a front end controller, with alarm-able output
 - d. Use 120VAC system.
 - e. Heat tracing systems should be clearly labeled on the systems they are serving.
6. LIQUID FUELING SYSTEMS
- a. If using an automated fueling system, the system must have a fuel return system that is capable of handling all of the feed fuel. Additionally, it must have secondary containment, automatic shut-off and alarm devices, manual re-set, and a gravity fuel return system.
 - b. Intertie automated fueling system with building automation system.

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- c. The liquid fueling system must be tested prior to start up with applicable medium (e.g. diesel).
- d. Place sight glass on outside of all fuel storage tanks in order to confirm fuel levels.
- e. Leak detection system on any storage tanks is required.
- f. Capability to lock out manual fueling systems is required.
- g. Underground fuel storage tanks and associated piping must comply with federal and state regulatory requirements and must be specifically approved by PSU's EHS department.

7. FACILITY NATURAL GAS SYSTEMS

- a. Natural gas pressure reducing valve (PRV) shall have test ports on each side of valve. Provide a dedicated PRV for each piece of equipment. Design flows shall be in the middle of the PRV spring range.
- b. If piping is exterior to building, it shall be finished with a weather resistant finish.
- c. Natural gas piping greater than 1" in diameter is required to be rigid piping and painted bright yellow.
- d. A seismic shut-off valve is required at the building's main gas feed. The seismic shut-off valve must have a 3-valve bypass. Vertical and horizontal valve considerations need to be considered. All installs need to be coordinated with utility provider. Do not install on utility side of the meter.
- e. When seismic valves are installed contractor to protect valve from aggressive physical contact in order to prevent valve from inadvertently tripping.
- f. Non- Utility main line gas meters must have a bypass.
- g. Piping must be tested and approved by City of Portland prior to start up.
- h. Yellow armaflex can be used for the last two feet length of gas connections less than 1".
- i. Steel pipe needs to be seamless.
- j. For lab applications, provide emergency gas shut off at lab entry.
- k. Pipes and piping systems which contain or transport hazardous substances, including compressed air, must be labeled to meet Oregon OSHA regulations. This is to be adhered to regardless of the aesthetic impact it may have in a finished space

8. HYDRONIC PIPING

- a. Hydronic piping shall be copper or black iron. Plastic piping is not allowed.

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- b. Hydronic piping must have isolation valves and unions at all pieces of equipment. Unions shall be placed at applicable locations for equipment replacement. Verify operations with Owner Representative prior to project closeout.
 - c. For radiant heating panels, use manufacturer's factory rated hose with swivel end (factory assembled). Field quick connects are not allowed.
 - d. Provide dielectric connections as required.
 - e. Prep, clean, and store piping per the design engineer's direction and to ensure no unneeded chemical/bacterial contamination.
 - f. Weld systems are preferred. Grooved systems, except for steam piping, are allowed with approval.
 - g. Where pipes penetrate floors and walls, sleeves around pipes shall extend a minimum of 4" above floor level to act as containment around the penetration.
 - h. Provide drains at low points. Slope piping toward drains as required.
 - i. Ports for corporation stops need to be located as close to the top of pipe as possible and not beyond 22.5 degrees in either direction.
 - j. Provide automatic air vents at all high points of the system.
9. STEAM AND CONDENSATE PIPING
- a. Steam condensate return piping, gravity or pumped, shall be carbon steel and at a minimum schedule 80 when piping is 2 inches or less. 2 inches or greater schedule 40 carbon steel is acceptable. All piping shall have socket welded connections for piping 2 inches or less and butt welded connections for piping 2 inches or greater.
 - b. Steam valves that control heat exchangers shall fail close.
 - c. Contractor to adhere to preparation and storage methods as specified by mechanical engineer.
 - d. Contractor to adhere to flushing and cleaning methods as specified by mechanical engineer.
 - e. Neutralize and chemically treat steam piping as specified by Portland State University chemical treatment vendor.
 - f. All new installed steam header piping is designed for future conversion to 150 psig system operating at 125 psig.
 - g. Expansions joints, hangers, guides and rollers need to be submitted via shop drawing and approved by mechanical engineer.
 - h. Each system and piece of major equipment are required to separate isolation valves. Isolation valves should be approved by Owner.

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10. CHLORINATION SYSTEM FOR POOLS

- a. Manufacturer: Chlorine Feed System: Pulsar One or as approved by PSU Project Manager.
- b. All Seals must be Teflon. Rubber is not allowed.
- c. Use liquid chlorine for pools.

11. AIR AND DIRT SEPARATOR'S

- a. Manufacturer: Spirotech or as approved by PSU Project Manager.
- b. Consider chilled water loops, condenser water loops (closed and open), and steam condensate return systems. Required for chilled water and boiler plants.
- c. During construction blow-down debris shall be captured and removed prior to floor drain.

12. STEAM TRAPS

- a. Float and Thermostatic Steam traps are preferred, Armstrong 800 and 813, or approved equal, are required when applicable.
- b. Provide union or flanged connections at both ends.
- c. Provide gate valve and strainer at inlet and gate valve. Check valve at discharge.
- d. For major steam traps provide by-pass and blow-down valves. Major steam traps are: drip-legs, headers, and major pieces of equipment.
- e. Overhead trap blow-down valve, ensure it can be operated from the ground level.

13. CHEMICAL TREATMENT

- a. Contractor shall maintain chemicals in system for 3-months after installation.
- b. When possible, do not mix vendors and products on the same piece of equipment/station.
- c. Mount information at chemical stations shall include products is being used, chemical levels, system served, etc. O&M manuals need to be available at station.
- d. Systems shall utilize corporation stop for injection and testing points of chemical. Provide adequate space for corporate stops in piping systems.
- e. Water treatment systems for boiler water systems shall be included in the Contract Documents. Systems controlled by metering pumps feeding chemical from barrels are preferred. Prefer Milton Roy metering pumps or as approved by PSU Project Manager.

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- f. Boiler water steam must have a de-oxygenator (de-aerator) on the system for both large and small boilers.
- g. For new equipment the Contractor is responsible for proper cleaning, passivation and chemical treatment for the first three months after start up.
- h. Before tying into PSU system loops, contractor must collect before and after samples at different points and provide documentation to owner.
- i. Each closed loop must have a sampling port placed before and after a major piece of equipment.
- j. When sampling, first allow water run clear and then take the sample.
- k. For chemical delivery provide PEX or copper with heat fusion connections. Provide isolation valves for all branch lines.
- l. Chemical treatment must be considered during design. Training must be included in the bid.
- m. Preferred liquid feed for cooling towers, closed loops, boilers, fountains and pool chlorinators.
- n. Pot feeders are good for immediate adjustments and should be kept in the design.
- o. During the submittal process, contractors to complete a chemical treatment plan to PSU and design engineer for review.


14. IDENTIFICATION

- a. Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- b. Mechanical piping shall be labeled with flexible, vinyl film tape with pressure sensitive extra strength adhesive backing. Mechanically fastened piping is acceptable as well. Provide manufacturer label for direct bury applications when required.
- c. Include flow direction for both air and water systems
- d. If pipe is insulated, note if polypipe or plastic pipe is being used on insulation jacket.
- e. Provide a valve schedule as a part of the submittal package. Upon approval from owner, these shall be framed and installed appropriately in building mechanical spaces upon completion of project. Valves shall be tagged in the field per schedule.
- f. Provide ceiling tile labels for equipment (labeled orange) and hydronic valves (labeled Green). Labels shall be machine generated, adhesive backed with black letters, clear tape.

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- g. Coordinate with facility maintenance personnel to ensure consistency with the existing system.
- h. Tag balancing valves with GPM or CFM and valve position after balancing is completed.
- i. Identify equipment and control panels with plastic nameplates riveted to equipment body.
- j. Provide stenciled signs on each access door and housing, indicating purpose of access.
- k. Any system that has heat trace installed, the insulation shall have a label marking the heat tracing.

15. COMMISSIONING


- a. A commissioning plan and report must be submitted.
- b. Contractor shall submit one electronic and five (5) hard copies of commissioning documents to Project Manager.
- c. Commissioning agent needs to review submittals and O&M's.
- d. Commissioning agent shall coordinate training of PSU personnel.
- e. There must be a mandatory review of system/equipment within one year of building turn over.
-  f. For projects seeking LEED certification, compliance with LEED definition of "Enhanced Commissioning" must be required.
- g. Commissioning agent shall maintain an activity/action log throughout entire commissioning process.

B. HVAC SYSTEMS

1. GENERAL

- a. Ensure code required and adequate clearance for ease of accessibility to systems/equipment for repair, maintenance, or replacement.
- b. All HVAC systems shall be installed per code, ASHRAE, SMACNA, and industry standards.
- c. Identify all HVAC piping and equipment with stamp tag and flow direction. Color of label shall follow Code.
- d. Ensure as much as possible adequate clearance for ease of accessibility to systems/equipment for repair, maintenance, or replacement.
- e. Commissioning, testing, and balancing of air systems shall be performed prior to the conclusion of each project.

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-  f. All systems shall be designed to optimize energy efficiency, improve indoor environmental quality, and assist in achieving credits in the LEED rating system. Refer to Energy Conservation Guidelines (Appendix 26.1).
 - g. The minimum required SEER rating's for new HVAC equipment shall comply with the Oregon Energy Code, PSU strives to exceed code so the project team shall provide equipment suggestions that accomplishes this.
 - h. All new HVAC equipment shall be charged with refrigerant / hydrochlorofluorocarbons (HCFC) that adhere to the Environmental Protection Agency (EPA) requirements and phase out protocols. In 2020, R-22 is scheduled to be phased out and in turn should not be specified for new equipment R123 shall not be specified for any new equipment.
- HANGERS, SUPPORTS AND ANCHORS**

1. Hanger rod shall be steel, galvanized, threaded on both ends, or continuously threaded. Hanger spacing shall follow guidelines per the Oregon Mechanical Specialty Code and SMACNA standards.
2. Duct stiffeners are preferred over additional supports in the appropriate locations. Stiffeners shall be installed outside of the airstream.
3. Seismic bracing and vibration isolation requirements shall be analyzed and verified by a specialized design professional.

2. TESTING, ADJUSTING AND BALANCING


- a. Coordinate testing and balancing (TAB) work with other trades when applicable (e.g. fire life safety, BAS controls, commissioning agent, etc.).
- b. TAB provider shall be NEBB or AABC certified.
- c. TAB shall be performed under simulated normal building operating conditions with doors and windows closed, ceiling's installed, etc.
- d. New filters shall be installed before balancing and again prior to handover to owner.
- e. Prior to TAB, examine systems and system components and verify their operation and accessibility.
- f. Systems shall be flushed of debris prior to balancing. Pete's plugs are required across major water balancing components.
- g. Provide one electronic copy, and 3 hard copies of the balancing report. Include equipment calibration reports.
- h. Mark on volume balancing dampers the final balancing settings/position.
- i. TAB shall be equipped with appropriate to prefer air/water balancing PSU control systems.

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3. INSULATION

- a. Provide flexible glass fiber, commercial grade insulation with factory applied reinforced aluminum foil jacket. Provide ductwork insulation accessories for complete installation.
- b. All ductwork installed outside shall be internally insulated.
- c. Contractor shall make shop available for owner review of duct fabrication and duct liner installation.
- d. All fan enclosures shall be insulated.
- e. All supply, return, and outside air ductwork shall be insulated.

4. DUCTWORK

- a. All ductwork shall be manufactured and installed per SMACNA standards.
- b. Seal joints and reinforce ducts to prevent buckling, vibrations, and unnecessary noises. Fabricate ductwork in order to eliminate all sharp corners.
- c. Fabricate and install ductwork fittings with the least amount of pressure drop.
- d. Duct systems constructed using duct board will not be accepted.
- e. Use Pittsburg clamping system or as approved by PSU Project Manager.
- f. Flex duct longest lengths shall be 5 feet prior to termination at diffuser.
- g. Ductwork used to exhaust chemical fume hoods and special exhaust systems must be welded and stainless steel or PVC coated.
- h. Supply air and general exhaust ductwork shall be galvanized steel.
- i. The Contract Documents shall require that new duct systems are cleaned and inspected for cleanliness prior to energizing air-handling equipment.
- j. Label all ductwork based on its service (e.g. supply air, return air, hazardous exhaust, general exhaust, etc.).
-  k. At the beginning of any remodeling work, cover all return air grilles with filtering material to prevent accumulation of dust in existing duct system.
- l. If duct work is installed but not in use, it shall be temporally sealed for protection.

5. AIR DUCT ACCESSORIES

- f. Manufacturer: Ruskin, Greenheck, Tamco Air-Foil Control dampers or as approved by PSU Project Manager; all actuators shall be Siemens, Belimo or approved equal
- g. Volume dampers shall be no lighter than 18 gauge and reinforced to prevent vibration.

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- h. Control dampers shall be opposed blade and air foil type. For exhaust and outside air dampers, blade edges must be sealed to prevent leakage. Leakage testing shall be required to ensure compliance with manufacturer's performance criteria.
 - i. Dampers that are greater than 25 ft. sq. in area shall be installed in two or more sections.
 - j. Install safety screen where fan inlet/outlet or moving parts are exposed.
 - k. Install flexible duct connectors to air handling units. Provide weather guard when installed outside.
 - l. All dampers and their accessories shall be accessible for future repair/replacement. Access points shall be visibly labeled from occupied space.
6. AIR OUTLETS AND INLETS
- a. Manufacturer: Titus, Price, or as approved by PSU Project Manager.
 - b. Provide gooseneck or rain cap to prevent water intrusion for outdoor installation.
 - c. In moist environments (e.g. locker rooms), provide aluminum construction and stainless steel mounting hardware.
 - d. Provide integral balancing dampers where balancing dampers are not already specified.
 - e. For door louvers, minimum steel thickness is 20 gauges.
7. FUME HOODS
- a. When there is more than one fume hood in a room, perform backflow verification test (i.e. if one fan shuts off ensure no backdraft).
 - b. New fume hoods shall be standard products from a manufacturer, acceptable to laboratory use, and specifically approved by the PSU Environmental Health and Safety. All fume hood designs should demonstrate containment of tracer gas less than 4.0 AM 0.05 according to ASHRAE Test Standard 110-1995. *AIHA Z9.5-1995*.
 - c. All hoods shall be equipped with sash stops on vertical rising sashes allowing the sash height to be set at 18 inches during routine use, unless otherwise advisable.
 - d. High performance fume hoods shall be used, unless otherwise advisable. High performance hoods shall have a 60 FPM face velocity at 18" sash height.
 - e. In those cases where high performance fume hoods cannot be used, constant air volume hoods with bypass air openings shall be used. The

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bypass air opening shall progressively uncover as the sash is lowered to its lowest point.

- f. New hoods should be mounted on a chemical storage cabinet.
- g. Interior fume hood surfaces shall be rigid, safe, and constructed of corrosion resistant, non-porous, non-combustible materials, appropriate for the intended use.
- h. The interiors of hoods shall have smooth and impermeable interior surfaces with rounded corners. Interior surfaces shall be free of cracks and crevices to allow easy cleaning.
- i. Laboratory hoods shall be provided with a means of containing spills.
- j. A horizontal bottom airfoil inlet at the front of the hood shall be provided.
- k. The rear and top interior of the hood shall be furnished with baffles to provide at least two, preferably three, slots. Baffles should be continuous.
- l. A quantitative airflow sensor and an audible and visual alarm shall be permanently installed and located so that the display is visible to the user from the front of the fume hood.
- m. Light fixtures shall be of the fluorescent type and replaceable from outside the hood. Light fixtures shall be displaced or covered by a transparent, impact resistant, vapor tight shield to prevent vapor contact. Hood lighting shall be provided by UL listed fixtures. If located within the hood interior, the fixtures shall meet the requirements of NFPA 70 (National Electrical Code) sections appropriate to hazardous atmospheres.
- n. The valves, electrical outlets, and switches for utilities serving hoods shall be placed at readily accessible locations outside the hood. All shut-off valves shall be clearly labeled. Each new fume hood utilities shall have their own shut off valves prior to fume hood.
- o. Plumbing (e.g., vacuum lines) should exit the sides of the fume hood and not the bench top.
- p. Post instructions on how to use the hood per chemical requirements for enclosed spaces and fume hood manufacturer recommendations.
- q. When cup sinks are provided they are to be integral to the fume hood and provided with backflow prevention. Cup sinks to drain to acid waste system.
- r. All fume hoods shall be labeled with local service representative.
- s. All serviceable parts on a fume hood shall be accessible.

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C. MECHANICAL EQUIPMENT


1. GENERAL

- a. Ensure code required and adequate clearance for ease of accessibility to systems/equipment for repair, maintenance, or replacement.
- b. All equipment to be installed per code and industry standard.
-  c. All equipment to be commissioned upon completion of project.
- d. Vibration and noise must be considered in design. Install systems where it causes the least disturbance. Otherwise use noise and/or vibration dampening.
- e. For mechanical equipment located outdoors, the design shall provide features to facilitate winterization of such equipment.
- f. If equipment is elevated off of roof, provide platform in order to meet code requirement for safe access and clearances. Exterior items should be constructed using hot dipped galvanized steel.
-  g. Mechanical room floors shall be protective, water resistant, and coated and sealed with a sustainable product.
- h. Contractor shall provide required equipment data for PSU deferred maintenance software.
- i. Provide DDC controls and program into PSU building automation system (BAS) for all mechanical equipment.
- j. Provide concrete housekeeping pads when applicable.
- k. Ensure that replacement parts and components are available locally.
-  l. All systems shall be designed to optimize energy efficiency, improve indoor environmental quality, and assist in achieving credits in the LEED rating system. Refer to Energy Conservation Guidelines (Appendix 26.1).
- m. Provide written energy control procedures (provisions for lock-out tag-out) for any new equipment installation. When making modifications to existing equipment, require revisions to the written energy control procedures.
- n. All standalone HVAC systems at a minimum are required to be monitored by PSU's Building Automation System.
- o. HVAC units with a cooling capacity of greater than 10 tons shall not be physically located above a drop suspended ceiling, especially in offices.
- p. Equipment on roof should be located 15' from roof edge whenever feasible.

2. PACKAGED ROOF TOP / SPLIT SYSTEM - HVAC UNITS

- a. Manufacturer: Trane, Carrier, York, Reznor, McQuay/Daikon, or as approved by PSU Project Manager.

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- b. Manufacturer (VRF Systems) : Daikon, Mitsubishi, LG or as approved by PSU project manager,
 - c. Split system and stand-alone condensers shall be tube and fin type.
 - d. Gas heat is preferred over electric strip heat.
 - e. Provide NEMA 3R enclosure for VFD's, electrical/controls components, control panels, etc.
 - f. Contractor shall provide required structural anchorage per structural engineer requirements. Provide vibration isolation in order to meet specified structural and/or noise/vibration criteria.
 - g. Provide walk-off pads around equipment on roof.
 - h. Roof curbs shall be pre-manufactured and provided by HVAC unit manufacturer.
 - i. Ensure that roof warranty will be maintained/adhered to.
 - j. Outside air intakes need to be provided with water guard and bird screen.
 - k. City of Portland design review requirements shall be considered during design.
3. VARIABLE FREQUENCY DRIVES (VFD) AND MOTORS
- a. Manufacturers:
 - i. VFDs: ABB or as approved by PSU Project Manager.
 - ii. Motors: Baldor or as approved by PSU Project Manager.
 - b. VFDs shall have no bypass and be enclosed in NEMA 3R rated waterproof enclosure if installed outside.
 - c. Motors shall be high efficiency, inverter duty rated, and must have shaft grounding provided by factory when a VFD is installed.
 - d. Perform an AMP draw after installation, results shall be included in start-up report and reported to owner.
 - e. Install disconnect within line of sight of VFD.
 - f. Design equipment so that load does not cause motor to run in its service factor. Maximize amperage of motor.
 - g. If replacing a motor, stay within engineering limits of the equipment.
 - h. Motor must be high efficiency and waterproof if in an exterior location.
 -  i. Bearings to be serviceable, accessible, and grease-able. Grease shall be a sustainable product.
 - j. Do not install disconnect on the load side of the VFD.

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4. CUSTOM AIR HANDLING UNITS

- a. Manufacturer: Hunt Air, McQuay/Daikon, Trane, York, or as approved by PSU Project Manager.
- b. Require close coordination between air handling unit manufacturer, structural engineer, mechanical engineer, electrical engineer, acoustical engineer, and architect to ensure that unit structural support and mechanical and electrical connections are fully covered and responsibilities are fully defined.
- c. Units having arrays of multiple small fans are encouraged.
- d. HVAC fans shall be high efficiency when applicable.
- e. Allow clearances to pull shaft, motor, and other fan components.
- f. A light and receptacle shall be provided in enclosure. For outdoor units, provide adequate lighting and access for service and maintenance needs.
- g. Roof off of enclosure to shed water. Provide floor drain in enclosure and route to roof drain.
- h. If AHU is shipped in multiple sections, provide water proof joints between sections.
- i. For HVAC fans, provide pressure safety switch on discharge side of fan in order to protect equipment.
- j. Provide heat recovery when viable.
- k. Provide two position valves at all coils for shut-off. Control valves shall not be used for shut-off.
- l. Provide signage at each access door into air handler that notifies personnel of potential safety hazard. Access door shall be lockable.
- m. Provide filter bank. All filters shall be MERV 13 rating. Filters to be replaced prior to building turnover to PSU.
- n. For AHU control dampers all shafts/linkages to be metal. No plastic parts.
- o. For AHU's with heat wheels a bypass and bypass damper shall be provided.

5. SPECIALIZED EXHAUST SYSTEMS

- a. Manufacturer:
Lab Exhaust: Greenheck, Strobic Air, or as approved by PSU Project Manager.
- b. Fans exhausting laboratory fumes shall be designed as such and shall provide high velocity discharge that sends plume into atmosphere.

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- c. Exhaust fans shall be designed to exhaust the required media (e.g. kitchen/grease fumes, paint fumes, etc.). Fan material and components shall be spark proof when applicable.
 - d. All laundry exhaust systems shall be installed with lint filter and constructed per Oregon Mechanical code.
 - e. All painting application shall be installed with industry standard paint booth and specialized HVAC system.
 - f. Wood shops shall be equipped with appropriate dust collection system, specialized exhaust system, and fire suppression requirements.
 - g. All specialized exhaust fans shall be controlled, monitored, and alarmed via building automation systems.
 - h. Obnoxious/ Smelly fumes shall be exhausted from building occupants and general public. Exhaust fan discharge shall be directed so that odors are not detected by occupants.
6. AIR TERMINAL UNITS
- a. Manufacturer: Titus, Trane, Siemens (lab applications only) or as approved by PSU Project Manager.
 - b. Terminal unit shall be certified under the ARI Standard 880 certification program and carry the ARI Seal.
 - c. Terminal unit casing shall be minimum 22-gauge galvanized steel, internally lined with insulation, sealant shall be applied at insulation edges to prevent entrainment of fibers in air stream.
 - d. Dampers shall be heavy gauge steel with, self-lubricating bearings shall be specified for fan terminal units. Nylon bearings are not acceptable.
 - e. Damper shaft shall be clearly marked on the end to indicate damper position, damper shall incorporate a mechanical stop to prevent over stroking.
 - f. At an inlet velocity of 2000 fpm, the minimum static pressure required to operate any terminal unit shall not exceed 0.13-inch WG.
 - g. No flex on the inlet of a terminal box.
 - h. Provide working clearances around terminal unit and piping components.
 - i. Terminal Unit shall only be supported from building structure.
 - j. All air terminal units must have disconnect for fan powered units within line of sight of control panel.
 - k. Provide pipe kits, drain pan (when applicable) and flexible connections to re-heat coil. Condensate pipe shall be copper a properly sloped to drain. No quick connect fittings. Fan powered terminal units that are equipped

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with a cooling coil shall have a stainless steel drain pan which drains to a code approved location.

- l. Terminal units shall be labeled at drop ceiling.
 - m. Provide fume hood exhaust, general exhaust, and supply air when air terminal units are installed in a lab environment.
 - n. All entering and leaving ductwork shall meet manufacturer's requirement to reduce turbulence and allow accurate measurement and control.
 - o. Fan powered terminal units shall be equipped with a filter bank.
7. CONDENSING AND HEATING BOILERS
- a. Manufacturer: RayPak, Cleaver-Brooks, Aerco, AO Smith, Braford White, KN or as approved by PSU Project Manager.
 - b. When applicable, review design with boiler inspector. Contractor is required to provide final boiler permit and inspections from boiler inspector.
 - c. For domestic water heating, install separate back up electric hot water heater system when steam domestic hot water heater is the existing source.
 - d. For condensing boilers, a condensate neutralization station to be provided and piped to appropriate drain.
 - e. Provide isolation pad between concrete and boiler to prevent electrolysis.
 - f. Condensing boilers shall be piped reverse return for multi-unit installations.
 - g. Boilers need to be UL listed and stamped accordingly.
 - h. Boilers shall be equipped with a dedicated city water make-up with gate valve in order to fill up boilers quickly.
 - i. Boilers shall be installed with hose bib in order to drain down.
 - j. Provide seismic restraint/anchorage per structural engineer requirements.
 - k. Burners shall be high efficiency (85%-98% depending on application) and linkage-less when available.
 - l. Flues shall terminate above roof line and be provided with rain cap.
 - m. Operating pressure of all system components shall be consistent throughout (e.g. storage tanks, condensate tanks, expansion tanks, T&P valves, etc.).
 - n. Emergency electrical shut-off to be clearly labeled, red, and installed at the main point of egress. Provide cover.

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8. CENTRAL PLANT BOILERS

- a. Manufacturer: Cleaver Brooks, Hurst, Johnston, Burnham, Miura, or as approved by PSU Project Manager.
- b. Boilers shall be UL listed and stamped accordingly. Boilers shall be constructed for 150 psi operation; actual operation shall be 15 psi.
- c. Boiler shall be provided with economizer.
- d. Boilers shall run off of natural gas and No. 2 oil.
- e. Tubes shall be cleanable from either front or back of boiler.
- f. OSHA-approved platforms and ladders shall be provided to access boiler.
- g. Burners shall have a minimum standard efficiency of 85%. When available, burners shall be linkage-less and have a parallel positioning system.
- h. Emergency electrical shut-off shall be clearly labeled red and installed at the main point of egress. Provide cover.
- i. Boiler(s) to be provided with control panel which can be controlled via PSU BAS system.
- j. Boiler shall be equipped with low NO_x control, O₂ trim system, and VFD on blower.
- k. Central plant boilers shall operate in conjunction with a spray type de-aerator system. De-aerator tank shall be installed with magnesium rod to prevent corrosion.
- l. Dirt separator shall be installed on central plant condensate return systems.
- m. Wet-back design is preferred.
- n. Boiler shall be seismically anchored per structural engineer's design.
- o. In multiple boiler installations provide means to prevent carry over via the main steam header.
- p. Chemical treatment equipment and program to meet PSU standards.

9. HEAT EXCHANGERS


- a. Heat exchangers shall be properly rated for the flow and the media.
- b. Shut-off valves shall be directly up/downstream of all inlets and outlets.
- c. Provide isolation drain down valves.
- d. Where possible, provide a hose bib and floor drain near plate and frame heat exchangers in order to clean and service.
- e. Heat exchanger shall have strainer ahead of inlets that meets manufactures recommendations.

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10. PACKAGED WATER CHILLER

- a. Manufacturer: Water Furnace, Climacool, or approved equal.
- b. Provide Glycol or heat trace and low ambient control for outdoor installations.
- c. When viable, provide extended warranty on compressor.
- d. Chemical treatment equipment and program shall meet PSU standards.
- e. Packaged water chiller shall be provided for specialized purpose (e.g. academic research, server room cooling, etc.). Campus chilled water shall be used in all other cases and when available.
- f. Authority having jurisdiction shall review and approve the use of domestic city water for cooling needs. If approved, this water shall be metered.

11. CENTRAL PLANT CHILLER

- a. Manufacturer: Trane, McQuay/Daikon, Carrier, York, Climacool, or as approved by PSU Project Manager.
- b. Provide 10-year extended warranty on compressor.
- c. Chemical treatment equipment and program to meet PSU standards
- d. For large chillers, provide a jib crane, rail system, or other in order to provide maintenance to chiller.
- e. A refrigerant Leak Detection System shall be required.
-  f. Refrigerant shall be specified to assist in achieving Energy and Atmosphere credits in the LEED rating system.
- g. Provide adequate clearances in order to clean tubes on both ends of chiller.
- h. Provide dirt/air separator.

12. COOLING TOWERS

- a. Manufacturer: Evapco or as approved by PSU Project Manager.
- b. Provide stainless steel basin construction. Supply sump heater for basin if tower is in year round operation.
- c. Make up water meter shall be provided, provide Carlon or approved equal.
- d. Cooling tower to be provided with VFD and a vibration limit switch. Provide ultra-quiet fan operation accessory when noise is a consideration.
- e. Provide side stream filter.
- f. Provide fan guard, safety railings, and ladder from grade to fan deck.
- g. Design access to the basin and means to pull the motor.

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- h. Prior to specifying chemical treatment systems, consult with PSU Project Manager. See Section 23.A.14 for additional information.
- i. Provide jib arm to pull the motor.
- j. Cooling tower and cooling loop shall be designed to match chiller capacity.
- k. Open towers shall be located external to buildings. Roof-mounted units are preferred.

13. PUMPS

- a. Manufacturer: Paco, Bell and Gossett, BFS Industries (Condensate Pumping Stations), or as approved by PSU Project Manager.
- b. For chilled and condenser water pumps, pump seals shall be Unitized EPR/SiC/SiC. Rated for 1000 ppm undissolved solids. Provide spare seal at the conclusion of the project.
- c. Impellor shall be silicon bronze, fully enclosed, keyed to shaft. Trim impeller to maximum flow rate without overloading the motor.
- d. Shaft shall be stainless steel.
- e. Condensate pumping stations shall come equipped with a welded steel tank. Motors are not required to have a VFD. Ensure means to fully drain tank. Tank and pump shall be rated for 180 F.
- f. Sump pumps shall be equipped with a mechanical float and alarmed for high levels.
- g. Sewage injection pumps shall have a grinder on the impeller.
- h. Submit documentation that pumps are in proper alignment.
- i. Piping needs shall be independently supported prior to pump installation; the pump should not bear any of the weight.
- j. Provide isolation valves, check valves, and unions or flanges for maintenance and replacement purposes.

14. IDENTIFICATION FOR MECHANICAL EQUIPMENT


- a. Provide stickers for identification rather than stenciling.
- b. All above ceiling equipment shall be marked using label tape markers affixed to the ceiling grid, or similar methods.

D. MECHANICAL INSTRUMENTATION AND CONTROLS

1. GENERAL

- a. PSU's centralized control system is Siemens Apogee. All new control systems shall interface accordingly.
- b. Contractor shall participate and provide a 50% and a 90% review of control drawing's and devices. As-builts shall be delivered in PDF and AutoCAD format.

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- c. All new work shall comply with NEC and all local codes.
- d. Throughout the creation of the instrumentation and controls construction specifications, contact PSU controls team for review.
-  e. All systems shall be designed to optimize energy efficiency, improve indoor air quality, and assist in achieving credits in the LEED rating system. Refer to Energy Conservation Guidelines (Appendix 26.1).
- f. The design of the BAS shall support networking of operator workstations and Building Controllers. The network architecture shall consist of two levels, an Ethernet based primary network for all operator workstations, servers, and primary DDC controllers along with secondary Floor Level Networks (FLN) for terminal equipment application specific controllers. **At the Floor Level BACnet shall only be used for third party devices.**
- g. Controls systems that shall be wired and installed via BACnet over MSTP. BACnet over IP will not be an approved method of installation.

2. COMMUNICATION

- a. Wireless devices are not preferred but shall be approved by PSU Project Manager on a case by case basis.
- b. Communication to 3rd party devices shall be BACNET. A third party device that is P1 or FLN compatible is acceptable.(e.g. Onicon BTU meters, ABB VFD's)
- c. The design of the BAS shall support networking of operator workstations and building controllers. The network architecture shall consist of three levels: Management Level Network (MLN) for all operator workstations and servers, Building Level Network (BLN) for primary DDC controllers, and Automation Level Network (ALN, aka FLN) for terminal equipment application specific controllers.


3. PROGRAMMING

- a. In lead/lag scenarios when a start command is issued and the equipment fails to run, do not remove the start command from the failed equipment.
- b. Limit the use of the resident point, "\$loc's". When they are used, create a virtual point that corresponds to the value of the "\$loc".
- c. For Building automation system programming "Define" statements shall not be used.
- d. All generators shall have a run status tied into the BAS.

4. GRAPHICS

- a. All points shall be shown on graphics.
- b. On graphics of major/critical equipment, provide a direct link to the sequence of operations and IOM. For terminal equipment and application specific controllers, provide a link to the application manual.

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-  c. Wherever feasible, online dashboard applications must be considered in new buildings, renovations, and remodels. If these applications are used, the system shall be web based and not directly tied into PSU's network.
- d. All PC monitors shall be of flat panel type and shall support a minimum display resolution of no less than 1280 x 1024 pixels. The display shall have a minimum of 19" visible area in diagonal measurement. Separate controls shall be provided for color, contrasts, and brightness. The screen shall be non-reflective.

5. DEVICES

- a. All actuators shall be electronic. Pneumatic devices must be pre-approved.
- b. For chilled water and condenser water flow sensing, no turbine type meters are allowed. Provide Onicon Model F(B)-3500 or as approved by PSU Project Manager.
- c. All enclosures shall be labeled with a minimum of node name, system name, and power source.

6. LOW VOLTAGE WIRING

- a. Provide color coded wiring per OIT Standard (appendix 27.1). Wiring shall be labeled at each end with point name and address.
- b. Contractor shall provide all supports for wiring. Wiring can't be supported from existing conditions (e.g. Ceiling grid hangers, sprinkler pipe hangers).
- c. Communication wiring shall be 24 AWG, twisted pair, shielded, and low capacitance.
- d. Power for BAS shall have dedicated circuits.
- e. All systems requiring interlock wiring shall be hardwired interlocked and shall not rely on the BAS programming to operate (e.g. emergency generator to fuel oil pump interlock, emergency generator damper interlock, etc.).
- f. All safeties shall be hardwired. Safeties shall not rely on the BAS to act and shutdown systems upon detection of a failure, safety limit, or alarm.



7. COMMISSIONING

- a. Provide point to point check out sheets prior to commissioning activities verifying functionality of each device.
- b. The contractor's technical support team (including programmer) personnel shall be consistent throughout the project including commissioning.
- c. After commissioning remove all unnecessary trending.


END OF SECTION

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Section 26 - Electrical

A. Common Work Results for Electrical

1. General

- a. All work shall be performed per the current adopted National Electric Code (NEC/NFPA70) and current enforceable Oregon specialty codes.
- b. Conduits feeding any branch shall have maximum of 40% fill.
- c. Each device box shall have grounding pigtails.
- d. Whenever possible, all junction boxes shall be readily accessible per NEC definition, labeled with circuit identifier and origin.
- e. All devices, equipment, and material within the scope of work shall be affixed with a PSU approved permanent label identifying panel of origin and circuit number.
- f. All electrical distribution busses and boards shall have copper (CU) bussing. AL plated buss & AL wound transformers are prohibited.
- g. All circuit breakers shall be bolt-on type, where applicable.
-  h. All EMT fittings of set screw types shall be steel with recycled-content.
- i. Flexible MC cable is not allowed in any new constructed building or major remodels, with the exception for lighting fixtures up to 6'-0" max.
- j. Hardpipe is required exiting all panel boards.
- k. For new buildings and major remodels, install full size panel equipped with 42 circuit breakers at a minimum.
- l. All low voltage wiring shall be independently supported using appropriate pre-manufactured supports.
- m. Underground and underslab ducts and raceways shall be rated for the type of installation.
- n. An overcurrent protective device coordination study, arc flash study, and arc flash assessment is required for all new construction and major renovation.
- o. All new services are preferred to be 480/277V.
- p. All new medium voltage distribution equipment, including transformers and switches (Fused or Non-Fused), that will be the owners maintenance responsibility, shall be equipped with PSU PM approved metering device(s). Metering components, beyond direct contact of energized voltage conductors (CTs, PTs), shall be housed in an integral metering compartment that easily and safely accessible of any electrical hazard(s).

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- q. Any new service shall have (1) adjustable Main OCPD, where applicable. The single main to have adjustable trip settings.
- r. All electrical control equipment, including lighting control panels (master, satellite, and/or modules) shall not be installed above a finished classroom ceiling. If design/installation cannot meet this requirements, contact PSU CPC.
- s. All OCPD's shall be rated for the applicable KAIC. Minimum KAIC rating allowed in most installations shall be 22KAIC.
- t. Provide a complete grounding system design including any schematics, risers, and details. Specifications and drawings shall include detailed requirements (sizes, quantities, conduits, etc.) of the grounding system. Grounding design shall include main service, supplemental, and equipment grounding requirements. Specifying grounding requirements by referencing a code is prohibited.
- u. Contractor(s), Designer(s) and Engineer(s) are responsible for addressing all design review comments to the satisfaction of PSU in order to assure the continued reliability of all power distribution systems.
- v. Minimum conduit size for power circuits shall be 3/4 inch. Minimum conduit size for control wiring shall be 1/2 inch. Conduit crossing building expansion joints shall have expansion provision with grounding continuity.
- w. Where applicable in new construction, all new electrical distribution equipment shall allocate 20% spare capacity (electrically & physical space) for future growth. If 20% is not obtainable during design phase(s) contact PSU CPC.
- x. Proper ventilation and cooling shall be provided at locations where transformers are installed to prevent temperature in the room to rise above 75 degrees F.
- y. All conduits shall be hidden in walls, floors, or ceilings where applicable.
- z. For electrical box acoustics, provide sound insulation and gasketing at switch and outlet box locations at conference rooms and executive offices. Boxes in walls shall be staggered and not back to back.
- aa. During any construction that requires the use of electrical extension cords, a GFCI surge protector must be in-line & in use, between the source and the load. Defected or clearly damaged extension cords are not allowed for use on campus.
- bb. All low voltage power distribution transformers shall meet NEMA TP-1 at a minimum.
- cc. During installation of all electrical distribution equipment/components/devices the contractor is responsible to verify, test, record, and document that all conductive electrical connection points

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are properly secured and seated per manufacturers' recommendations. Completed installation should be free of all defect.

- dd. All equipment control wiring shall be installed in a control raceway. Power (Voltage/Current) conductors shall share same control raceway. The only exception is if the control wiring sources the same load as the power conductors the insulation of the conductors are identical.
- ee. During the design process, design team to provide a true life cycle cost of equipment if requested by PSU.
- ff. If a project requires a new or an altered existing (30% or more as determine by PSU) piece of electrical distribution equipment such as Services, Switchboards, Distribution Boards, Panel Boards, Busways, Load Centers, the design team is responsible to perform NFPA 70 requirements as it pertains to Arc Flash, Available Fault and TCC. PSU will require each requirement to be provided in electronic format (.dez, .dwg, & .pdf) and hard copy.
- gg. If a project requires an existing or a new piece of electrical distribution equipment such as Services, Switchboards, Distribution Boards, Panel Boards, Busways, Load Centers to be altered/installed, the design team is responsible to produce an updated warning/hazard labels to be applied to such equipment per current NFPA 70 & 70E.
- hh. If a warning/hazard label is required to be installed, apply label on the front face of the specified piece of equipment. The only exception to this rule is if such equipment is in a common corridor/space. If contractor is unsure, contact PSU and submit an RFI.
- ii. If a warning/hazard label is required to be installed on an existing piece of equipment, contractor shall remove all other warning/hazardous labeling and apply new label on the front face of the specified piece of equipment. The only exception to this rule is if such equipment is in a common corridor/space. If contractor is unsure, contact PSU and submit an RFI.
- jj. Provide written energization, de-energization, and testing electrical control procedures (provisions for lock-out tag-out) for any new equipment installation(s). When modifications to existing equipment, require revisions to any written electrical control procedures.
- kk. All electrical work to be performed within the scope of work shall only occur while all equipment is de-energized. Prior to any electrical work to be performed, the Electrical contractor is responsible to perform a site assessment of all energized electrical equipment within the same distribution system as it pertains to the scope of work. In certain situations, where existing facilities and systems lack documentation, the electrical contractor will be responsible to implement additional safety measures when performing electrical work, including but not limited to grounding straps, protective blast barriers, etc. If the electrical contractor cannot de-

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energize the equipment or system to perform the work, the electrical contractor is required to contact PSU PM.

- ll. Prior to performing any electrical work, the contractor is required to provide a safety plan and pre-task plan to PSU PM and PSU EH&S for review and approval.
- mm. Ceiling access panels shall be min. 2'x2' where deep ceiling access is required.
- nn. Unless approved by building official routing new piping over electrical equipment is not allowed.
- oo. Electrical panels located in public space shall be built so it can be secured with a lock.

2. Identification

- a. Provide label trim plates.
- b. Color-code for different systems and by voltage:
 - i. Black, Red, Blue - 120/208
 - ii. Brown, Orange, Yellow - 277/480
 - iii. Gray, White - Neutral
- c. Where a color system is in place, continue the same pattern as is.
- d. Label all electrical distribution equipment such as switchgear, distribution, and panel boards to match plans (Phenolic Labels).
- e. Provide schedules for all electrical distribution equipment such as Switchgear, Distribution, and panel boards.
- f. All electrical distribution equipment enclosures, including disconnects, shall be affixed with a label identifying where that piece of equipment is being sourced from. The label should include name of source, type of source and location of source.
- g. All naming to follow table below

Electrical Equipment Labeling Identification							
Facility Identifiers		Source Type	Voltage (kV)	Eqpt Type	Level/Flr	RowColumn (AlphaNumber)	Series
<i>Campus</i>	<i>BLDG</i>	:N (Normal)	:6 (12.47)	:S (SWGR/Bldg Service)	:01 (Sub Basement)	:D2 (Row D Column 2)	:A
	<i>XCP</i>	:E (Emergency)	:4 (0.48)	:B (Distribution Board)	:0 (Basement)		:B
	CLSB-	:U (Uninterrupted)	:D (0.24)	:P (Panel Board)	:1 (First Floor)		:C
	HGCD-	:S (Stand-By)	:2 (0.208)	:L (Load Center)	:2 (Second Floor)		
	NASC-	:L (Loop)	:T (XFMR)	:W (Busway)	:3 (Third Floor)		
	CHXP-			:U (UPS)	:4 (Fourth Floor)		
	ABXP-			:X (Disconnect)	:M (Mezzaine)		
	SBAP-			:V (VFD/ASD)	:R (Roof)		
				:M (Motor Control Centr)			
				:A (ATS [A] MTS [M])			

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EXAMPLE


In Cramer Hall locating a distribution board, panel board and transformer

>400A Distribution board is on the first floor at row A and column 1, Emergency source of 480V would be :CHXP-E4B1A1

A second sub-fed 400A panel board, normal power, 208V, located on third floor, row 6 column B would be :CHXP-N2P386-B

A 45kVA, 480-208/120 xfmr sourced by UPS power, located in sub-basement at row F, column 5 would be :CHXP-UT01FS

3. Electrical Distribution Equipment

- a. Manufacturer: Eaton, Square D, or as approved by PSU Project Manager.
-  b. Sub-metering of main building switchgear is required. Provide connection to PSU building automation system. Sub-metering shall be considered for other pieces of electrical gear in which it provides coverage for large portions of the building.
- c. For any transformer and switch enclosures, provide window to be located in the cabinet to allow for performance of infrared testing.
- d. In certain cases, PSU will require double ended switch gear for the building's main 120V, 208/230V, and 460V/480V electrical infrastructure.

4. Wiring Devices – Receptacles, Switches

- a. Provide commercial grade receptacles in most cases. PSU maintains numerous types of buildings. If building type/space is not clear, contact PSU.
- b. Provide commercial grade switches in most cases. PSU maintains numerous types of buildings. If building type/space is not clear, contact PSU.
- c. Provide stainless steel covers/faceplates for new construction in most cases. PSU maintains numerous types of buildings. If building type/space is not clear, contact PSU.
- d. For all medium voltage, cabling partial discharge sensors shall be installed. At the conclusion of installation, a partial discharge report shall be provided.
- e. Provide GFCI devices where required by code.
- f. Provide AFCI devices where required by code.
- g. Provide tamper resistant devices where required by code.
- h. If not feasible or prior approval by PSU, a combination of circuit breakers and fuses within the same electrical distribution system is not permissible. An exception includes primary voltage services, MCC's, and UL classified fuses as required for time delay and limitation requirements of the application.






5. Automatic Transfer Switches

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- a. Manufacture: ASCO, Eaton or as approved by Project Manager.
 - b. For emergency systems, design to match generator demand load, in compliance with NFPA guidelines.
 - c. For medium voltage infrastructure, design to meet building load(s). Ideally, transfer shall be seamless, with no power bumps. Consult with PSU.
 - d. All transfer switch status shall be wired into PSU building automation system.
 - e. Provide automatic transfer switches with maintenance bypass isolation.
6. Generators
- f. Manufacturer: MTU, Generac, CAT or as approved by Project Manager.
 - g. When installing a EPSS (Optional or Stand-by), the source shall be separately derived.
 - h. When installing a single (Optional or Stand-by) generator, provide a breaker at the generator. If multiple or parallel generators are being considered during design consult with PSU.
 - i. If generator is located in an interior space, that space shall be equipped with a CO monitor.

B. Lighting

1. General

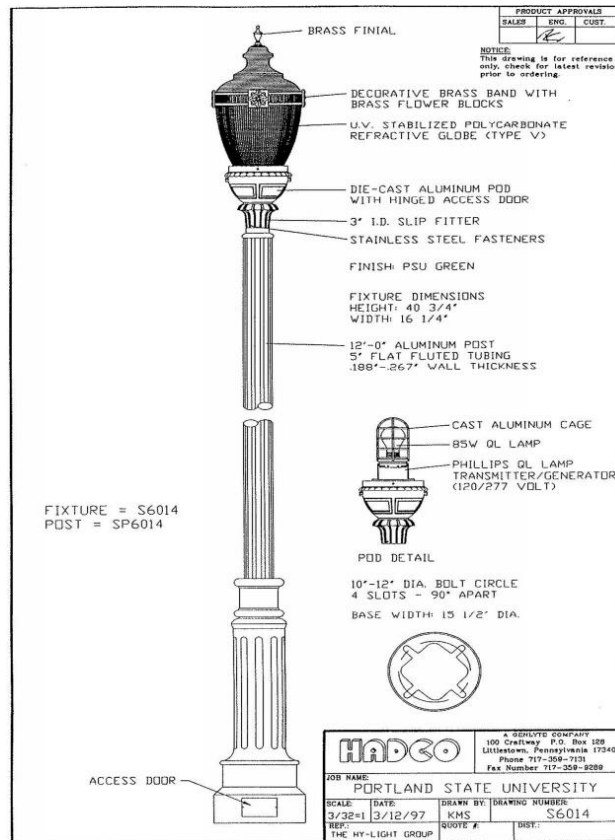
-  a. Daylighting shall be the primary lighting strategy with electric lighting supplementing, where applicable and feasible.
-  b. Daylight sensors shall be installed to control light fixtures where applicable and feasible.
-  c. All lighting installations must meet or exceed Oregon Energy Code.
-  d. All light bulbs and fixtures shall be ENERGY STAR-rated whenever possible. Prefer high-efficiency florescent lights and fixtures. Refer to Energy Conservation Guidelines (Appendix 26.1).
-  e. All purchased florescent lighting shall meet the LEED credit for Reduced Mercury in Lamps. The maximum target for the overall average of mercury content in lamps is 70 picograms per lumen-hour or less.
- f. All mounting heights shall be per ADA standards.
- g. MC Cable is acceptable for lighting fixtures subject to the same limitations outlined in Section 26.A.1.p.
- h. Provide schematics, schedules, relay (sizes & quantities), and clear intent for all lighting controls as applicable.

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- i. Occupancy sensors for lighting are recommended in all areas where appropriate according to use patterns.
 - j. In any new construction, renovation and/or remodel that replace lights within offices, conference rooms or classrooms ≥ 1000 sqft, 75% of the total design/installation area (if not all) shall be LED type(s).
 - k. In any new construction, renovation and/or remodel that replace lights within corridors and/or common areas (≥ 1000 sqft), all new light designs/installations shall be LED type.
 - l. In any new construction, renovation and/or remodel that replace lights within parking structures, utility rooms and system facility areas/spaces that are considered to be continuous operation (≥ 3 hrs), all new light designs/installations shall be LED type.
 - m. New and replacement lighting fixtures shall be sourced locally so replacement parts can be easily acquired.
2. Interior Lighting Fixtures
-  a. Indirect LED is preference.
 - b. When approved for installation, all LEDs to meet a minimum measured CRI value of 80 and a minimum measured CCT value of 3500K as applicable to the use and function of the space.
 - c. Preferred model for interior LED Lighting: RPT, LEDPanels G3 2x2,2x4, and 1x4, or as approved equal by Project Manager.
3. Lighting Control Devices
- a. Manufacturer: nLite, Watts Stopper or as approved by PSU Project Manager.
 -  b. Local occupancy sensors are required. In offices, classrooms, etc., they should be located adjacent to doors and should be the primary control for any energy reduction measures.
 - c. Segregate zones/areas as small as suites or rooms.
4. Networking Lighting Controls
- a. Manufacturer: nLite or as approved by PSU Project Manager.
 -  b. Design for daylight harvesting.
 - c. For public space, install step dimming.
 -  d. Master lighting control panel are not allowed.
5. Exterior Lighting and Light Poles

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- a. Comply with City of Portland current standards. (See light post cut sheet below)
- b. LED Lamps preferred to be Lumecon LROF or project manager approved



*1This detailed figure of a lamp post can be found on the I Drive at
I:\Staff\Facilities\Shared\All_FAP\Construction Standards\Revision 2B - January 2017 - Minor
Revision\Feeback Comment Documentation\Lamp\Lamp.PNG*

6. Installation

- a. Exterior lighting fixtures shall be WET-LISTED watertight and shall have vandal-proof bases. For poles up to 15-20' high, hinged poles are preferred. All poles should meet, at a minimum, any seismic anchoring/bracing requirements. Exterior lighting fixtures shall have heavy-duty guards.
- b. Fixture covers shall be UL-approved and regularly manufactured.
- c. Select consistent fixtures and lamps for use throughout buildings. Minimize models, types, and systems.
- d. LED Fixtures to have electronic devices. Select items that are not going to become obsolete or difficult to obtain shortly after turnover to PSU.

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- e. Interior High Output Fixtures must have accessible ballasts.
- f. When high light fixtures in auditoriums and gyms are used, consideration must be given to access, maintenance, and serviceability.
- g. Accessibility to ballasts must be provided when using compact fluorescent fixtures.
- h. Place power packs for switching in maintenance accessible-friendly locations. These items are best located directly above banks of light switches, or in electrical rooms when feasible.

END OF SECTION

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SECTION 27 – COMMUNICATIONS AND AUDIO VISUAL

A. PHONE AND DATA

1. DESCRIPTION

- a. Refer to Appendix 27.1 – Structured Cabling Standards - for all phone and data installations
- b. Telephone and Computer Network Cabling -- by PSU Office of Information Technology (OIT). Coordinate as required for complete installation. All cable and conduit to be concealed where possible.

B. AUDIO VISUAL

1. DESCRIPTION

- a. Refer to Appendix 27.2 – AV Standards for Audio Visual requirements.
- b. Protect existing AV Equipment and Cabling where applicable.
- c. New AV Equipment and Cabling -- by PSU OIT. Coordinate as required for complete installation. All cable and conduit to be concealed where possible. Refer to OIT Structured Cabling Standards (Appendix 27.1) & AV Standards (Appendix 27.2) for additional information and requirements.
- d. Provide electrical installations as required.

2. LOCATION / INSTALLATION

- a. Equipment locations are to be on a case-by-case basis. Consult with OIT prior to all installations or purchase of equipment. See Appendix 27.2 – AV Standards for Audio Visual requirements.

END OF SECTION

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Section 28 – Electronic Safety and Security

A. Access Control

1. PSU currently has an exclusive contract for Lenel Security Management Software System for electronic access control in campus buildings. The server is maintained by PSU Office of Information Technology (OIT), it is maintained by FPM with the central station being monitored by Campus Public Safety Office staff. Installations, repairs or other work done on system must be performed by certified Lenel personnel and coordinated by CPC, FPM and CPSO Access Control team for Capital Projects & Construction design and construction projects. For further description, refer to Access Control standards (Appendix 28.1).
2. Access control is required in all exterior doors (except ones that are exit only) and preferred on entry doors to office suites. Access control shall be considered and discussed with PSU Project Manager and CPSO in all other spaces. PSU Project Manager will ensure that a meeting is held with CPSO to discuss installation locations.
3. Where applicable access control system to be integrated with fire alarm system to initiate door release. Refer to division 28.
4. Card Access Doors
 - i. Provide/Install all transformer or other electrical devices and hardware required to support card access for locks and panic bars.
 - ii. Strikes to be ANSI type 10-025, electric as required for card access.
 - iii. Key card access control at all exterior entry points, including to roof, and at department suite entry and exit points. Retro-fit existing or provide at new doors for electric strike. Coordinate with existing PSU system, door hardware, or power opening device.

B. Security Cameras

1. All new building and major renovations should include security cameras at entrances and in conjunction with any panic button installation. Additional thought should be given to installing security cameras at exits, in areas with public use, where cash is handled, and in other potential high crime areas. Camera installation shall include discussion with the Campus Public Safety Access Control Team.
2. If panic buttons are installed cameras shall also be required. The installation of panic buttons shall be discussed on a case by case basis with PSU Project Manager and CPSO. PSU Project Manager will ensure that a meeting is held with CPSO to discuss installation locations.

END OF SECTION

**Section 28 – Electronic Safety And Security – Fire Alarm System Analog
Addressable Fire Alarm System**

A. General

1. Scope

- a. The Silent Knight Farenhyt Series IFP-2000ECS or IFP-2000 24VDC analog addressable fire alarm system with IDP protocol addressable initiation devices and System Sensor two-wire synchronized notification devices is the Portland State University standard for Fire Alarm Systems.
- b. The Silent Knight Select Farenhyt Engineered Systems Distributor shall furnish all labor, materials, appliances, cabling, tools, equipment, facilities, transportation, and services necessary for and incidental to the performance of all operations in connection with furnishing, delivery, and installation of all equipment, cabling, programming, configuration, testing, and training required by this Section, complete as indicated in the applicable Contract Drawings and/or specified herein.
- c. This specification provides the requirements for the installation, programming, configuration, testing, and maintenance of a complete analog addressable fire alarm system. This system shall include, but shall not be limited to:
 - i. Main Fire Alarm Control Panel (FACP)
 - a) Network Nodes (on network systems only)
 - Network Interface Module
 - Fiber optic or copper network connection circuits
 - b) System cabinet
 - c) Power supply
 - ii. Digital Signaling Line Circuits (SLC)
 - iii. Notification Appliance Circuits (NAC)
 - iv. RS-485 Serial Communication Bus (S-bus)
 - v. Annunciators both integral and remote
 - vi. Batteries
 - vii. Wiring
 - viii. Conduit
 - viii. Associated peripheral devices and modules

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- ix. Other relevant components and accessories required to furnish and install a complete and operational fully automatic, addressable reporting Life Safety System.
 - x. Fire alarm has to be tied in to access control to release doors.
 - xi. Fire alarm panels or sub-panels shall not be installed in private offices.
- d. The fire alarm system shall be capable of providing, at a minimum, the following:
- i. Fire Alarm Control Panel (FACP)
 - Integral Digital Alarm Communications Transmitter (DACT). Silent Knight IPGSM-4G Alarm communicator or approved equal.
 - Network Interface capability via copper and/or fiber optic network.
 - ii. Analog addressable initiation devices
 - iii. Analog addressable monitor and/or control modules
 - iv. Notification appliances
 - System Sensor.
 - v. Notification Appliance Circuit (NAC) remote power supply
 - RPS-1000 Remote Power Supply shall provide the capability of housing the 5815XL SLC Expander for remote SLC generation.
 - Combination horn/strobe two-wire circuit.
 - Built-in synchronization capabilities
 - vi. Integral Voice Evacuation capability
 - vii. Firefighter Telephone capability
 - viii. If smoke control is determined to be required by PM and/or AHJ, Honeywell (Gamewell-FCI or approve equal) to be integrated with all control systems. control systems includes but not limited to HVAC, access control, all suppression systems, sprinkler systems, etc.
- e. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this Specification.
- f. Mini Monitor Modules are not allowed.

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- g. The Analog Addressable Fire Alarm System specified herein shall be connected to a UL Listed Central Station Monitoring Company provided by Portland State University.
- h. Points lists with descriptions will be provided to Portland State University.

2. Qualifications

a. Equipment

- i. The equipment installer should have at least three (3) years experience.
 - Equipment provided for this project shall be the product of Silent Knight Farenhyt by Honeywell.
- ii. All equipment shall conform to currently adopted applicable codes and ordinances.
- iii. All equipment shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as Intertek Testing Services NA, Inc. (ITSNA - formerly ETL) or Underwriters Laboratories Inc. (UL) and be listed by their re-examination service.

b. System Supplier/Installer

The system shall be furnished and installed by a Silent Knight Select Farenhyt Engineered Systems Distributor who is trained and certified by the Manufacturer in the proper installation, programming, configuration, testing, service, and maintenance of the systems specified herein.

3. Applicable Codes & Standards

c. The Fire Alarm System shall comply with the currently adopted versions of the following:

- ix. Building Standards Administrative Code, Part 1, Title 24,
- x. Oregon Fire Codes
- xi. International Fire code with Oregon Amendments

d. NFPA Standards

- i. The fire alarm system shall comply with the applicable provisions of the following current National Fire Protection Association (NFPA) standards:
 - NFPA 12 Carbon Dioxide Extinguishing Systems
 - NFPA 12A Halon 1301 Fire Extinguishing Systems
 - NFPA 13 Installation of Sprinkler Systems
 - NFPA 15 Water Spray Fixed Systems

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- NFPA 16 Deluge Foam-Water Sprinkler Systems
 - NFPA 16A Installation of Closed Head Foam-water Sprinkler Systems
 - NFPA 17 Dry Chemical Extinguishing Systems
 - NFPA 17A Wet Chemical Extinguishing Systems
 - NFPA 72, National Fire Alarm Code:
 - a) Central Station Fire Alarm Systems
 - b) Local Fire Alarm Systems
 - c) Auxiliary Fire Alarm Systems
 - d) Remote Station Fire Alarm Systems
 - e) Proprietary Fire Alarm Systems
 - NFPA 70, National Electrical Code
 - NFPA 90A, Installation of Air Conditioning and Ventilating Systems
 - NFPA 101, Life Safety Code - Safety to Life from Fire in Buildings and Structures
 - NFPA 750 Water Mist Fire Protection Systems
 - NFPA 2001 clean Agent fire Extinguishing Systems
- e. ADA - Americans with Disabilities Act
- f. U.L. Standards
- i. The system shall comply with the applicable provisions of the following U.L. Standards and Classifications:
 - UL 38, Manually Activated Signaling Boxes
 - UL 268, Smoke Detectors for Fire Alarm Signaling Systems
 - UL 268A, Smoke Detectors for Duct Applications
 - UL 346, Water-flow indicators for Fire Protective Signaling Systems
 - UL 464, Audible Signal Appliances
 - UL 521, Heat Detectors for Fire Protective Signaling Systems
 - UL 864, Control Units for Fire Protective Signaling Systems
 - UL 1481 Power Supplies for Fire Alarm Systems

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- UL 1635, Standard for Digital Alarm Communicator System Units
- UL 1638, Visual Signaling Appliances
- UL 1971, Emergency Devices for the Hearing Impaired
- UOJZ, Control Units, System
- SYZV Control Units, Releasing Device
- UOXX, Control Unit Accessories, System
- SYSW Accessories, Releasing Device Service

B. Products

1. System Requirements

- g. Basic Performance and Capabilities
 - i. System shall be fully programmable and configurable on site to accommodate system expansions and facilitate changes in operation.
 - ii. All software programs shall be stored in non-volatile programmable memory within the FACP.
 - Loss of primary and secondary power shall not erase the instructions stored in the memory.
 - System programming shall be password protected.
 - iii. Alarm, supervisory, and trouble signals from analog addressable devices shall be encoded onto NFPA Class B signaling line circuits (SLC).
 - iv. Initiation device circuits (IDC) shall be wired NFPA Class B.
 - v. Notification appliance circuits shall be wired NFPA Class B.
 - vi. A single ground or open on any system SLC, IDC or NAC shall not cause a system malfunction, loss of operating power, or the ability to report an alarm.
 - vii. Alarm signals arriving at the main FACP shall not be lost due to a power failure.
 - viii. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of 120 VAC power in a normal supervisory mode for a period of twenty four (24) hours with five (5) minutes of alarm indication at the end of this period.

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- Systems that include voice evacuation shall provide sufficient battery capacity for twenty-four (24) hours with fifteen (15) minutes of alarm in lieu of the five (5) noted above.
- ix. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70% capacity in twelve (12) hours.
- h. System Functional Operation
- i. The actuation of any approved alarm initiating device shall automatically initiate the following functions:
- Alarm LED on the FACP shall flash.
 - Local audible piezo electronic signal in the FACP shall sound.
 - The alarm condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s).
 - System shall transmit the condition to a UL Listed Central Station Monitoring Facility. History storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence.
- ii. The actuation of any approved supervisory alarm initiating device shall automatically initiate the following functions:
- Supervisory LED on the FACP shall flash.
 - Local audible piezo electronic signal in the FACP shall sound.
 - The supervisory condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s).
 - History storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence.
 - System output programs configured via control-by-event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system output (alarm notification

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appliances and relays) shall be activated on either local outputs or points located on other network nodes.

- iii. Whenever a trouble condition is detected and reported the FACP shall automatically initiate the following functions:
- Trouble LED on the FACP shall flash.
 - Local audible piezo electronic signal in the FACP shall sound.
 - The trouble condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s).
 - System shall transmit the condition to a UL Listed Central Station Monitoring Facility.
 - History storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence.
 - System output programs configured via control-by-event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and relays) shall be activated on either local outputs or points located on other network nodes.

i. Test Functions

- i. A “Lamp Test” or “Indicator Test mode shall be a standard feature of the FACP and shall test all LED’s and the LCD display on the main FACP and remote annunciators.
- ii. A “Walk Test” mode shall be a standard feature of the FACP.
- The Walk Test feature shall function so that each alarm input tested shall operate the associated notification appliance for two seconds. The FACP will then automatically reset and confirm normal device operation.
 - The event memory shall contain the information on the point tested, the zone tripped, the zone restore, and the individual point’s return to normal.
- iii. A “Fire Drill mode shall allow the manual testing of the Fire Alarm System notification circuits. The Fire Drill shall be

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capable of being initiated at the main annunciator, remote annunciators, and via a remote contact input.

- iv. "Bypass Mode" shall allow for any point or NAC circuit to be bypassed without affecting the operation of the total Fire Alarm System.
- j. Remote Monitoring Connection
 - i. The fire alarm system shall be connected via Digital Alarm Communicator Transmitter (DACT).
 - The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter (DACT) for signaling to a UL Listed Central Station Monitoring Company.
 - ii. The fire alarm system shall transmit alarm, supervisory alarm, and trouble signals with the alarms having priority over the trouble signal.
- k. System Components
A listing of individual Silent Knight Farenhyt System Components will be provided upon request.
- l. Horns and strobes shall be White Ceiling mounted devices where viable.
- m. Smoke detectors shall be installed along and on path of egress. Per current enforceable code for corridor coverage.

C. Execution

1. Division of Work

- a. Equipment specific boxes provided by the system manufacturer shall be labeled for fire alarm by System Supplier/Installer
- b. Elevator Recall
 - i. All relays for elevator recall will be in an accessible location. They shall not be mounted on the ceiling.
 - ii. All recall programming shall be tested and documented.
 - iii. Contractor is responsible for complete installation and final approved inspection per the elevator inspector.

2. Installation

- a. All work shall be completed in strict accordance with all applicable codes and ordinances, by a Silent Knight Select Farenhyt Engineered Systems Distributor.

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- i. Final installation heights of all wall mounted annunciator (Surfaced or Recessed) to be 60 inches to center line.
- ii. All cable/wire for the system specified herein shall be new, unless otherwise noted on plans.
- iii. System cable/wire and equipment installation shall be in accordance with good engineering practices as established by the National Electrical Code. Wiring shall meet all applicable codes. All cable/wire shall test free from all grounds and shorts.
 - All cable/wire shall be continuous between terminals with no splices.
- iv. All cable/wire shall be labeled at all points of termination. All labeling shall be based on the room numbers as provided by the District/Owner or his representative.
- v. Underground cables
 - The cable/wire shall be intact with no cuts in the protective outer jacket.
- vi. PSU leased retail spaces
 - Each retail space should have a dedicated NAC circuit.

3. System Start-Up

All start-up programming and system commissioning shall be performed by a manufacturer's trained and certified technician currently employed by the System Supplier/Installer.

4. System Verification

Subsequent to system start-up the system installer shall perform a 100% system pre-test to verify that the following features are functioning properly.

- a. All notification appliances
- b. All initiation devices
- c. All control modules
- d. All monitor modules
- e. Communication link to monitoring service

5. Acceptance Testing

The system installer shall, in the presence of the Inspector, perform 100% testing as noted in System Verification above.

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6. In Service Training

The Contractor shall instruct personnel designated by the Owner in the proper use, basic care and maintenance of the system beyond the warranty period. Contractor shall provide in-service training with this system.

7. Factory Training & Certification

When requested by Owner, provide Factory Training for a maximum of two District Technicians.

8. Contract Close-Out Documentation

Contractor shall provide the following:

- b. One PDF or AutoCAD drawings of project record drawings.
- c. Three hard copies of manufacturer's maintenance and operation manuals and/or PDFs of all materials.
- d. One thumb drive in fire alarm panel with all manuals and O&M data.
- e. Three copies of system warranty and/ or PDFs.

9. Warranty

The Contractor shall warrant the equipment and/or materials to be new and free from defects in material and workmanship, and will, within three (3) years from the date of final acceptance, repair or replace any equipment and/or materials found to be defective. This warranty shall not apply to any equipment or materials that have been subject to misuse, abuse, negligence or modification by owner or contractors other than the original installer that provided this warranty.

END OF SECTION

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Section 32 – Exterior Improvements

A. Irrigation

1. The Contractor shall meet with the PSU Landscape Manager to review/evaluate final irrigation system prior to final acceptance and installation.
 2. Provide and maintain temporary irrigation of species for two years. Refer to Section 32.B.1.a
 3. Provide a shutoff valve and backflow preventer if need to isolate the irrigation system from the water supply main.
 4. Provide sprinkler heads and nozzle types of the same manufacturer and pressure rating within the same irrigation zone. Rainbird irrigation systems preferred.
 5. Drip irrigation should be used in all planters and parking lot islands. Spray heads shall be used in turf.
 6. Color code Type U.F. control wiring as follows: ground/common wire – white; lead-in signal wire – red; spare signal wire – orange; moisture sensor wire – green; master valve wire – yellow; master valve dedicated common wire – white; future expansion signal spares – black; future expansion common – white.
 7. Provide quick coupler valves (e.g. Buckner QB44RC-10) every 100 feet or less. These quick coupler valves are used to hand water landscaped areas. Locate quick coupler valves to limit water hoses crossing walkways and roads.
 8. Irrigation Pipe shall be PVC Schedule 40.
 9. All new and substantially modified irrigation systems are to be provided with a Rain Bird ESP-LXME, or approved equal, irrigation controller. Controller shall be equipped with Ethernet connection capability, IQNCCEN Rain Bird IQ or approved equal. All power wiring and communication wiring shall be installed in separate conduits and per applicable building codes.
- All new spray heads shall be Rain Bird 1800-SAM-PRS or approved equal.
10. Irrigation controls shall be readily accessible for maintenance and be provided with an ethernet connection.

B. Planting

1. General
 - a. Selection of plants shall require plant varieties that are drought-tolerant and require minimum to no irrigation beyond first years of establishment. Irrigation systems should be limited to what is operationally and cost-

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effective during maturing years. It is preferred that irrigation not be completely disconnected.

- b. Prefer selection of native non-cultivar species. Consider maintainable, adaptable, low-maintenance, and non-invasive species.
- c. New gardens, eco-roofs or vegetated roofs shall be biologically diverse and contain multiple species of plants.
- d. All new landscaping mulch shall meet the campus standard. Provide “Deco Nuggets” or approved equal.
- e. All plants to be approved by PSU Landscape Staff.
- f. When planting are on slope, select appropriate materials to avoid sloughing.
- g. Planters, Edging & Safety:
 - 1. At planting areas that have a drop off at the edge, provide an edging plate or curb that indicates an edge to the walkway. This is in-line with ADA guideline requirements for edges at ramps and walkways for use by cane detectors and wheelchairs to keep from rolling off an edge. Consider installing a 4” tall metal plate on the inside face of the planting area similar to other areas on campus.
 - 2. By code, drop-offs greater than 30-32” should have a guardrail installed at the edge in addition to a wheel stop or edge indicator.


2. Trees



- a. The use of native, not cultivar, species is encouraged.
- b. The following species are forbidden in designs: poplars, female ginkgo, pin oaks, and locusts. Refer to City of Portland Parks and Recreation's Urban Forestry Division's list of recommended species and The Campus Tree Care Plan – Appendix 32.1. Unless included in contained and designated areas for food production and wild life habitat, trees that produce berries, fruits or nuts shall be prohibited.
- c. Aspens are prohibited in bioswales.
- d. Tree planting to occur only during October through December, and March through May.
- e. Pruning of newly planted trees, except limbs that are dead or broken, is prohibited.
- f. Species and placement of trees by approval of PSU's Landscape Manager in accordance with the insulation procedures that can be found in Appendix 32.1 The Campus Tree Care Plan.
- g. All trees to be planted by approved Landscaping Contractor or PSU Landscape Staff.

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3. Turf and Grasses

-  a. The use of drought-tolerant species is preferred
- b. Areas to be grassed shall be seeded. Use of sod is discouraged. All grass seed used shall be 'certified'.
- c. Hydro seeding is the preferred method of seeding large areas.
- d. Select grass blend to accommodate formal or informal pedestrian traffic patterns.
 - i. Sun locations: 3-way Perennial Ryegrass blend
 - ii. Shade locations: 30% Perennial Rye, 60% Creeping Red Fescue
- e. Seeding to be done late summer or early fall.
- f. Newly seeded areas shall be watered for a period of two to three weeks after application of seeds.



4. Planting Beds and Plants

- a. Preferred designs shall include raised planting beds with a mix of medium-sized bushes and/or shrubs, colorful perennials for interest and diversity, and grasses not requiring mowing (e.g. bunchgrasses).
- b. Plants must be grouped in beds with plants of similar needs for sunshine/shade, water or fertilization, soil type, and PH.
- c. Kinnikinnick ground cover is prohibited.
- d. Decorative rock is not to be used in planting beds.
- e. All landscape designs to be reviewed by PSU Landscaping.

C. Landscaping Maintenance

Provide landscape maintenance for two years.

D. Paving

-  1. Large areas of exterior concrete flatwork for roads and sidewalks increase surface runoff of rainwater into the City of Portland's storm water drainage system and prevent natural percolation into the subsurface. Designs of large areas of flatwork should include collecting or routing of this runoff into flowerbeds, bioswales, and other planted areas.
-  2. The use of recycled aggregate at the highest percent possible is encouraged where appropriate and structurally allowed. Exposed aggregate sidewalks are discouraged except to match existing, e.g. the Park Blocks and Montgomery Greenway.

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3. When selecting pavers, provide products that have adequate drainage systems.
4. Where applicable, the use of permeable pavers is encouraged.
5. At recessed bioswale installations, provide edge indicator warning for visually impaired individuals.
6. Swales should be designed with an edge or curb to prevent fall hazards.

END OF SECTION

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SECTION 33 - PARKING

A. GENERAL

1. Green Garage Certification
2. Following all City Requirements
3. PSU Climate Action Plan

B. EQUIPMENT

1. PRODUCTS / LOCATION

a. Curb Stops (Parking Bumpers)

Manufacturer: Traffic Safety Supply Company's, model: Recycled Rubber Parking Block or as approved by PSU Project Manager and PSU Transportation and Parking Services. Product #: 3S-WS48 from Street Smart Solutions. Lag6 - screws and washer/shields

b. Speed Bumps

Manufacturer: Traffic Safety Supply Company's, model: 100% Recycled Plastic Speed bump or as approved by PSU Project Manager and PSU Transportation and Parking Services.

c. Bollards and Posts 48" magnetic posts, black with white reflective striping located at UCB Garage. Manufacturer: Parking Zone, model: "Gorilla Posts" or as approved by PSU Project Manager and PSU Transportation and Parking Services. Product #: GPMAGBOLLARD48BLKW2

i. Flexible Posts, black with white reflective striping located at 4th Avenue Garage and Parking Structure 1 Manufacturer: Street Smart Solutions, model: "Self-erecting Flexible Posts 3s-K71" or as approved by PSU Project Manager and PSU Transportation and Parking Services. Product #'s: 3S-K71-B-W, posts; 3S-K71-BTC, black top caps; 3S-K71-AB, anchor bolt sleeves.

ii. Safe-hit posts, white with 2 white reflective bands (round).
Manufacturer: Traffic Safety Supply Co., INC. Product # 11613910

iii. Breakaway wooden, green.

2. Signage

a. "Standard Reserved Space" parking template.

3. Traffic Control Markings

a. Striping- Skipdash Type 1 Traffic Paint Fast Dry Waterborne Type White

b. ADA stalls –

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- i. Minimum of 96" wide with minimum 60" hashed area on right side. Preferred -Van Accessible - minimum of 96" wide with 96" hashed area on right side (where space is available)
 - ii. 36" x 36" white square with blue interior containing International Symbol of Accessibility in white, marked "Van Accessible" in 6" lettering in white where applicable, using above mentioned Skipdash paint Type White and Type Blue
 - c. Loading Zones – marked "Loading Zone 30 Min" in 6" lettering using above mentioned Skipdash Paint Type White
 - d. Traffic Paint
 - i. Product Type: SB Paint
 - 1. SB LF YEL WA HI VOC HY8Y2
 - 2. SB BLUE OR HI VOC
 - 3. SB BLK OR HI VOC
 - 4. SB PAINT FLUSH SOLUTION
 - 5. SB RED 100 VOC
 - 6. SB WHT 100 VOC
4. Paint
- a. Miller Paint - Premium– 38864
 - b. Miller Paint - T/M Green Premium Satin Neutral Base – 44884
 - i. Stairwells walls-Exposed concrete were possible, painted walls and corridors – Miller Paint Composed CW048W
 - ii. Stairs and landings- Epoxy finish, wraps up walls 6 inches, grey.
 - iii. Accents- PSU Green 06M2612. Satin finish
5. Bird Spikes
- a. Manufacturer: Bird-B-Gone. 5" Wide Stainless Steel Bird Spike, Product #: BBG2001-5

C. TECH

- 1. Garage Door - Make/model: Various, Support: Metro Overhead.
 - a. Rated for commercial use
 - b. Operated on campus security system (Lenel)
 - c. Manual override
 - d. Roll up door preferred. Avoid swing type installations
- 2. Gate Arms - Make/Model: Various, Support: Metro Overhead

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3. Fencing
 - a. Support: Cornerstone
 - b. Storage surround, or enclosures.
 - c. Garbage enclosure fencing.
 - d. Building Security fencing
 - e. Perimeter fencing
 - f. Prefer iron-style (steel) fencing as produce by Ameristar Fence Co. or approve equal.
 - g. Avoid use of barbed wire or razor wire topping above fencing. Reference City of Portland requirements and other TDS sections for PSU fencing preferences and requirements.
4. Access, Camera, Panic Buttons- Make/Model: Various, Support: Reece. Refer to Section 28.
 - a. Cameras located at all entrances and exits
 - b. Kiosks require cameras and panic buttons.
5. Lighting
 - a. Simply LEDs - 50W CEILING FIXTURE, GRANITE, Acrylic Diffuser, 5000K, 70+CRI, Bridgelux BXRA LEDs - Product #CLG-50-C-AP
6. Awnings - Make/Model: Custom, Support: Pike Awnings
7. Pull Station Location
 - a. Pull Stations and fire alarm systems shall meet building & fire codes for location, mounting & frequency. Equipment to integrate with existing systems on campus.
 - b. Fire extinguishers shall be installed per applicable building & fire codes such that there is one visible from every point in the garage and with adequate signage.
8. Fire Exit Signs - LED, Red, Hardwired to emergency lighting; individual battery backup units are discouraged.
9. Required in enclosed garage spaces
 - a. Ventilation – No less than 1.5 CFM per square foot exhaust ventilation. Meet current code requirements for ventilation if different.
 - b. CO2 Monitors InTec Controls TS-M5160-R CO Monitor wired to control variable speed fans
10. Surface Coatings
 - a. Roof- ISO-Flex Deck Coating System Grey

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11. Surface Lots –Prepare and compact rock base for asphalt. Pave light traffic locations with 3" of Commercial C asphalt. Pave locations in heavy truck areas with 4" of Commercial C asphalt
12. Pay stations - Make/model: T2 Luke 2, Support:T2 systems
13. Vehicle Count Controller, Make/Model: T2 AutoCount, Support: T2 systems
14. Radio Repeater - Contact Event Rental Communication

D. BIKE PARKING

1. Long-Term Bike Parking Facilities
 - a. Facilities will be located on site or within 300 feet of the site
 - b. Access control
 - c. ID Card access control system is mandatory for all locations and must be compatible with Lenel system and meet PSU standards for access control. This includes door hardware, locking mechanism, access panel and all associated materials for connectivity.
 - d. Security cameras will be installed to monitor and record all use of entrance door(s) at minimum. Additional security cameras to monitor interior of bike facility are optional, depending on design and layout of facility
 - e. Orientation of racks will be determined to maximize space while maintaining access. Space design will be approved by TAPS before installation.
 - f. 48" door for all entrances and exits
 - g. Bike Racks
 - i. Huntco Staple 1.5" Sch. 40 Round Steel Pipe with 3" x 6" Steel Flanges (horizontal parking)
 - ii. Dero Decker (two-tiered, articulated parking system, horizontal)
 - iii. Dero Ultra Space Saver (vertical rack system)
 - iv. Cargo Bike Staple 1.5" Sch. 40 Round Steel Pipe with 3" x 6" Steel Flanges (customized short version of Huntco staple)
 - v. For racks that are perpendicular to a building or curb, spacing between racks shall be 36" apart; spacing can be reduced if racks are installed at an angle.
 - h. Storage for bicycle locks shall be provided (simple bar/pipe mounted to wall allowing users to securely store their lock)

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- i. Signage
 - i. Instructions for rack use will be posted
 - ii. Cargo bike spaces will be marked and signed for cargo bike use only
 - iii. Bike Garage Design
 - j. Space allocated to secure bicycle parking in new or remodeled buildings shall be based on target bicycle mode share identified in the PSU Climate Action Plan
 - k. Preferred design allows for people with bicycles to enter the facility separate from vehicle traffic if auto parking is present. Streetside or at-grade entry is preferred.
2. Short-Term Bike Parking Facilities
- a. Site Furnishing
 - i. Huntco Staple 1.5" Sch. 40 Round Steel Pipe with 3" x 6" Steel Flanges. For color, PSU green is preferred but black is also permitted.
 - ii. For racks that are perpendicular to a building or curb, spacing between racks shall be 36" apart; spacing can be reduced if racks are at an angle.
 - b. Preferred model is Staple Corral w/3-4 racks per unit
 - c. If Corral is not possible individual Staple units will be used
 - d. Site location
 - i. Short-term bicycle parking should be located within 50 feet of the building entry
 - ii. Use of the building footprint should be prioritized over use of the furnishing zone in the public right of way
 - iii. Tamper resistant hardware and/or secure access is required for facility.

E. KIOSKS

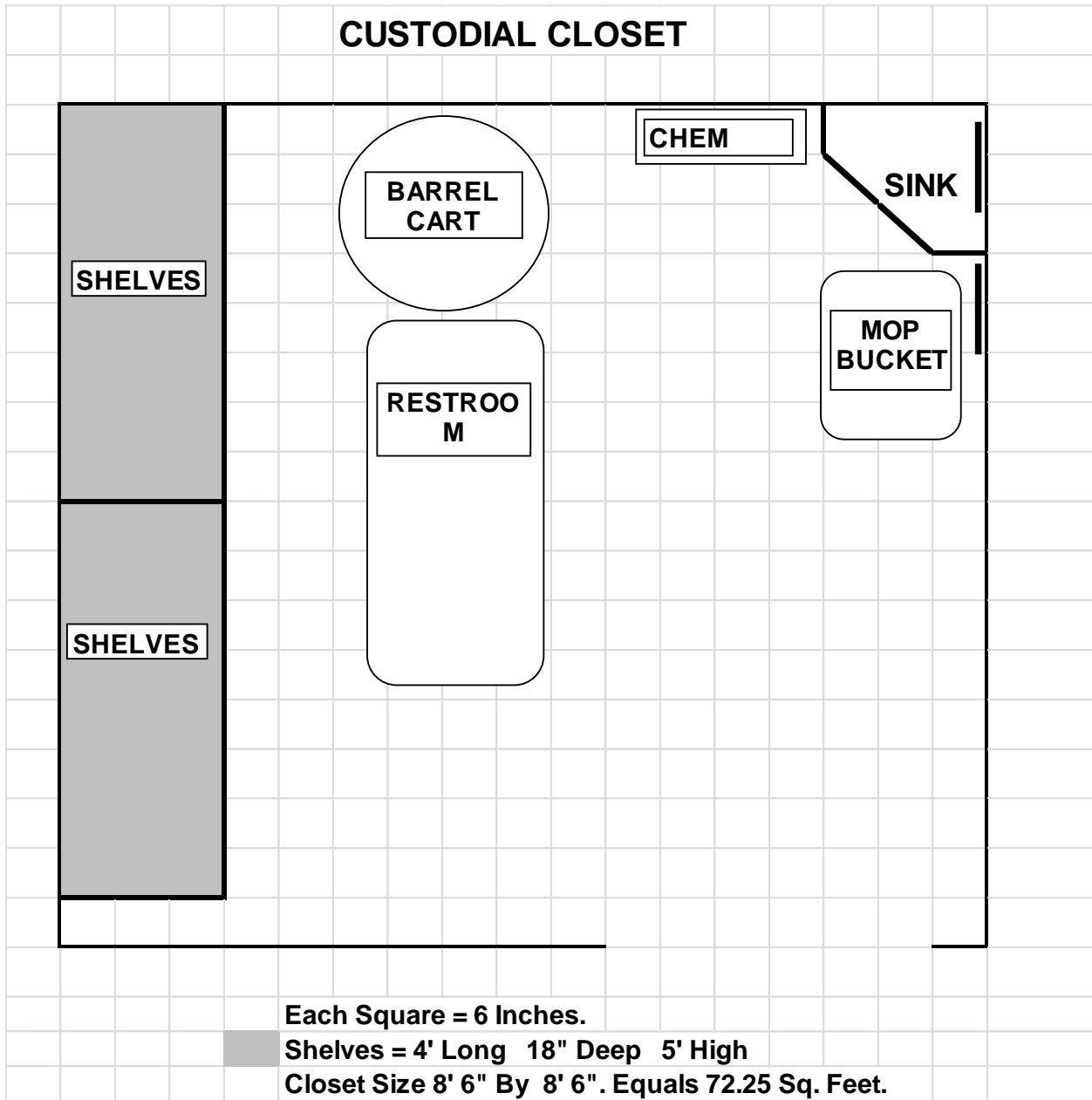
- 1. Make/Models vary. Any new kiosks will need to be ADA compliant.
 - a. Air Conditioning in Kiosk. Make/Models vary by kiosk. They should be Energy Star compliant.
 - b. Kiosks to have panic buttons and cameras per Section 28.
 - c. Include data
 - d. Include eight outlets per attendant work station.

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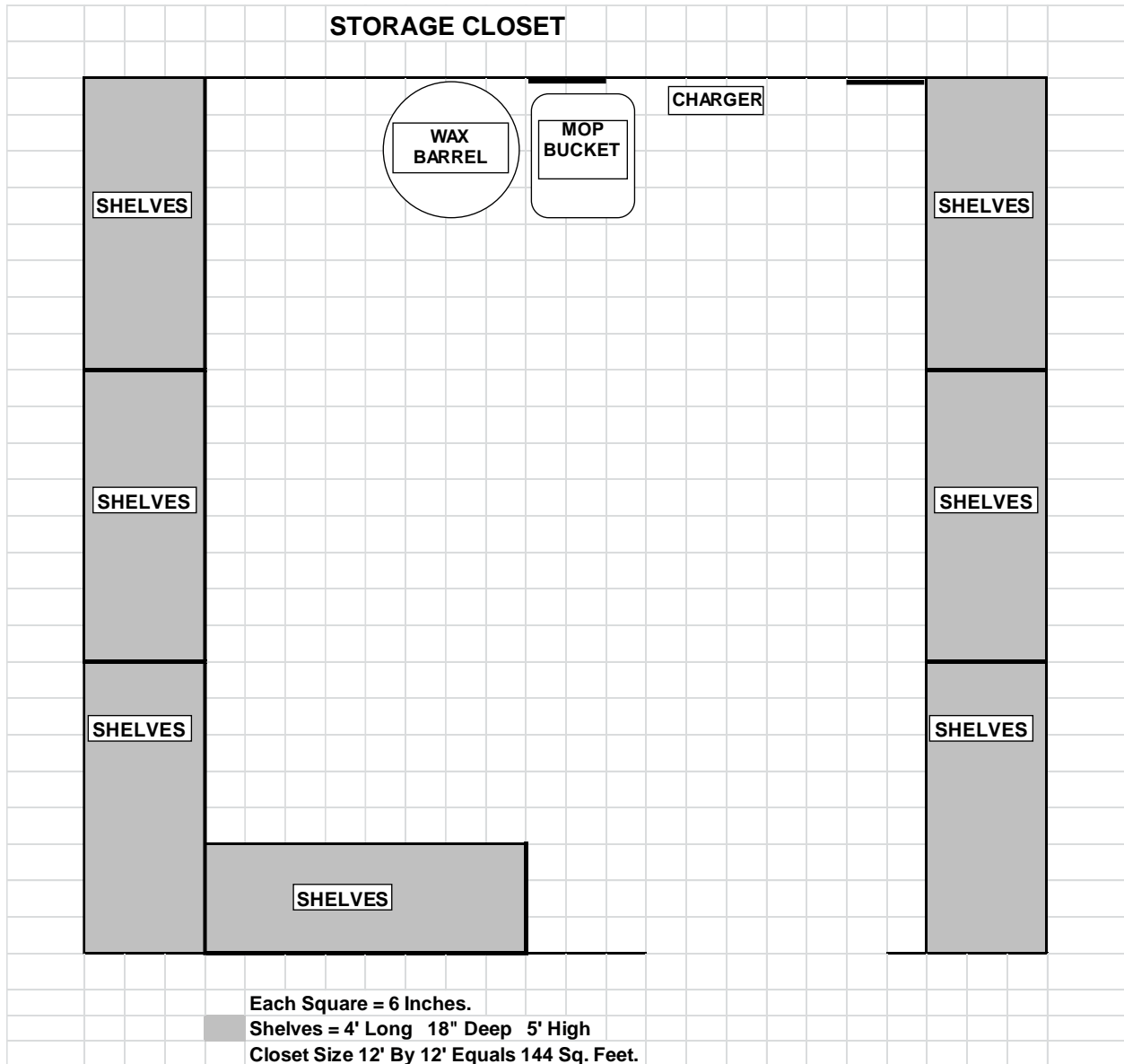
- e. Doors and window configuration and numbers

END OF SECTION

Appendix 01.5 – Custodial and Storage Closets



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APPENDIX 01.6 – RESTROOM PREFERENCES

Restroom Flooring – Avoid using ceramic tile. Preferred flooring is a seamless floor and cove base. Example: Epoxy Quartz Seamless Floor.

Restroom Partitions - Recycled plastic is a suitable material for toilet partitions due to the durability, anti-graffiti features, reparability and clean-ability of the material. These products use recycled HDPE post-consumer plastic. Depending on the product, the recycled content can vary from 30% to 75%.

Steel partitions should be manufactured with recycled materials and content can vary up to 50%.

Standard Men’s and Woman’s restrooms should provide partitions with standard height partitions & hardware options. HDPE materials are preferred.

All-Gender Restrooms shall provide partitions with extra height & “No-Sightline” features and hardware, and as follows:

- Trim: Aluminum or stainless steel
- Thickness: 1” panels +/-
- Latch Edge: Shiplap joint at overlapping edges or full height stop trim.
- Hinges: Full height edge mounted stainless steel hinges or full height trim to block sightlines with pivot hinges.
- Mounting: Floor mounted, overhead braced.
- Wall attachment: Full height channel.
- Panel attachment: Full height channel.
- Latch: Sliding or rotating latch with Occupancy indicator, ADA latch function.
- Side panels may be modular or 2-piece for 72” extra-high side panels
- Dimensions: 9” clear at base, 72” high doors & divider panels, 4” above to top of head rail. This allows for a balance between privacy and security.
- Interior hardware: Coat hook bumper, sliding latch, misc. caps & shoes.
- Door hardware: Provide pull handle on pull side of door. A coat hook alone does not constitute a pull handle.

Available manufacturers used at other locations on Campus are noted below. Other manufacturers & product lines shall meet the above basic criteria.

Scranton Products

www.Scrantonproducts.com

801 East Corey Street, Scranton, PA 18505

Products:

Eclipse Partitions – Modern style, Standard or Enhanced Privacy Design, Shiplap Edge option, HDPE.

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Hiny Hiders Partitions – Standard or Extra Height options, HDPE.

Hadrian Partitions

www.Hadrian-inc.com

3602 West Washington St., Suite 200, Phoenix, AZ 85009

Products: Elite Plus – Enhanced privacy, powder coated steel partitions.

ASI Accurate Partitions

www.Accuratepartitions.com

160 Tower Drive, Burr Ridge, IL 60527

Products: Ultimate Privacy 72 – powder coated steel, or Phenolic. (No HDPE available in tall panel option)

Restroom Entries

Open entrances (without doors) should be considered at higher traffic areas of buildings for increased ease of accessibility to restrooms. Where restroom doors are needed due to limited available space, consider door openers for increased ease of access. Where possible, avoid multiple doors in sequence at entries to restrooms. Reference Door Hardware section for door opener specification preferences.

Water Heaters

All water heater thermostats must be set no higher than 120 degrees. All water heaters shall have at least 1.5 inches of foam insulation. Contractors shall select a water heater with the highest energy factor (EF) and annual fuel utilization efficiency (AFUE) rating. EF is based on recovery efficiency, standby losses, and cycling losses. Electric-resistance water heaters have an EF ranging from 0.7 to 0.95; gas water heaters from 0.5 to 0.6, with a few high-efficiency models at around 0.8; oil water heaters from 0.7 to 0.85; and heat-pump water heaters from 1.5 to 2.0. Product literature from the manufacturers usually give the appliance's EF rating. If it does not, literature can be obtained by contacting an appliance manufacturer association. AFUE ratings are shown on product EnergyGuide labels. The higher the EF and AFUE ratings, the more efficient the water heater.

All water heaters must be compared on the basis of EF and AFUE ratings. All other things being equal, heat pump and electric water heaters are preferred and the product with the highest EF and AFUE is recommended.

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Water Saving Devices

Devices that lower the quantity of water flow can reduce the operating costs of a building. The U.S. Energy Policy Act of 1992 established water conservation standards for water closets, showerheads, faucets and other uses to save water consumption in the United States. These standards can be met and even exceeded by installing sensors and flow restrictors on water fixtures.

Consultants are required to employ strategies that use 20% less water, in aggregate, than the water use baseline calculated for the building (not including irrigation). This shall be beyond meeting the Energy Policy Act of 1992 fixture performance requirements.

Energy Policy Act of 1992 Flow Requirement	
Water Closets/Dual Flush (GPF)	1.6/1.28
Urinals (GPF)	1.0
Showerheads (GPM)	2.0
Faucets (GPM)	1.0
Replacement Aerators (GPM)	0.5

Additional interior water saving methods including waterless urinals may be considered.

Water Saving Product Resources:

- How to Buy a Water-Saving Faucet/Showerhead/Toilet: www.eren.doe.gov
- US Department of Energy Federal Emergency Management Program

Faucet Manufacturer: All faucets for bath lavatories & kitchenette sinks shall be:

Chicago Faucets
2100 S. Clearwater Drive, Des Plaines, IL 60018
www.chicagofaucets.com

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DIVISION 10 - SPECIALTIES

Section 10810 - Toilet Accessories

This section addresses the type of accessories which are to be provided or anticipated for all new and remodeled restrooms. Below are the requirements for restrooms which will be serviced and maintained by Facilities & Property Management (FPM). [is this correct group?]

Part 1 – General:

- Provide at least one paper towel dispenser for every three sinks and install at an ADA accessible height.
- All dispensing units shall be surface mounted. Recessed elements are to be avoided. Stud walls should receive appropriate blocking to accommodate surface mount attachment.
- For new projects, FPM Custodial Services will provide paper towel, hand soap and toilet tissue dispensers for installation by the Contractor.
- Trash receptacles are to be located or at least anticipated in every restroom. Confirm if these should be wall mounted units.
- Provide an Accessories Schedule in the specifications or on the drawings listing each room and the quantity of each type of accessory required as well as who provides what elements and who installs.
- Consultant should identify locations of owner-furnished accessories to allow for proper prep & installation.
- Consider a shelf or countertop at lavatory installations.
- Provide Baby Changing Stations at main floor restrooms and at multi-stall All Gender Restrooms.

Part 2 – Products:

- Paper towel dispensers: Owner furnished, Contractor installed. Confirm current model with FPM or Project Manager.
- Soap dispensers: Owner furnished, Contractor installed. Confirm current model with FPM or Project Manager. Avoid attaching to mirror.
- Toilet tissue dispensers: Owner furnished, Contractor installed. Confirm current model with FPM or Project Manager.
- Seat Cover Dispensers: Specify surface mounted. MFR: Bobrick B-221 or approved equal.
- Urinal Partitions: Match type & brand with toilet partitions.

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- Diaper Changing Stations: Provide surface mount, horizontal mount (vertical if space restrictions exist) polypropylene case with steel reinforcing. MFR: Koala Kare or approved equal.
- Sanitary napkin disposal units shall be surface mounted and constructed of stainless steel. MFR: Bobrick B-270 or approved equal.
- Waste receptacles will be provided by Custodial Services as part of FFE and will be free standing units.
- Grab bars shall be, Type-304, 18 gauge stainless steel, 1-1/4" outside diameter with concealed mounting devices with snap flange covers. Surface to be satin brushed finish. Install to provide 1-1/2" clearance between wall and inside face of handrail. Utilize lengths needed to meet ADA grab bar requirements as well as current City of Portland requirements for a 24" vertical grab bar on the side wall. MFR: Bobrick B-5806 series.
- Mirrors shall be 1/4" glass with Type 304 stainless steel angle frame, welded corners and concealed fasteners for theft resistant mounting. Locate and size mirror to provide adequate free wall space for soap dispensers. Install above sinks and full length sizes to meet ADA restroom requirements. Provide mirror with shelf or separate shelf below mirror as space allows. MFR: Bobrick, B-290 Series. Shelf: 18 gauge, various sizes. MFR: Bobrick B-295 or B-298 Series.
- Hand dryers: See Section 1 General Requirements
- Diaper/ Baby Changing Stations: Provide surface mount, horizontal mount (vertical if space restrictions exist) polypropylene case with steel reinforcing. MFR: Koala Kare or approved equal.

Part 3 – Execution:

- Provide stud wall backing for all surface mounted accessories.
- Clean all surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.
- Mount all accessories to meet ADA accessibility requirements.
- Layout all accessories to ensure that surface mount elements do not restrict access to sinks or other fixtures.

Appendix 01.10 Construction Safety Sign Off & Checklist



Completion of Construction Safety Sign Off

This Section to be Completed by PSU Project Manager Prior to Construction

Project: _____ Construction Date: _____

Contractor: _____

PSU Project Manager: _____ Room Number/s: _____

Project Scope: _____

Phases of Construction at which Construction Safety Sign Off is Required:

Return Signed Certification & Checklist To: Capital Projects & Construction Attn: PSU Project Manager

University Services Building
617 SW Montgomery Suite 302
Portland, OR 97201

In an effort to take every opportunity possible to improve Campus safety and to eliminate as much confusion as possible when planning future work, PSU Capital Projects & Construction (CPC) has instituted a procedure to review work site conditions upon completion of work milestones in a given area. This process will include representatives of CPC, as well as PSU Facilities & Property Management (FPM), PSU Environmental Health & Safety (EH&S), & the Contractor.

One of our goals is to leave areas in as safe a manner as possible. Therefore, the procedure includes a review to insure that tools, material, equipment, debris, etc. have been removed and that remaining installed items have been left in a safe manner. This will insure that the work area will be as safe as possible for the occupants of a space.

The other main objective is to make a last evaluation regarding adding scope to a project to eliminate unnecessary congestion in our work areas by removing or, at least, mapping and/or labeling obsolete items. This will help reduce confusion when we return to that work area for future maintenance or projects.

By signing below the individuals attest that the items on the below checklist have been inspected to the best of their abilities, accessibility and knowledge.

Approved by Contractor _____
Approved by Design Team Representative _____
Approved by PSU Project Manager _____
Approved by CPC Director _____

**Construction Safety Checklist (Contact CPC for latest Checklist)
(Revised on October 2, 2017)**

Room Number/s:		Date:	Sign-offs				Corrective Action By	Comments
Construction Phase:		FPM	Contractor	CPC	EHS	Design Team Rep		
General								
G.1	Hazardous materials in this area have been abated or have been identified for future abatement.							
G.2	Hazardous conditions in this areas resulting from demolition and construction have either been remedied or identified for future remedial action.							
G.3	Prior to beginning work and upon completion of work, an inspection of the building's existing conditions occurred. These inspections were to ensure there are no unknown safety concerns that either existed or may have been created due to the recent project demolition or construction. Examples may include protrusions, trip hazards, improperly supported ducts, piping, wires, etc.							
G.4	All tools, equipment, debris, and un-used construction materials have been removed.							
Electrical (Also includes low voltage and controls)								
E.1	Visible conductors have been terminated, secured properly, removed, and/or identified as abandoned.							
E.2	Equipment (boxes, enclosures, panels, etc.) have been secured and properly anchored and/or identified for future correction.							
E.3	All wiring and conductors at equipment have been terminated properly and/or identified for future correction.							
E.4	Devices (light switches, receptacles, OCPD's, etc) and raceways have been secured, properly anchored, are in the appropriate location, and/or identified for future correction.							
E.5	All junction box covers, panel covers, and LB covers placements have been verified, fully secured, and/or identified for future correction.							
E.6	All over-current protection devices that are remaining in place without load have been opened and/or identified for future correction.							
E.7	All schedules are typed capturing all new loads, existing loads and within the MDP, SDP, and or PB.							
Plumbing/Mechanical								
M.1	Piping, ductwork, and equipment have been properly secured and/or identified for future correction.							
M.2	Valves, dampers, control panels, maintenance items, etc. have been checked for accessibility.							
M.3	All abandoned pipes have been capped, secured, and/or labeled as abandoned.							
M.4	All water or air leaks have been identified.							
Architectural/Structural								

A.1	All ceilings have been secured to building structure and/or identified for future correction.							
A.2	It has been confirmed that nothing is resting directly on drop ceilings and that any items resting directly on hard-lid ceilings do not exceed the capacity.							
A.3	All glass has been secured properly, whether exterior façade glass or interior glass partitions.							
A.4	All interior fixtures, building specialties and furniture have been properly secured.							
A.5	All unused drop ceiling connections (support wires, seismic wires, grid, etc.) have been removed.							
A.6	All protruding objects (nails, screws, bolts, studs, etc.) whether in the floor, walls, or ceilings have been removed or identified for future correction.							

* Note: After Photos to be provided as necessary

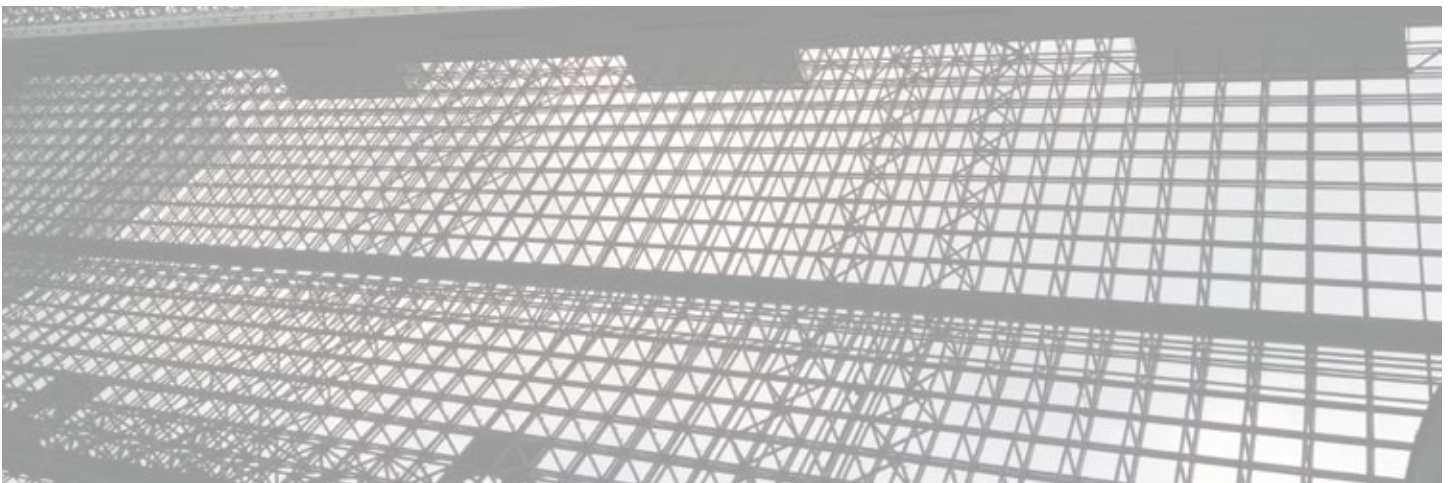
DRAFT



Healthier Buildings

A public procurement guide to safer products for new construction and existing buildings

Version 1: October 2015



Acknowledgements

Oregon Environmental Council would like to acknowledge the important contributions of time and expertise made by the following organizations. Their input and feedback on the contents of this guide have added significant value and are appreciated.



Price, Colin A. (2015). Healthier Buildings: A public procurement guide to safer products for new construction and existing buildings. Oregon Environmental Council. www.oeconline.org

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Founded in 1968, Oregon Environmental Council (OEC) is a statewide nonprofit dedicated to advancing innovative, collaborative solutions to Oregon's environmental challenges for today and future generations.

For more information:

Colin Price
Director of Market Innovation

503-222-1963 x117
colinp@oeconline.org

www.oeconline.org

About this guide

What does “healthier buildings” mean?

When we say healthier buildings, we’re talking about using materials and products to construct, rehabilitate, remodel, or maintain buildings that contain safer alternatives to toxic chemicals. While there are other factors, like ventilation, natural light, and other design features that contribute to occupant health, this guide is focused on how to ensure that your projects use safer products. Safer products don’t contain toxic chemicals, or contain fewer toxic chemicals that are inherently less hazardous.

Considering human health and well-being in building projects is responsible and innovative

Public procurement and project management professionals are dedicated practitioners who hold important decision-making power. Leading public sector organizations, in collaboration with contractors and their supply chains, are using information about chemical ingredients and safer alternatives in innovative ways to inform the design, engineering, construction, and operation and maintenance of buildings.

A guide to empower procurement professionals

Together, state and local governments across the U.S. spend about \$1.5 trillion annually on goods, supplies, equipment, services, and construction.¹ That means that your organization has the power to protect the public, employees, and the environment while creating a positive influence in the marketplace. Even if your budget or scope is relatively small, when you embed healthy building elements into standards, solicitations, and contracts, you’re part of a larger movement of organizations and governments across the country and around the world. Together, we’re able to drive demand for safer, healthier building products.

Every building can use safer, healthier building products

Even if your project isn’t pursuing a green or sustainable building certification, it can still be a healthy building. Healthy buildings help minimize organizational risk, and represent a responsible use of public funds. Hiring building professionals like architects, engineers, and contractors that help provide reasonable due diligence to protect human health makes sense for any project.

A note about costs

Many people still consider “green” building features or safer building products to carry an extra cost for projects. While a cost comparison specific to safer building products was beyond the scope of this guide and does not appear to currently exist for reference, experience by a wide variety of public and private sector organizations reveals that many safer products that do not contain toxic chemicals are cost competitive with traditional versions. For more information about costs, see the Relevant Resources section on page 18 of this guide.

The science supports action

Chronic diseases are among the most common, costly, and preventable of all health problems in the U.S.

- Seven out of 10 deaths among Americans each year are from chronic diseases
- Heart disease, cancer and stroke account for more than 50% of all deaths each year²
- One in 11 American kids have asthma³

Strong scientific evidence links toxic chemicals to some chronic diseases

There are multiple factors that can cause chronic diseases in people, including genetics and lifestyle choices like nutrition and physical activity. Environmental factors, including exposure to toxic chemicals also play a role in chronic diseases in people, including children.³ For example, over 200 chemicals are known, or reasonable anticipated to be human carcinogens, including diesel particulate matter, formaldehyde, vinyl chloride, and styrene.⁵

Toxic chemicals linked to chronic diseases and other health impacts are commonly found in building materials and products

Chemicals scientifically linked to chronic diseases like cancer, asthma, and obesity are used in a wide variety of materials and products used to construct and maintain our workplaces, homes, schools, and other buildings. Flooring, furniture, paints, and sealants are some of the materials that frequently contain chemicals of concern for human health and the environment.

Hazardous chemicals commonly found in building materials and products are also found in our bodies

National health surveys conducted by the Centers for Disease Control and Prevention have found more than 148 synthetic chemicals present in the blood and urine of most Americans.⁶

Chronic diseases that result from environmental exposures to these hazardous chemicals are preventable

We spend up to 90% of our time indoors.⁷ This makes healthier indoor environments and good indoor air quality critical in preventing unnecessary exposures to hazardous chemicals.

Prevention of these diseases can result in significant cost savings and improve our quality of life

Chronic diseases like cancer, asthma, and diabetes impact our physical, mental, and emotional well being over long periods of time. Managing chronic diseases is costly for individuals and families, as well as our society. Medical expenses and the associated losses in productivity that result from missing work from chronic diseases cost an estimated \$13 billion in Oregon in 2010.⁸

Common chemicals in building products

We consider materials and products used in and around our buildings to be an important design consideration because they frequently contain hazardous chemicals. Since we work, play, learn, and live so much of our lives indoors, the potential for continuous and prolonged exposure to hazardous chemicals is significant. The following is some basic information about where hazardous chemicals are found in some building products, how we're exposed, and how our health can be impacted. In many cases, safer alternatives to these hazardous chemicals exist or are being developed and tested.

Flame Retardants (Halogenated and Organophosphate)



Halogenated flame retardants (HFRs) are a class of chemicals that use halogens including bromine and chlorine. Organophosphate flame retardants are a class of chemicals that use phosphorous.

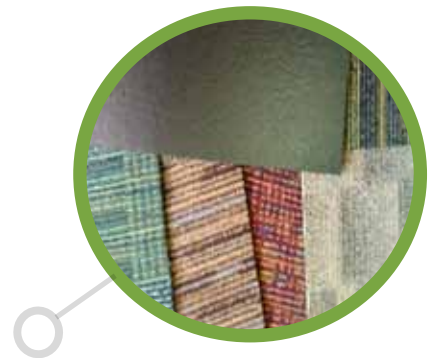
Products that commonly contain flame retardants include foam building insulation, polyurethane foam, wire and cable, and electronics. We're commonly exposed to flame retardants through dust in our buildings.^{9,10}

These chemicals have been shown to disrupt thyroid and estrogen hormones, which are linked to reproductive and developmental health effects including reduced sperm count in males, changes in ovarian cell structure in females, and abnormal brain development in children.^{11,12} Many HFRs are also persistent in the environment and bioaccumulative, building up in children's bodies through breast milk and dust inhalation.^{14,15,16} Organophosphate flame retardants are also linked to impacts on fish and other aquatic organisms.¹⁷

Perfluorochemicals (PFCs)

PFCs are commonly found in stain and non-stick treatments, including Scotchguard®, Teflon®, and Stainmaster® on furniture, carpet, and other office products with fabric.¹⁷ Common PFCs include perfluorooctanoic acid (PFOA) and perfluoroactane sulfonate (PFOS).

These chemicals do not break down in the environment and are found in indoor dust as well as human breast milk, where they are passed on to infants.^{18,19} PFCs can cause reproductive and developmental health effects in children including impaired behavior, learning, and memory as they become adults.²⁰



Chlorinated Compounds

The manufacture and disposal (combustion) of chlorinated compounds like polyvinyl chloride (PVC) produces a variety of chemicals including dioxins, vinyl chloride, polychlorinated biphenyls (PCBs) and more.²¹ Vinyl chloride is a potent carcinogen, known to affect the liver, brain, and lungs at low concentrations.²² Dioxins are some of the most toxic chemicals known and are created when chlorinated plastics burn. They do not break down in the environment, accumulating in our bodies where they can cause cancer.²³

Chlorinated compounds including PVC, chlorinated polyethylene, and polychloroprene are ubiquitous plastics, found in pipes, door and window frames, resilient flooring, carpet backing, furniture, membranes, and many other products. These plastics are frequently made with other toxic chemicals like phthalates and metals.²⁴



Volatile Organic Compounds (VOCs)



VOCs are a class of chemicals including formaldehyde, toluene, xylenes, and methylene chloride that are commonly found in building products.²⁵ VOCs are emitted as gases from solids and liquids and may concentrate in indoor air, where levels can be much higher (up to 10 times) than outdoors.²⁶

They are commonly found in paints, adhesives, cleaning supplies, composite wood products, and furniture. Concentrations of VOCs in new buildings have been shown to be higher than in established buildings, often at levels linked to increased cancer risk in humans.²⁷ VOCs can also cause headaches and damage the liver, kidneys, and central nervous system.²⁹

Phthalates

Phthalates are a class of chemicals that are used in a wide variety of products as a plastic additive.³⁴ Phthalates, and specifically Di(2-ethylhexyl) phthalate (DEHP) is used in PVC building materials.

Phthalates are a concern given their potential reproductive and developmental health effects on children, particularly to children exposed in the womb.^{35, 36} Exposure to phthalates, and specifically DEHP has been linked to cancer, skeletal malformations, developmental delays, and adverse effects on the male and female reproductive tract.^{37, 38}



Heavy Metals

Metals commonly found in building materials include lead, cadmium, and mercury. Mercury is found in synthetic gypsum board (also known as drywall or wallboard) and can leach into water from unlined landfills, where it comprises about 15% of construction and demolition debris.³⁹ ⁴⁰ Mercury is particularly toxic to children, where exposure results in a loss of intelligence and impaired learning, attention and memory.^{41, 42} In adults, low levels of mercury exposure over time are linked to diseases similar in nature to Alzheimer's.⁴³

Sample language

The following section includes sample language for a variety of building construction, renovation, and operations & maintenance-related documents including procurements, contracts, and design standards.

The sample language included in this section can be added to documents verbatim, or modified to suit the need of individual organizations and projects.

For some sample language sections, like for the Standard Professional Services Contract, sample language can be added to sections or subsections of existing documents that bear the same or similar title as denoted by “**(or similar section)**”. It’s up to the document developer to determine which section or subsection most closely align with the sample language provided.

In some cases, like the sample language provided for Invitations to Bid, you will need to customize it by filling in **[bracketed]** sections.

Sample Language - Standard Professional Services Contract

Standard Professional Services Contracts are commonly used by organizations when hiring architectural, engineering, and other building construction and renovation-related service providers. The following sample language is designed to be added to existing sections and subsections.

PROJECT PHILOSOPHY (or similar section)

In pursuing these goals, Consultant, with Owner's assistance, shall:

Reduce the number of toxic chemicals used in specified products on the Project, like those identified in the State of California's Proposition 65 List, the Living Building Challenge Red List, and other relevant lists of chemicals of high concern.

BASIC SERVICES - SCHEMATIC DESIGN SERVICES (or similar section)

MATERIALS RESEARCH/SPECIFICATIONS Services (or similar subsection).

(Note: Add to existing section language) Consultant shall include: less toxic materials specifications or materials lists reviewed by third-party certification programs; safer products which are already commercially available to the greatest extent possible; safer options that also limit premium costs and overall lifecycle costs.

BASIC SERVICES - DESIGN DEVELOPMENT SERVICES (or similar section)

MATERIALS RESEARCH/SPECIFICATIONS Services (or similar subsection)

(Note: Add to existing section language) Consultant shall conduct research on safer materials and products that protect human health and the environment by avoiding chemicals of concern, including carcinogens, asthmagens, mutagens, neurotoxicants, reproductive toxicants, endocrine disruptors, and chemicals that are persistent, and/or bioaccumulative.

Sample Language - Technical Design Standards

Technical Design Standards documents help clearly and concisely communicate your standards, including preferences and recommendations, to the team of Consultants and Contractors who work on renovation and construction projects. Compliance with these standards are often a contractual requirement for contractors.

GENERAL REQUIREMENTS (or similar section) **SUSTAINABLE DESIGN (or similar subsection)**

BASIC SERVICES - SCHEMATIC DESIGN SERVICES (or similar section) **MATERIALS RESEARCH/SPECIFICATIONS Services (or similar subsection).**

Consultant shall include: less toxic materials specifications or materials lists reviewed by third-party certification programs; safer products which are already commercially available to the extent that is practical; safer options that also limit premium costs and overall lifecycle costs.

BASIC SERVICES - DESIGN DEVELOPMENT SERVICES (or similar section) **MATERIALS RESEARCH/SPECIFICATIONS Services (or similar subsection)**

(Note: Add to existing section language) Consultant shall include research for safer materials and products that protect human health and the environment by avoiding chemicals of concern, including carcinogens, asthmagens, neurotoxicants, reproductive and developmental toxicants, and endocrine disrupting chemicals, among other type of hazards.

Sample Language: Invitations to Bid

The sample language included in this section is intended for use in Invitations to Bid (ITBs) for building construction and renovation or public improvement projects.

This sample language is designed to compliment traditional ITB language, including projects pursuing Leadership in Energy & Environmental Design (LEED) certifications. It strengthens traditional ITB language including LEED requirements by emphasizing the importance of protecting human health through the use of safer, less-toxic building products.

This language can be used verbatim or modified for incorporation into ITB template documents including the pursuant contract documents, or used for individual projects.

This sample language should be customized for your organization by changing the **[bracketed]** language. Bracketed “Note” language is included as a reference for ITB developer and can be removed if desired.

Simply cut and paste this language into the relevant sections of any existing ITB documents to improve the value and sustainability of the project while reducing risk and liability.

Sample Language - Building Construction or Renovation ITBs

Section [X] – Drawings and Specifications (or similar section)

[X.X] Product and Material Health & Safety Standards

[X.X.X] Standards Overview & Purpose

[Organization] is committed to protecting the health of building occupants, employees, children, and the environment by using safer, less toxic products and materials on this project. To the greatest extent possible, [Organization] prefers to use safer products and materials that do not contain chemicals of concern as defined in item **[X.X.X. Priority Product Classes]** below. Prospective bidders can support this commitment by ensuring that the standards set forth in this section are adhered to during project planning and delivery.

[X.X.X] Priority Product Classes

[Organization] is focused on product categories that represent the highest potential for human and environmental exposure to toxic chemicals during building construction and use. These categories of products and materials include, but are not limited to, the following with accompanying Construction Specifications Institute MasterFormat divisions for reference:

Div 03 Concrete, Div 04 Masonry, Div 05 Metals, Div 06 Wood, Plastics, Composites, Div 07 Thermal and Moisture Protection, Div 08 Openings, Div 09 Finishes, Div 10 Specialties, Div 11 Equipment, Div 12 Furnishings, Div 32 Exterior Improvements, Div 33 Utilities

[Note: Additional information about toxic chemicals typically found in products within these divisions is available here: <http://transparency.perkinswill.com/Home/PrecautionaryList>]

[X.X.X] Priority Chemicals of Concern

[Organization] wants to limit risk by reducing exposure to products and materials that contain priority chemicals of concern scientifically linked to toxicity in humans or ecosystems. On this project, to the greatest extent possible, Contractor will avoid the use of products that contain chemical ingredients like those found on the Living Building Challenge Red List and the following classes of chemicals: Volatile organic compounds, phthalates, heavy metals, perflourinated chemicals, chlorinated chemicals, and halogenated flame retardants.

[X.X.X] Authority

[Organization] pursues safer, healthier building products and materials under the authority of **[Organization's risk management, environmentally preferable procurement, green building, sustainability, or other relevant policies]**.

Sample Language: Requests for Proposals

The sample language included in this section is intended for use in Requests for Proposals (RFPs) for building-related services on new construction and renovation projects.

It is designed to compliment traditional proposal language including references to Leadership in Energy & Environmental Design (LEED) certifications. It strengthens traditional proposal language including LEED requirements by emphasizing the importance of protecting human health through the use of safer, less-hazardous building products.

This language can be used verbatim or modified for combined services including Architectural and Engineering (A&E) services and Construction Manager/General Contractor (CM/GC) services. This language can also be modified for Architectural, Engineering, Construction Manager, and General Contractor services provided individually.

Simply cut and paste this language into the relevant sections of an existing RFP to improve the value and sustainability of the services provided on the project. This sample language should be customized for your organization by changing the **[bracketed]** language.

Sample Language - Architectural & Engineering Services RFPs

Relevant RFP Sections:

Introduction, Project Overview, Purpose, Scope of Work/Scope of Services, Proposal Requirements

Introduction/Project Overview/Purpose

Maintaining healthy workplaces and public spaces is a priority for [Organization]. Architects and Engineers have an important role to play in protecting human health and the environment on this project by identifying and specifying safer building products.

Scope of Work/Scope of Services (“LEED”, “Living Building Challenge”, “Green Building”, “Sustainable Design”, or similar subsection)

[Organization] prioritizes the use of building materials and products that are safer for people and the environment. In pursuit of Leadership in Energy and Environmental Design (LEED) v4 certification, this project is required to achieve points for the Materials & Resources credit with specific emphasis on MRc4 “Building Product Disclosure and Optimization – Material Ingredients”. Additionally, products used in this building should avoid chemicals ingredients found on the Living Building Challenge’s Red List.

Proposal Requirements (“Experience with Sustainable Design”, “Experience with Green Building Design”, “Experience with LEED Projects”, or similar subsections)

Describe your team’s experience designing safer buildings using products including those that do not contain chemical ingredients identified on the Living Building Challenge’s “Materials Petal” Red List or other relevant lists of chemicals of concern like the U.S. EPA’s Chemicals of Concern list. Describe the process by which your team identifies and specifies safer, less hazardous building products.

Sample Language - Construction Manager/General Contractor Services RFPs

Relevant RFP Sections:

Introduction, Scope of Work, Scope of Services, Proposal Requirements

Introduction (Project Overview, Purpose, or similar section)

Maintaining healthy workplaces and public spaces is a priority for [Organization]. Contractors and subcontractors have an important role to play in protecting human health and the environment on this project by using safer building products.

Project Goals and Development Principles (or similar section – Design/Build Option)

The goals and development principles below reflect [Organization's] values and commitment to sustainability in both the building and development process.

Goal: Achieve Leadership in Energy and Environmental Design (LEED) version 4 Platinum certification or better, with an emphasis on points in the “Indoor Environmental Quality” and “Materials & Resources” categories.

Principle: Construction and Operational Sustainability – Use durable, safer building materials and products with transparent ingredient lists and the fewest possible hazardous chemicals that will deliver low long-term operational costs and an easy-to-maintain, functional, healthy, and efficient facility.

Scope of Work/Scope of Services (“LEED”, “Living Building Challenge”, “Green Building”, “Sustainable Design”, or similar subsection)

[Organization] prioritizes the use of building materials and products that are safer for people and the environment. In pursuit of Leadership in Energy and Environmental Design (LEED) v4 certification, this project is required to achieve points for the Materials & Resources credit with specific emphasis on MRc4 “Building Product Disclosure and Optimization – Material Ingredients”. Additionally, products used in this building should avoid chemicals ingredients found on the Living Building Challenge’s Red List.

Proposal Requirements (“Experience with Sustainable Construction Practices”, “Experience with Green Buildings”, “Experience with LEED Projects”, or similar subsections)

Describe your team’s experience building with safer building products including those that do not contain chemical ingredients identified on the Living Building Challenge’s “Materials Petal” Red List or other relevant lists of chemicals of concern like the U.S. EPA’s Chemicals of Concern list. Describe the process by which your team, including your subcontractors, identifies and purchases safer, less hazardous building products.

Sample Language - Janitorial Services

The following sample language can be used in solicitations for janitorial services. It should be customized for your organization by changing the **[bracketed]** language.

The [Organization] places a high priority on the health of employees and our environment. That means [Organization] prefers hiring service providers that use products and methods of cleaning and sanitation that are safer for human health and protect ecosystems. Proposers shall provide at least two examples of how they identify and select products and methods that avoid hazardous chemicals for your customers.

Examples could include, but are not limited to, the use of only third-party certified products, using EPA's Design for the Environment (DfE) cleaning products, requiring vendors to identify safer products using fully disclosed Healthy Product Declarations (HPDs), or meeting the requirements of Leadership in Energy & Environmental Design (LEED) v4 Green Cleaning – products and materials credit (EQc7).

Sample Language - Clean Diesel Construction

The following sample language can be used in RFPs for construction services where diesel equipment (generators, equipment, vehicles, etc.) will be used. It should be customized for your organization by changing the **[bracketed]** language.

[Organization] places a high priority on the health of employees and our environment. Increasing studies link diesel particulate matter to serious public health impacts from aggravating asthma to heart and lung problems to cancer and premature mortality. Diesel exhaust also has environmental significance as a global warming contributor. As such, [Organization] is interested in working with contractors that are taking steps to reduce their diesel emissions through “clean diesel” engines. “Clean diesel compliant” includes the following:

- A. Any diesel powered vehicle with an USEPA certified model year 2007 or newer engine, or
- B. Non-road diesel equipment certified as USEPA Tier 4, or
- C. Any diesel powered vehicle or non-road diesel equipment that has been retrofitted with a diesel particulate filter verified by USEPA or the California Air Resources Board, or
- D. Any medium-duty or heavy-duty vehicle or non-road equipment powered by alternative fuels like propane, natural gas, electricity, or biodiesel blends greater than 50%.

Proposers shall address the following in their response:

1. Please identify the quantity (total number and percent of your vehicle fleet and non-road equipment) that is clean diesel compliant.
2. Does your firm require the rental of diesel vehicles or non-road diesel equipment that is clean diesel compliant? If yes, please describe how this preference is implemented.
3. Does your firm require subcontractors to utilize diesel vehicles and non-road equipment that is clean diesel compliant? If yes, please describe how this preference is implemented.
4. Does your firm have an idle reduction policy for its construction projects? If so, please provide a copy of the policy and describe how it is implemented.
5. If your firm does not currently have these requirements, will you comply with them in the performance of these contracts? Which ones?

Product vendor outreach

Promoting information exchange with your vendor and contractor pool will support informed decision-making and amplify the impact of your healthy building efforts. It can provide vendors and contractors with the opportunity and motivation to engage their suppliers and manufacturers, and allow them to differentiate themselves through value-added services like product screening.

Clearly communicating about the importance of human health will lead to the creation of safer chemistries and innovative products now and in the future, opening the door to better value, more competition, and lower costs.

To further foster information exchange and open communication with vendors and contractors, use the sample vendor letters on the following pages. It should be customized for your organization by changing the **[bracketed]** language.

Vendor Letter - Flame Retardants in Furniture

The following sample letter is drafted for communicating about toxic flame retardants in furniture. It should be modified for your organization by changing the **[bracketed]** language.

[Date]
[Company]
[Attention]
[Address]

Re: Safer alternatives to chemical flame retardants in furniture

To Whom It May Concern:

As you may know, in January 2014 a new furniture flammability standard was adopted by the California Bureau of Home Furnishings and Thermal Insulation. We welcome the updated standard, Technical Bulletin 117-2013 (TB 117-2013), which will improve fire safety without requiring the use of flame retardant chemicals.

[Organization] is interested in purchasing products that do not contain flame retardant chemicals (including classes of organohalogens and organophosphate based flame retardants). Scientific studies show that these chemicals can migrate out of the products and into our air, dust and water. These chemicals then find their way into our food, bodies and the environment. Many of these chemicals are known to be persistent, bioaccumulative and toxic. Scientific studies in humans show changes in thyroid and reproductive hormones, alterations in the male reproductive tract, reduced sperm quality, and adverse impacts on brain development associated with higher exposures to various flame retardants. Some flame retardants are mutagens and likely to be carcinogenic.

Most notably, these chemicals have not been shown to actually improve fire safety in furniture and instead have led to the widespread use of, and exposure to, flame retardant chemicals nationally.

As your company frequently supplies the **[Organization]** with furniture products, we want to notify you that once TB 117-2013 is fully adopted by manufacturers in January 2015, we will seek and prefer those products that do not contain flame retardant chemicals. Thus, we encourage you to work with your supply chains to eliminate these flame retardants from the products you sell and move to safer alternatives.

As part of this switch to safer alternatives we encourage your company to provide a publicly available Health Product Declaration (HPD) (<http://hpdcollaborative.org/>) and/or Declare Label for the products you sell. The transparent disclosure of this information in a consistent manner enables us to make fully informed purchasing decisions and the **[Organization]** is currently considering whether to require HPDs in future furniture solicitations.

We also urge your company to consider endorsing and implementing principles for safer chemicals such as those developed by the Business-NGO Working Group (<http://www.bizngo.org/safer-chemicals/principles-for-safer-chemicals>).

Thank you for your attention to this issue. We ask that you respond to this letter with relevant information about what you may already be doing to identify, disclose, and eliminate hazardous chemicals like flame retardants from products you make or sell, and/or plans you have to provide products free of flame retardant chemicals after January 2015.

Sincerely,

[Purchasing Manager, Project Manager, Analyst, Sustainability Manager or other relevant staff]

Vendor Letter - General

The following sample letter is drafted for communicating more generally about healthier buildings and future solicitations. It should be customized for your organization by changing the **[bracketed]** language.

[Date]
[Company]
[Attention]
[Address]

Re: Changes to future solicitations to encourage healthier buildings

To Whom It May Concern:

[Organization] is committed to protecting the health of the public, our employees, and our natural environment.

Doing business with companies that are responsible and offer the best overall value is also an important of our efforts. Our emerging perspective on the quality of goods and services is one that includes consideration of chemical hazard and toxicity to humans and ecosystems. When factors like cost and availability are the same, products that avoid chemicals of concern and use safer alternatives represent a better value in our opinion.

Future contracts from **[Organization]** may include specifications or requirements related to chemical hazard disclosure and avoidance. This information will help us make more informed decisions.

Our initial focus includes goods and services purchased to design, construct, and maintain buildings. One reason we are focused on our built environment because there is strong industry leadership in green building services and products. Research also shows that there is strong potential for extended exposure to hazardous chemicals given the amount of time we spend indoors.

[Organization] wants to take a harmonized approach and use existing tools to support our healthy purchasing efforts. We believe it will save time and money for us both. For example, some future contracts may require that vendors request product manufacturers to publicly disclose chemical ingredient hazard(s) through a Health Product Declaration (HPD) (<http://hpdcollaborative.org/>) and/or Declare label and use that information to identify products that are safer for people and ecosystems.

We also urge your company to consider endorsing and implementing principles for safer chemicals such as those developed by the Business-NGO Working Group (<http://www.bizngo.org/safer-chemicals/principles-for-safer-chemicals>).

Thank you for your attention to this issue. We ask that you respond to this letter with relevant information about what you may already be doing to identify, disclose, and eliminate hazardous chemicals like flame retardants **[or other relevant classes of chemicals/chemicals of concern]** from products you make or sell.

Sincerely,

[Purchasing Manager, Project Manager, Analyst, Sustainability Manager or other relevant staff]

Relevant resources

Oregon Department of Administrative Services Green Chemistry Procurement Guidelines

These guidelines are designed to helping agencies to procure safer products and reduce chemicals of concern, protect public health, and foster innovation by encouraging the design and use of safer products through procurements and awards.

Leadership in Energy & Environmental Design (LEED)

LEED is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for their project. Points are awarded in the USGBC's LEED v4 standard for products verified to minimize the use and generation of harmful substances using the GreenScreen® for Safer Chemicals. [Link](#)

GreenScreen for Safer Chemicals

GreenScreen for Safer Chemicals is a scientifically based, open method for assessing how chemicals can impact human health and the environment. It is used by a wide range of professionals, governmental bodies, non-profits, businesses, formulators, and product developers. [Link](#)

Health Product Declaration

The Health Product Declaration (HPD), an impartial tool for the accurate reporting of product contents and each ingredient's relationship to the bigger picture of human and ecological health. The HPD objectively defines the critical information needed to support accurate supply chain disclosure by manufacturers and suppliers, and informed decisions by building designers, specifiers, owners, and users. [Link](#)

The Living Building Challenge Red List

The Living Building Challenge™ calls for the creation of building projects at all scales that operate as cleanly, beautifully and efficiently as nature's architecture. It is a building certification program, advocacy tool and philosophy that defines the most advanced measure of sustainability in the built environment. Certification requires compliance with all aspects of seven performance categories called Petals: Place, Water, Energy, Health & Happiness, Materials, Equity and Beauty. The Materials Petal, which includes a 'Red List' of banned chemicals, is designed to encourage a healthy materials economy that is non-toxic, transparent and socially equitable. [Link](#)

Declare

Declare® is a program of the International Living Future Institute and a transparency tool created in support of the Living Building Challenge Materials Petal requirements and aligned with the Red List. The program is relevant to all parties seeking product ingredients and source location information. By providing a clear and informative "nutrition label" and a publicly accessible database of building products, Declare facilitates effective communication between manufacturers, building product specifiers and consumers. [Link](#)

Perkins+Will Precautionary List

Design and planning firm Perkins+Will has developed a precautionary list used in their projects. The list is searchable by chemical name, category of chemicals, health effects, and divisions and sections is intended for product specifiers and building owners, but is useful for everybody in the building design and construction industry.

Healthy Building Network Pharos Project

The Pharos Project encourages manufacturers to disclose all ingredients in building products; helps architects, designers and building owners avoid using products that contain harmful chemicals; and creates incentives for product redesign and modification to reduce the impacts of hazardous materials use throughout the lifecycle of building products.

Office Furniture Survey and Guide

The Center for Environmental Health provides guidance for purchasers in “Kicking Toxic Chemicals Out of the Office: An Easy Guide to Going Flame Retardant-Free”, along with information about manufacturers that make office furniture without toxic flame retardant chemicals.

Cost of Green Revisited

This Davis Langdon report evaluated the feasibility and cost impact of sustainable design in the light of increased market adoption. Key findings include: Many projects are achieving LEED within their budgets, in the same cost range as non-LEED projects, construction costs have risen dramatically, but projects are still achieving LEED, and the idea that green is an added feature continues to be a problem.

The Business Case for Green Building

The U.S. Green Building Council has assembled an impressive set of data and information about the cost effectiveness of green building. Included in the findings are that LEED buildings, including those that use safer, less toxic products, lead to improved health and productivity benefits for tenants.

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Introduction

Portland State University (PSU) understands that lower potable water use for toilets, showerheads, faucets, and other plumbing fixtures reduces water withdrawn from underground aquifers and from rivers, streams, and other water bodies that support aquatic ecosystems. Reduced water consumption also minimizes the amount of water discharged to municipal water treatment facilities, lowering chemical inputs and the need for new treatment infrastructure. PSU acknowledges that water heating in commercial buildings can account for nearly 15% of building energy useⁱ and that conservation measures also reduce energy use and energy-related pollution.

Scope

This plan applies to all PSU properties. In the event that any domestic water fixture is required to be replaced in a building, PSU Technical Design Standards will be used. Technical Design Standards will be updated in accordance with this plan, and can be accessed at: <https://www.pdx.edu/construction/technical-design-standards>

Goals

To reduce indoor fixture and fitting water use and to reduce the burdens on potable water supply and wastewater systems. PSU design standards for water fixtures will be assessed on an ongoing basis and at least every other year using an economic assessment to explore opportunities to increase water efficiency through plumbing fixtures/fittings.

Water savings will be calculated between existing design standards and higher-performing plumbing fixtures/fittings.

Procedure and Strategies

An economic calculator will be used to evaluate updating design standards. In sum, the plumbing design standards will be evaluated based on the following:

- a. Economics of municipal domestic/potable water supply savings
- b. Economics of municipal sewage waste water discharge/treatment savings
- c. Economics of other maintenance savings or added costs (i.e. any applicable replacement parts, urinal cartridges, etc.)
- d. Uniform Building Code 2006 (UPC)
- e. International Plumbing Code 2006 (IPC)
- f. USGBC LEED Water Efficiency Credit Requirements

Responsible Parties

PSU Capital Projects & Construction and Facilities & Property Management Departments are jointly responsible for:

- Monitoring overall effectiveness of the program
- Reviewing water efficiency economic assessment
- Updating design standards based on cost: benefit of water savings

PSU Facilities & Property Management Department is responsible for:

- Collecting water cost data, reviewing historical trends, and maintaining an inventory of all water fixtures on site

- Monitoring overall effectiveness of the reduced flow fixtures
- Reporting functionality problems as well as maintaining the fixtures according to manufacturer’s instruction
- Plumbing fixture and fitting inspection, testing, and preventive maintenance program

Time Period

This Plan is effective March 1st 2017 and will be in effect for the duration of building operations.

Relevant Definitions

Nonpotable water is water that does not meet EPA’s drinking water standards, and therefore, is not suitable for human consumption.

Plumbing fixtures and fittings are receptacles, devices, or appliances that are either permanently or temporarily connected to the building’s water distribution system and receive liquid or liquid-borne wastes and discharge wastewater, liquid-borne waste materials, or sewage either directly or indirectly to the drainage system of the premises. This includes water closets, urinals, lavatories, sinks, showers, and drinking fountains.

Potable water is water suitable for drinking that meets or exceeds EPA drinking water standards; it is supplied from wells or municipal water systems.

Substantial completion is defined as either initial building construction or the last plumbing renovation of all or part of the building that included a 100% retrofit of all plumbing fixtures and fittings as part of the renovation.

¹ Energy Information Administration, 1999 Commercial Buildings Energy Consumption Survey, retrieved May 2008. www.eia.doe.gov/emeu/cbecs/.

Introduction

Under the direction of the Campus Sustainability Office (CSO), Portland State University (PSU) encourages source reduction, reuse, and recycling of materials used in the operations and maintenance of the campus. Acknowledging that the campus generates significant amounts of waste, PSU has identified and prioritized waste diversion strategies to reduce demand for new materials and related harvesting or extraction of natural resources. Additionally, PSU acknowledges that disposal of solid waste by incineration or land filling produces greenhouse gas emissions and should be avoided through waste reduction and recycling whenever possible.

Scope

This plan applies to PSU's entire campus and addresses the following waste streams within the University's control:

- Ongoing Consumables
- Durable Goods
- Facility Alterations and Additions
- Mercury Containing Lamps
- Batteries

Procedure and Strategies

Ongoing Consumables

PSU will identify the top most purchased product categories, based on total annual purchases. Examples of these include, but are not limited to: paper, plastics, cardboard/OCC, metals, glass, food scraps, toner cartridges, and batteries. All building occupants will be encouraged to recycle paper, plastics, cardboard/OCC, metals, glass, toner cartridges, and batteries, and to compost food scraps. Provisions will be made for building occupants through collection stations which will be placed throughout campus buildings according to the following guidelines:

- Approved paper recycling bins will be provided at each shared copier / printer station and serviced by contracted custodial services.
- Centralized waste stations for recycling and garbage will be provided for open office areas. Additionally, staff can opt to obtain a desk-side recycling container that they can empty at waste stations at their convenience.
 - PSU custodial contractors do not service individual, desk-side trash cans. Building occupants are responsible for emptying their own trash and recycling containers into centralized collection containers.
 - Centralized waste stations are serviced by contracted custodial services and all recycling bin contents are hauled to a materials recovery facility by our contracted hauler.
- A battery recycling bin will be provided for all general office areas. The bins will be emptied upon request via work order.
- An approved waste collection system will be provided for all kitchen / breakroom areas. The waste station will be specifically used for comingled plastic bottles/tubs, metal cans, paper, and cardboard, as well as a separate bin for glass. Signage at waste stations will clarify what materials may be deposited. These waste stations will be serviced nightly.

- An approved collection bin for food scraps and food soiled paper (paper napkins, paper towels, coffee filters, etc.) will be provided in all kitchens /breakrooms and collected for composting. Signage will clarify what materials may be deposited.
- All recyclables will be captured and contained in clear plastic bags so that contaminants can easily be spotted and removed. This will reduce contamination and allow more waste to be recycled.
- PSU does not provide bins in individual classrooms. We instead implement an “All in the Hall” approach by placing centralized midpoint recycling stations in hallways. This recognized best practice is a common strategy at universities across the country as it increases waste diversion and reduces costs. PSU’s “All in the Hall” program encourages greater waste diversion by bringing people to a central location where ALL waste management options are present.

Durable Goods

Examples of durable goods include, but are not limited to, office equipment (computers, monitors, copiers, printers, scanners, and fax machines), appliances (refrigerators, dishwashers, and water coolers), furniture (systems furniture, conference tables, and guest chairs), external power adapters, and televisions and other audio-visual equipment.

Building occupants are required to place a work order for surplus pick-up for all usable and working durable goods. If no longer usable, the following items are required to be recycled:

- Electronic equipment (computers, monitors, copiers, printers, scanners, and fax machines), external power adapters, and televisions and other audio-visual equipment via work order for Environmental Health & Safety (EHS).
- Appliances (refrigerators, dishwashers, and water coolers) via work order for EHS.
- Furniture (systems furniture, conference tables, and guest chairs) via work order for PSU Surplus.
- All unwanted and usable office supplies should be donated to the Campus Reuse Room located in Cramer Hall, Room 180.

Facility Alterations and Additions

Examples include, but are not limited to, building components and structures (wall studs, insulation, doors, windows); panels; attached finishing (drywall, trim, ceiling panels); carpet and other flooring material; adhesives and sealants; and paints and coatings. Mechanical, electrical, plumbing, furniture, fixtures and equipment are excluded.

- PSU maintenance staff and construction contractors working on tenant improvements as well as larger renovations on campus will be required to recycle building components and structures (wall studs, insulation, doors, windows); panels; attached finishing (drywall, trim, ceiling panels); carpet and other flooring material; adhesives and sealants; and paints and coatings.
- Old and un-repairable carpet tiles will be stored for collection by PSU’s contracted hauler or carpet manufacturer where possible for recycling.
- Project Managers will work with general contractors to ensure provisions for construction waste recycling.

- All weight tickets for construction and demolition recycling should be routed to PSU's Waste Management
- Coordinator to track performance and identify areas for improvements.

Mercury Containing Lamps

- Per PSU's Sustainable Procurement and Life Cycle Considerations Policy, new lamps must meet the LEED credit for reduced mercury in lamps: 70 picograms per lumen-hour or less.
- When lamps are removed, the EHS department will collect them upon waste pickup requests made via the Facilities work order system. Lamps will then be picked up and processed by a lamp recycling agent in accordance with all State and federal requirements for managing hazardous lamps pertaining to the Universal Waste Rule.
- PSU will take advantage of manufacturer take back programs where possible.

Batteries

- Per PSU's Sustainable Procurement and Life Cycle Considerations Policy, rechargeable batteries should be purchased for standard office use.
- All departments will be provided a battery collection bucket with a dated Universal Waste sticker and instructions for submitting a work order to EHS for pickup and proper disposal.
- Batteries are picked up and processed by EHS, who ships them to various battery recycling facilities depending on the type of battery to be recycled.

Performance Metric

Currently, performance is tracked on a monthly basis using waste and recycling invoices which calculate weights based on an estimation of 150 pounds per 1 yard of waste collected from campus. Beginning in 2017, waste and recycling containers will be metered to provide more accurate weights and performance will be measured based on this data.

Goals

This solid waste management plan aims to reduce the amount of solid waste and toxins that are hauled to and disposed of in landfills or incineration facilities by encouraging the reuse and recycling of items and the composting of food scraps, where possible. The following sustainability goals are challenging, but achievable:

- Ongoing-Consumables: Reuse, recycle or compost 70% of ongoing consumable items and food scraps in the total waste stream (by weight)
- Durable Goods: Reuse/recycle 75% of durable goods in the total waste stream (by weight or volume)
- Facility Alterations and Additions: Divert at least 70% of construction waste (by weight or volume) from facility alterations and additions
- Mercury Containing Lamps: Divert 100% of all mercury containing lamps
- Batteries: Divert at least 80% of all batteries

Quality Control and Assurance

To verify and assure the procedures and performance metrics of this plan are successfully implemented and achieved, the Waste Management Coordinator, within the Campus Sustainability Office, will periodically inspect waste management practices throughout the year through waste audits. These inspections include a review of how solid waste is generated, handled, and disposed; the types of materials designated for the landfill; how durable goods are removed from the ongoing consumable waste stream; and the methods used for disposing of construction waste. The Waste Management Coordinator will also track and review performance metrics at least semi-annually and the contents of this plan annually.

Responsible Party

Implementation, oversight, and the quality assurance of this Solid Waste Management Plan is the responsibility of the Campus Sustainability Office and the Waste Management Coordinator. *This Plan is effective February 1, 2017 and will be reviewed on an annual basis.*

Definitions

Comingled recycling: a system in which all paper fibers, plastics, metals, and other containers are mixed in a collection truck, instead of being sorted by the depositor into separate commodities.

Durable goods: goods with a useful life of two years or more and are replaced infrequently and/or may require capital program outlays. Examples include furniture, office equipment, appliances, external power adapters, and televisions and other audiovisual equipment.

Incinerator: a furnace or container for burning waste materials. Landfills: waste disposal sites for solid waste from human activities.

Ongoing consumables: materials with a low cost per unit that are regularly used and replaced through the course of business. These include paper, toner cartridges, binders, batteries, and desk accessories.

Recycling: the collection, reprocessing, marketing, and use of materials that were diverted or recovered from the solid waste stream.

Reuse: when materials are returned to active use in the same or related capacity thus extending the life of materials that would otherwise be disposed. Examples of ongoing consumables that can be reused include binders, staplers, and other desk accessories, whether they are reused on-site or donated to other facilities.

Source reduction: reducing the amount of unnecessary material brought into a building. Examples include purchasing products with less packaging and that are designed with sustainability in mind.

Waste: all materials that flow from the building to final disposal. Examples include paper, grass trimmings, food scraps, and plastics. Waste refers to all materials that are capable of being diverted from the building's waste stream through waste reduction, including source reduction, recycling, and composting.

Waste diversion: a management activity that disposes of waste other than through incineration or landfilling. Examples are reuse and recycling waste.

Waste reduction: source reduction and waste diversion through reuse or recycling.

Waste reduction program: (1) the organization's commitment to minimizing waste disposal by using source reduction, reuse, and recycling; (2) assigned responsibility within the organization for implementation of the program; (3) the general actions that will be implemented to reduce waste; and (4) tracking and review procedures to monitor waste reduction and improve waste reduction performance.

Waste stream: is the overall flow of wastes from the building to a landfill, incinerator, or other disposal site.

Portland State University Waste Container Standards

Many containers and signs across Portland State University (PSU) are in need of updating to optimize waste reduction and diversion. The Campus Sustainability Office (CSO) aims to modernize and standardize university waste management systems from containers and signs to processes and programs. Several guiding principles inform our approach:

Consistency: Building occupants should be presented with the same waste management options throughout campus.

Consolidation: Right-sizing and centralizing our infrastructure is key to an effective, affordable, and user friendly waste management system.

Accessibility: Every landfill bound trash bin should be paired with diverse recycling options. Most of the waste we produce can be diverted from the landfill and recycling should be as accessible to building occupants as possible.

Permanence: Our waste management system, including containers, should communicate a lasting university commitment to waste reduction.

Safety: Containers should be safe to operate, service, and maintain.

Preparedness: Standardized containers enable architects, project managers, and design teams to anticipate space needs for waste receptacles and integrate them into the design of the building and reduce unexpected challenges.

Flexibility: Containers should be moveable to maximize effectiveness and adaptable to respond to changing markets or community needs.

Kitchens, breakrooms, study lounges, lobbies, hallways, and corridors

CLEANRIVER MIDPOINT RECYCLING STATIONS

Midpoint tri-sorting waste collection stations are the approved waste receptacles for hallways within student centered buildings such as classroom buildings, Smith Memorial Student Union, and Viking Pavilion. They are also the approved standard for other common areas such as kitchens, break rooms, lobbies, and study lounges. Midpoints provide a centralized, convenient, flexible, and uniform system for waste management. Distinct sections of the station can be customized and are adaptable to changing markets or community needs. The entire unit can be moved if needed and is easily serviced and maintained. The Waste Management Coordinator within CSO coordinates procurement of Midpoint waste stations to ensure compliance. Built-in waste systems are not permitted due to the inflexibility they create.



Midpoint Recycling Station – Specifications:

Dimensions: 41.25" x 18.00" x 37" x 51.00", Weight: 185 lbs.

3 streams – Landfill, Commingled Recycling, and Glass

Manufactured with 97% recycled material

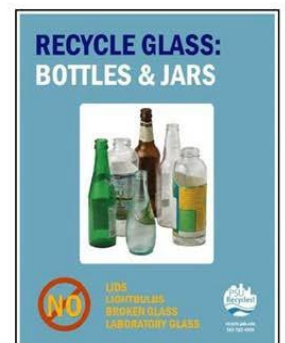
Model	No. of Streams	Dimensions	Weight	Price
IMSF-3 Flat Backboard	3	41.25" x 18.00" x 37" x 51.00"	185 LBS	\$

Position	Stream	Opening	Capacity	Bag Size
1	Landfill	9x9 Square	22 USG	32"x43"
2	Mixed Recycling	9x2x5 Saturn	22 USG	32"x43"
3	Recycle: Glass & Jars	5.5 Round with Baffle	22 USG	32"x43"

IMSF-3 is designed for easy servicing; the unit has front opening doors and rigid liners. Heavy duty casters allow the unit to be moved for cleaning or repositioning. Color coded compartments and top plates standardize your facility wide program.

Midpoint Recycling Station – Signage:

CSO creates and approves signage for ALL waste containers, including Midpoint waste stations. CSO may choose to update or change signage over time due to changing markets, rules, or community needs. The signage used across campus is an amalgamation of institutional best practices, contractual requirements, and refinement over time, so any proposed changes should be sent to the waste management coordinator in CSO for review and approval to ensure all needs and requirements are being met.



Kitchens, breakrooms, study lounges, and approved public spaces

SIMPLEHUMAN COMPOST CANS

33% (by weight) of landfill-bound waste on campus consists of food waste and compostable fibers such as napkins, coffee filters, tea bags, and paper plates. Food waste not only takes up valuable space in the already overtaxed landfill but it also emits the potent greenhouse gas, methane, as it decays. When composted, food waste becomes a beneficial soil amendment. PSU is committed to both food waste reduction and composting. Stainless steel, SimpleHuman containers with lids and push pedals are the standard compost container for kitchenettes and breakrooms, as well as most public spaces on campus.

38-Liter (10-Gallon) SimpleHuman Step Waste Cans

Specifications:

Dimensions: 12.5"D x 15.8"W x 25.9"H

Weight 14.3 lbs.

Brushed stainless steel with finger-proof coating

Strong steel pedal

Dent-proof lid has shocks technology for a smooth, silent close

Internal hinge allows for placement right up against the wall

Estimated price (2017) - \$ 99.99



Residence Halls

PORTLAND COMPOSTS! PAILS*

Sure-Close Kitchen Composter – Specifications:

Dimensions: 9"D x 11"W x 9.5"H

Weight 1.1 lbs.

HDPE plastic includes recycled content, UV protected

Dishwasher safe and compostable bag liner ready

Easy fit under sink, cupboard, countertop or in a corner

Hinged lid that clicks open and swinging handle with lip grip, bottom grip and back grip

Inside is smooth and easy to clean with patented airflow channels and microperforated

lid that seals out fruit flies and insects, reduces smells with aeration



HOUSING RECYCLING BIN*

Rehrig Pacific Company 6-Gallon Apartment Recyclers – Specifications:

Dimensions: 13"D x 12"W x 13"H

Weight 2.2 lbs.

Made with durable, washable, 100% recyclable, high density poly-ethylene (HDPE) resin

**PSU's Housing & Residence Life (HRL) provides housing recycling and compost bins. HRL charges students for bins if not left in the room when moving out.*



Shared and individual offices – desk side containers

BUSCH SYSTEMS BUDDY BINS

Most of the waste created in an office setting is recyclable. Using a trash/recycling buddy system for waste collection is the most effective way to increase capture of recyclable materials generated in offices. By pairing all trash bins with a larger recycling bin, it is more convenient for users to dispose of waste properly. Similar to PSU's "All in the Hall" program regarding classrooms, PSU DOES NOT service individual, deskside trash cans. Building occupants are responsible for emptying their own trash and recycling containers into centralized collection containers. These designated centralized collection points are then serviced by custodians. CSO recommends one of two different options when setting up desk-side waste collection in offices.

Busch Systems Recycling & Hanging Waste Bin - Specifications:

14-quart (3.5 gallon) blue recycling bin and smaller (0.75 gallons) hanging trash bin

Dimensions: 11.5"D x 7.9"W x 12"H

Weight: 1.05 lbs.



City of Portland's Sustainability at Work deskside recycling box:

The Campus Sustainability office can provide these for building occupants. Individuals would still have to acquire their own trash can if one is desired, but the recycling deskside box is provided free of cost from the City of Portland.

You can contact PSU Recycles at 503-725-4300 or through e-mail recycles@pdx.edu to request a deskside cardboard recycling box for your office.



Printer and copier areas

BUSCH SYSTEMS SLIM JIMS

The Campus Sustainability Office recommends one of two different options when setting up paper recycling collection in printer/copier/fax areas:

Busch Systems Waste Watcher Recycling Bin - Specifications

Dimensions: 20"D x 11"W x 30"H

Weight: 6.75 lbs. (7.65 lbs. with lid)

23-Gallon capacity (also available in 16- and 20- gallon containers)

Lid Specification: Mixed (Saturn Style) container lid with 5" diameter circle inside a slot that 16 1/4" D x 1 3/4" W



City of Portland Sustainability at Work Central Collection Container
Dimensions: 18”D x 12”W x 26”H

You can contact PSU Recycles at 503-725-4300 or through e-mail recycles@pdx.edu to request the central collection cardboard recycling box for your office.



Outdoor spaces: plazas, entrances, walkways, parking garages, etc.

STREETSCAPE OUTDOOR RECYCLING / GARBAGE RECEPTACLE WITH RAIN HOOD
Portland State aims to pair all outdoor garbage cans with recycling containers with landfill-bound waste receptacles is one small step to assisting with university sustainability goals and increasing opportunities for our campus community to recycle no matter where they are on campus.

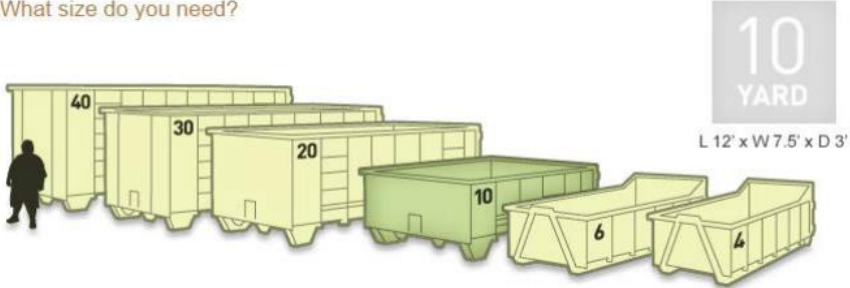
- Recycleaway Streetscape 36-gallon Recycling Receptacle with Rain Hood – Specifications
- Dimensions: 26”D x 42”H, Weight: 145 lbs., 35.5 gallon capacity
- Recycle Blue gloss finish, Garbage Black gloss finish
- Weather resistant EXL-COAT powder coat finish is durable enough for any climate
- 1.5" wide x 3/16" thick welded steel bars
- Bottom consists of steel channels so unit can be secured to the ground if desired
- Adjustable leveling glides keep unit stable on uneven surfaces
- Lid is secured to unit with plastic coated steel cable to prevent vandalism
- Color matched removable LLDPE plastic liner with lift openings meets UL94 Flammability Standard
- Made in the USA
- Estimated price (2017) Recycling - \$ 999.99, Garbage - \$ 939.99



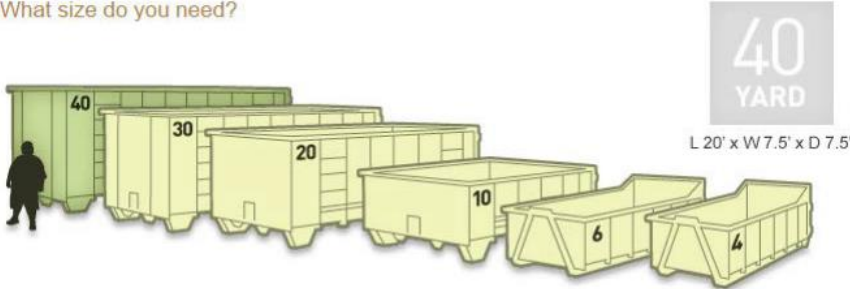
Temporary roll-off containers

The following images serve as a size and planning reference for PSU staff needing large temporary waste containers. These containers are delivered and serviced by our waste hauler. Need a large temporary trash dumpster? Feel free to e-mail recycles@pdx.edu or call 503-725-4300 for assistance from one of our waste management specialists.

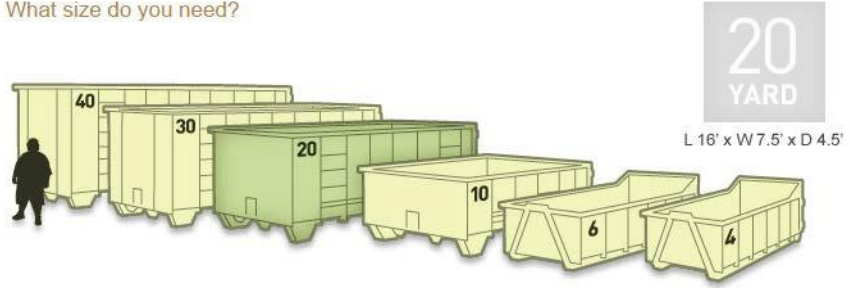
What size do you need?



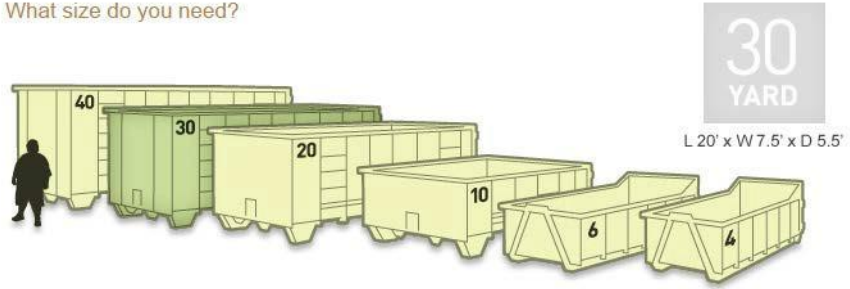
What size do you need?



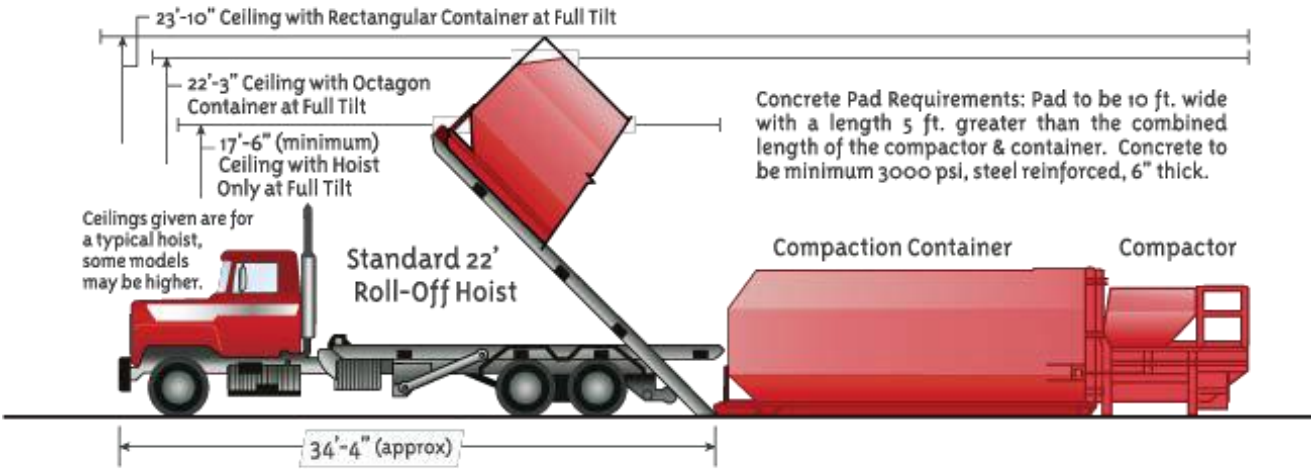
What size do you need?



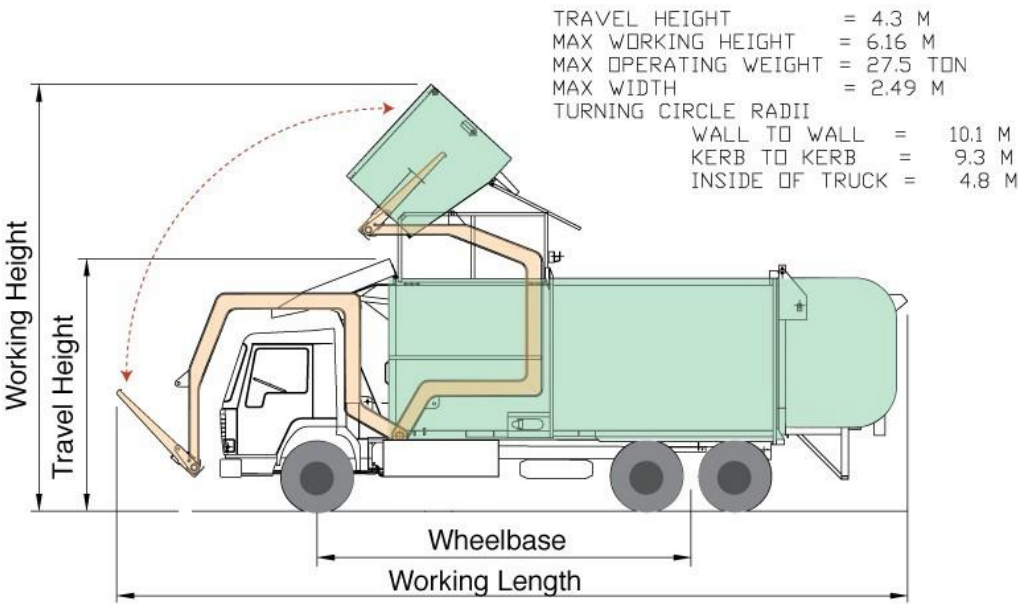
What size do you need?



Roll off vehicle configuration



Front end load vehicle configuration



Concrete pad requirements

Pad to be 10 feet wide with a length of 5 feet greater than the combined length of the compactor and container. The concrete should be a minimum of 3000 psi, steel reinforced, and 6" thick.

APPENDIX: Outdated containers found on campus but no longer purchased

Office Style Bins GeoCube
 Recycling Containers Witt
 Industries



Commingle "Candy"
 Smooth, blue steel recycling Canables®
 Windsor Barrel Works



Curbside/Curby:
 Used throughout the Metro area for
 residential glass recycling



Ribbed Bullet
 Ribbed, blue steel
 recycling can
 Witt Industries



Dome Top Can
 Used on campus for
 garbage in public
 spaces

Warriors:
 Stations with locking doors on front



Accessibility and Universal Design Protocol

1. Purpose

- a. In the pursuit of becoming a fully accessible campus, Portland State University expects all consultants and service providers to design to 2010 ADA Standards for Accessible Design and the latest adopted edition of the Oregon Structural Specialty Code (OSSC) and to exhibit a commitment to employing Universal Design principles in their service and product delivery. Additionally, all consultants and designers shall design to Portland State University's [Accessibility and Universal Design Standards](#). Consultants shall engage with project representatives on how Universal Design principles shall enhance accessibility and create a campus that is accessible to everyone. Design teams shall ensure that the principles of Universal Design are considered to the project representative's satisfaction.

2. Design Process and Review Requirements

a. Considerations and Review in Project Design

- i. The PSU CPC PM is charged with overseeing the implementation of PSU's [Accessibility and Universal Design Standards](#). On smaller projects that impact accessibility, the ADA/504 Coordinator and DRC Director (no outside consultant shall be hired) shall be contacted by the CPC PM via email **if** any of the following conditions exist:
 1. Accessibility and Universal Design Standards cannot be strictly adhered to because of conditions beyond the control of the designer.
 2. An element of the project requires further interpretation of the Accessibility and Universal Design Standards or further discussion to determine the most appropriate solution.
 3. The designer believes an alternative solution may meet or exceed the functionality of the Accessibility and Universal Design Standards.
 4. An element of the project shall impact accessibility and the Accessibility and Universal Design Standards does not address the issue.
 5. The Accessibility and Universal Design Standards cannot be met for another reason.

The ADA/504 Coordinator and DRC Director shall work collaboratively with the CPC PM to determine an approach that incorporates universal design principles and ensures that the project is accessible as possible.

3. Accessible Design Workshop

- a. For all new construction and major renovation projects, design teams (including architect/engineer, consultants, and CPC's PM, assigned to the project, and project "owner") shall engage in an "Accessibility Design Session". This session shall be facilitated by the design team during the initial planning and design phase. The session shall seek to identify issues related to the specific project and to explore innovative approaches to accessibility. The following shall be discussed:
 - i. Specific accessibility issues related to the projects.
 - ii. Opportunities for innovative solutions to provide a fully accessible facility.
 - iii. How accessibility issues could be addressed and how the innovative solutions discussed above can be integrated into the design.

4. Design review and recommendations by CPC PM, ADA/504 Coordinator and DRC Director

- a. All new construction and renovation projects shall be presented to CPC PM, DRC Director, and ADA/504 Coordinator in the form of a "facilitated review or page turn" during:
 - i. The final stages of Schematic Design
 - ii. Design Development
 - iii. Construction Document stage

The review shall be facilitated by the CPC PM (and design professional, at the discretion of the PSU PM) and shall include the following:

- i. Incorporation of the requirements of the Accessibility and Universal Design Standards.
- ii. Compliance with the Oregon Structural Specialty Code, 2010 ADA Standards for Accessible Design, and other applicable codes related to accessibility.
- iii. Incorporation of Universal Design principles.
- iv. Incorporation of concepts and design solutions resulting from Design Workshop or page turn.

5. Review by Accessibility Consultant

a. A review by an Accessibility Consultant (hired by either the design team or PSU) shall be conducted on large new building construction and major renovation (over \$10 million) projects. A consultant shall be contracted to provide the following services:

- i. Review drawings and specifications for accessibility and universal design at the design development phase.
- ii. Review drawings and specifications at the 50% construction document phase for accessibility.
- iii. After each of the two phases of review, the consultant shall provide PSU and the design team with a report related to elements depicted on the documents that appear to not be in line with the Accessibility and Universal Design Standards. The consultant shall provide suggestions on how to improve accessibility and meet to discuss their suggestions with the ADA/504 Coordinator and DRC Director.

Part 3: Design Elements

1. APPLICABLE CODE, GUIDELINES AND STANDARDS

1. All design work shall comply with all applicable sections of the following (or latest upgrades, as applicable):
 1. 2010 ADA Standards for Accessible Design
 2. 2014 Edition of the Oregon Structural Specialty Code (OSSC)
 3. ICC/ANSI A117.1 – 2009 Accessible and Usable Buildings and Facilities (Referenced by OSSC)
 4. 2011 Oregon Elevator Specialty Code
 5. ASME A17.1 – 2010 Safety Code for Elevators and Escalators
 6. BHMA A156.10-2011 American National Standard for Power Operated Pedestrian Doors
 7. BHMA A156.19-2013 American National Standard for Power Assist and Low Energy Power Operated Doors
 8. NFPA 72: National Fire Alarm and Signaling Code - 2013
 9. ORS 447.233 - Oregon Transportation Commission Standards for Accessible Parking Spaces (April, 2012)
 10. ORS 447.220 - It is the purpose of (state law) to make affected buildings, including but not limited to, commercial facilities, public accommodations, private entities, private membership clubs and churches in the state accessible to and usable by persons with disabilities, as provided in the Americans with Disabilities Act, and to make covered multifamily dwellings in the state accessible to and usable by all persons with disabilities, as provided in the Fair Housing Act.

Accessibility and Universal Design Standards

Universal Design (UD) is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. This concept originated in architecture and has great potential to positively impact disability-related access.

UD means that, rather than designing your curriculum, facility, and services for the average user, they are designed for people with a broad range of abilities, disabilities, reading levels, learning styles, native languages, cultures, and other characteristics in mind. UD, aides in the inclusion of all community members and the success of all learners and employees. The removal of access barriers and the promotion of equity on campus shall gradually allow for more people to have access to a Portland State education and reap all of its benefits. UD for learning is further defined on the [Universal Design for Learning webpage](#).

Portland State University is committed to an inclusive and welcoming experience for all students, staff, faculty and guests. We believe that as we design University spaces and experiences, from classrooms, coursework, exams, events or programs, we have a responsibility to identify and remove barriers to access. If we incorporate proactive accessibility and universal design into our initial plans, it may reduce or eliminate the need for individual accommodations and increase inclusion and participation of all users. To this end, we strive to incorporate universal design in the physical layout of PSU buildings and accessibility of the university as a whole. For more information, please review the Center for Universal Design's [Seven Principles of Universal Design](#).

In addition to these standards, all Portland State construction and renovation projects shall adhere to current Americans with Disabilities Act - Accessibility Guidelines (ADA-AG) regulations.

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Academic Spaces

Classroom and Auditorium Features

- Classrooms with 50 seats or more shall include an induction loop or FM transmitter with hearing aid compatibility (whatever technology needs to serve both people who have hearing aids and those who do not).
- Space for wheelchair users shall be integrated, dispersed, and include a minimum of one companion seat which shall be a bariatric chair per classroom.
- Space for wheelchair users shall be a minimum of 36" wide x 52" deep (60" deep if side access).
- Space for wheelchair users shall be adjacent to an accessible route.
- A clear line of sight to the instructor and media shall be provided at spaces for wheelchair users.
- Detectable warnings, barriers and seat signage shall be provided where required in classrooms, auditoriums or assembly areas where there are significant changes in level.
- Designated area with adequate lighting shall be included for Interpreters at the front of the room.
- If elevated stages are provided, they shall be on an accessible path internal to the classroom or auditorium.
- A minimum 42" clearance between aisles that lead to accessible seating shall be provided.

Furniture

- Ergonomic, accessible furniture shall be placed in classrooms, instructional laboratories and computer laboratories as follows:
 - Rooms with up to 25 seats: 1 for students and 1 for a faculty member
 - Rooms with 26-75 seats: 2 for students and 1 for a faculty member
 - Rooms with 76-150 seats: 3 for students and 1 for a faculty member
 - Rooms with more than 151 seats: 4 for students and 1 for a faculty member
- Specific furniture for the rooms types are as follows:
 - Classrooms: Ergonomic chairs and pneumatic adjustable height desks that adjust to at least 38"
 - Teaching laboratories: Accessible workstations
 - Computer laboratories: Electric height adjustable table and one fully adjustable ergonomic chair without arms
- A variety of desks, tables, and chairs shall be included in common spaces.
- All accessible spaces and furniture shall be provided with signage indicating that the space is reserved for people with disabilities.

Technology

- All technology shall be approved as accessible according to Electronic Information Technology Accessibility Policy.

Residential Spaces

Housing Buildings

- All doors with closers that access common rooms (e.g. laundry room, kitchen, trash room) shall have automatic door openers.
- Accessible units shall be located on the first floor and dispersed throughout the floor so residents shall have a choice of location. If the building has an elevator, accessible rooms shall be dispersed throughout multiple floors.
- A high and low peephole shall be provided on corridor doors to accessible units.
- Window sills in accessible units shall be no higher than 42”.
- Window covering controls in accessible units shall be extra long and accessible (e.g. long blind wands or extra long control strings)
- Outlets in accessible units shall be located at a consistent height of 18” AFF measured to the centerline of the outlet or object. [ADA note: outlets 15” AFF]
- Private bathrooms in accessible units shall have water durable surfaces on walls and floors.

Recreation Spaces

Fitness and Weight Rooms

- Accessible fitness equipment shall be provided that allows for the same range of exercises and strength training provided by the rest of the equipment. Where feasible, equipment that can be used by all individuals shall be provided.
- Adequate path of travel to each type of accessible exercise equipment shall be provided.
- Tether anchors shall be installed where service animals can rest securely while their person is using equipment. Tethers shall be stationed at multiple locations throughout the room.

Pools

- At least two accessible means of access shall be provided in to pools. At least one of these shall be either a pool lift or a sloped entry.

Non-Commercial Kitchens and Kitchenettes

- Where kitchen ranges or stove tops are installed, provide accessible height units with controls located near the front of the units. The exception is in childcare areas.
- Where a microwave is provided, locate the unit such that the face is always flush to the front edge of the counter and the top of all controls are located at a height not exceeding 43" AFF. Provide nearby surface area for food preparation.
- 40" wide minimum clear aisles shall be provided.

Event/Sports Arenas

- Accessible and companion seating shall be available on multiple levels of the arena and shall be clearly marked.
- Sensory bags shall be available for checkout during arena events.
- Railings and partitions that may impact the line of sight of a guest in a wheelchair shall be either: a. Installed a variety of heights around the arena, or b. At a height tall enough not to impede any wheelchair users view.

Campus Grounds

Construction Zones

- Secure fencing or appropriate barriers shall be required around all construction zones. Warning tape is not accessible as the visually impaired may be unable to see the tape and is not sufficient as a safety barrier.
- Ramps to sidewalks or buildings shall not be blocked by vehicles or equipment.
- When building access or egress is being relocated or substantially modified, connections from the project site to accessible parking and accessible paths of travel shall be maintained.
- When an accessible path of travel needs to be closed for construction purposes, an alternate accessible path and signage shall be created.

Hardscapes

- Exterior smooth or rough aggregate travel surfaces are prohibited. Finishes shall be medium broom finish or approved equal.
- Whenever possible, locate items such as cleanouts, vault covers, grates, and similar items outside of the path of travel. When these items are located within the path of travel, they shall be flush with the surrounding walkway.

Path of Travel

- Construct alternatives to ramps (such as sidewalks and proper grading) to achieve gentler slopes.

- Where design slopes on walks approach 5% (1:20) due to existing conditions, consider the incorporation of a ramp or ramps to provide reduced slopes along the majority of the path. Ramps may be preferred over long stretches of walks at maximum allowable grade.
- For landscaping swales adjacent to paths of travel, provide a raised edge that can be detected by white canes.
- Bicycle parking shall not encroach upon paths of travel.
- Pavers or stamped concrete shall not be used on accessible paths of travel. Pavers may be used in other areas, but shall have flush joints. Stamped concrete shall not have joints larger than 1/8" wide. Exceptions to be reviewed by the Project Manager.
- Maximum cross slope goal shall be 1.5% (1:66.7). [ADA note: 1:48 or just over 2%. This recommendation is to ensure that, with construction tolerances, the resulting slope shall be less than 2% (1:48).]
- All exterior routes to and from parking areas to building entries and between buildings shall be designed and graded in such a way that persons with mobility disabilities shall be able to negotiate such areas without special assistance. Grades shall meet the same standard as ramps with landing and resting areas strategically located along regular intervals along the route.

Restrooms

Restrooms

- When possible, restroom entrances shall be designed without doors or vestibules (recommended).
- Bariatric fixtures (including wall carriers) shall be included in ambulatory and accessible stalls.
- A minimum of one in four stalls shall be ambulatory stalls.
- A minimum of one sink and counter shall be installed at a lower height for wheelchair and children. This sink shall have an automatic faucet.

Accessible Toilet Stalls

- A sliding latch shall be installed at accessible stalls that can slide easily using only a fist.
- Pull handles shall be installed on both sides of accessible stall doors.

Toilet Accessories

- Vertical grab bars shall be included in ambulatory and accessible stalls (required by the City of Portland).

- Toilet paper dispensers shall be installed on the nearest side wall, a minimum of 7" from the front edge of the toilet and a maximum of 36" from the back wall to the centerline of the dispenser. Dispenser(s) shall be between 19" minimum AFF and 48" maximum AFF. Install at least one toilet paper dispenser below the grab bar.
- Toilet seat cover dispensers shall be mounted on the opposite wall or partition from side grab bar. The opening shall be a maximum height of 43".
- Fixtures (including hand dryers, paper towel holders, sharps containers, and soap dispensers) shall be mounted with controls at a range of 43"-46" AFF. [ADA note: up to 48"]
- Paper towel dispensers and hand dryers shall be mounted in locations that are not within an accessible path of travel.
- Where provided, baby changing tables shall be installed so that the front is at 34" above the floor. The horizontally-oriented tables are preferred to vertically-oriented units.
- Coat hooks in accessible stalls shall be installed at a height of 36" AFF.

Lactation Rooms

Lactation Rooms

- All lactation rooms shall have an accessible height sink and faucet combination deep enough to wash bottles and pump parts. Gooseneck or kitchen type faucets are recommended.
- All lactation rooms shall have a paper towel dispenser, a trash can, coat hooks at an accessible height, and a full length mirror.
- Outlets shall be located at a consistent height of 18" AFF measured to the centerline of the outlet or object. [ADA note: outlets 15" AFF] and close to the table and chair so that a pump can be plugged in on the table.
- A minimum footprint of 7 feet x 7 feet (2100 X 2100) is recommended as it allows for a 5-foot (1500) radius circle with an accessible height surface that shall be at least 24" deep.
- Walls shall ideally reach up to the structure or install sound attenuation in walls to minimize echoes and sound transmission (i.e. minimum STC 45) over them into adjacent spaces. Carpeting or other sound-dampening materials to minimize echoes is recommended.

Locker Rooms and Showers

Locker Rooms

- Accessible lockers shall be provided on accessible routes.
- Lockers shall be located near accessible showers.
- Accessible lockers shall be located within 18" - 43" reach range and be furnished with handles operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.
- Full length mirrors shall be provided at least 74" AFF at their topmost edge and lower edge at 6" AFF maximum to allow for wall base if needed. Provide 48" clear floor space in front of full length mirrors. Doors shall not swing into this clear floor space.
- A separate area for individuals needing the assistance of a personal care attendant of the opposite gender shall be provided.
- At least 1 bench shall be 24" wide and shall have a padded surface to facilitate laying down to change clothes.

Showers

- Roll-in showers that are 36"x60" minimum shall be installed. [ADA note: 30"x60"]
- Provide a clear floor space of 36"x60" minimum outside of transfer shower stalls and 36"x60" minimum at roll-in shower stalls. [ADA note: 36"x48" and 30"x60"]
- A lift-track system from the mobility device into the shower shall be provided.
- Shower controls shall be installed at 43" AFF. [ADA note: 38"-48"]
- Shower seats shall be installed at 18" AFF.
- Grab bars shall be mounted at 34" AFF. [ADA note: 33"-36"]

Signage and Wayfinding

Signage

- Service animal signage shall be installed at all exterior building doors.
- 'Elevator yield' signage shall be installed at all elevator doors.
- Priority stall signage shall be installed at accessible stalls in multi-stall restrooms.
- Temporary braille signage shall be posted if it is to be in place for more than 7 days.
- Display monitors shall be accessible both visually and audibly whenever possible.

Wayfinding

- Touch monitors shall be installed at an accessible height with audible feature to serve as an accessible map on at least the first floor of the building (recommended).

- Color coding shall be used to distinguish floors when possible. Color coding shall not be used as the sole method of wayfinding.

Building Elements

Entrances

- No building entrances shall have stairs (unless this is unavoidable).
- The main entrance shall always be the accessible entrance and be located closest to other structures.
- An accessible path of travel shall be provided from the main accessible entrance to adjacent buildings, parking and other uses located on the same site.

General Elements

- When possible, avoid creating multi-leveled classrooms with less than 60 seats. When designing rooms and spaces, show permanent furniture, fixtures, and equipment (e.g. accessories such as hand dryers) in the drawings to make sure these items shall not encroach on accessible routes, turning spaces, and required clear floor spaces.
- When possible, provide a minimum clear circular turning space of 67" diameter or allow for approved T-shaped turning space. Overlap of knee and toe clearance is 10" max. [ADA note: 60" diameter or T-shaped 30"x48"]
- When a rectangular clear floor space is required, when possible provide a minimum of 30"x52". [ADA note: 30"x48"]

Interior Routes

- When possible, design accessible paths on a single level to avoid having to incorporate ramps and ensure they are 60" wide.
- Stair climbers and vertical platform lifts shall not be used in new construction. In existing buildings, stair climbers or vertical platform lifts may be an option for making an area accessible, but shall always be a last resort.

Reach Ranges

- Controls for items such as automatic door openers, infrared sensors, card readers, emergency call boxes, switches, or controls shall be installed between 18" and 46" AFF to the centerline of the outlet or object. [ADA note: 15"-48" AFF over counters up to 25" deep]
- Controls and objects shall be installed at least 18" away from inside corners of walls or cabinets to allow for wheelchair access and shall not be blocked by furniture.

- Items attached to walls (such as fire extinguishers, first aid kits, and defibrillators) shall be mounted so that the top reach is at 46" AFF [ADA note: 48" AFF]

Protruding Objects and Cane Detection

- All circulation paths shall remain clear of barriers and hazards.
- When possible in public spaces, no wall-hung items shall project more than 4" from a wall when between 27" AFF and 80" AFF. Projections over 4" in that height range require cane detection.
- Curbs may be mistaken for a step or change in level, instead of cane detection for headroom obstruction. For this reason, barriers significantly higher than a curb or riser are recommended, such as a guardrail, fixed planter box, fixed bench, wall, or similar element.

Openings

- When possible, design interior passageways without doors.
- Avoid doors that swing out into corridors or accessible routes of travel except where required for emergency egress. In new construction, doors that are required to open out into corridors shall be designed within alcoves regardless of corridor width.
- At door control devices, a clear floor space that is level and located outside of the swing of the door shall be provided.
- Consider path of travel and traffic flow when placing door control devices.

Doors and Hardware

- When possible, recess classroom and suite entry doors to allow for easier entry in and out of rooms.
- All accessible exterior entry doors shall have an automatic sliding door or an automatic door opener, including gated entrances.
- All classrooms and labs with accessible exterior entry doors shall have an automatic door opener.
- All lactation stations shall have an automatic door opener.
- Restrooms on the most highly trafficked floor of buildings shall have automatic door openers at a minimum of 1 women's, men's and all gender multi stall restroom.
- All vestibule entrances shall have automatic door openers.
- Where fire rated doors are required, doors shall have magnetic locks fitted.
- In housing buildings, all doors with closers that access common rooms (e.g. laundry room, kitchen, trash room) shall have automatic door openers.

Hallways

- Where large expanses of glass exist in the path of travel, decals or frosting shall be used to help distinguish the glass.

Steps, Stairs and Stairwells

- Carpet shall not be used on stairs and in stairwells.
- When possible, space shall not be designed with a single stair riser.
- The leading edge of stair treads shall contrast with the rest of the treads. Provide a contrasting strip on the leading edge of the tread that extends a total of 2" back from the leading edge of each tread with a minimum 80% contrast. Integral, colored, cast-in-place stair nosings are preferred.
- Slope treads of exterior stairs shall be 1.5% (1:66.7) maximum slope goal toward the leading edge of the treads. [Note: This is to ensure that, with construction tolerances, the resulting slope shall be less than 2% (1:48).]
- At stairs that are not part of an egress route and are wider than 8', intermediate handrail(s) that are evenly spaced shall be installed.

Ramps

- Avoid creating curved ramps.
- When a ramp is necessary, ramps shall have a slope goal between 5% (1:20) and 6.25% (1:16). Strive for the least amount of slope that is feasible. [ADA note: 8.33% 1:12 maximum].
- The cross slope goal of ramps and landings shall be 1.5% (1:67) maximum. [ADA note: up to 2% (1:48). This recommendation is to ensure that, with construction tolerances, the resulting slope shall be less than 2% (1:48).]

Handrails

- Where possible, handrails shall be included on both sides of stairs.
- Continuous handrails around the perimeter of intermediate landings shall be provided.
- Handrails with centerline of handrail at 36" above stair nosings or above ramp surface shall be installed. Include handrail at 26" in locations used primarily or frequently by children. [ADA note: 34"-38" AFF]
- Handrails shall be round in cross section.

Drinking Fountains and Hydration Stations

- Where possible, drinking fountains with bottle fillers shall be installed in locations with alcoves. If fountains are not recessed in alcoves, cane detection shall be installed.

- If drinking fountains in alcoves cannot be accommodated due to existing building conditions, hydration stations shall be installed and shall be the combination fountain and bottle filler type.

Service Counters and Reception Desks

- All service counters and reception desks shall be installed at a height to accommodate wheelchairs.

Life Safety

- Code compliant areas of refuge shall be designed on every floor and shall include signage and a telephone.
- Detectable warnings, for example fire alarm flashing lights, shall be installed.
- A portable evacuation chair shall be located in all buildings.
- If Fire Code requires alarm strobes to be located such that two or more are visible from the same location, strobes shall be perfectly synchronized.

Lighting and Electrical

- Unless space usage requirements dictate otherwise, 3500K LED lights shall be used in all interior building spaces. 5000K shall be used for all exterior lighting.
- Lighting levels on ramps and stairs shall be at least equivalent to the lighting levels in adjacent areas.
- Outlets shall be located at a consistent height of 18" AFF measured to the centerline of the outlet or object. [ADA note: outlets 15" AFF]

Elevators

- Hall call buttons shall be brightly illuminated. The down button shall be centered at a height of 35" AFF and the up button not more than 43" AFF.
- Buttons shall be installed in the cab, with the highest buttons at 46" AFF. [ADA note: up to 48"]
- A handrail at 32" AFF shall be provided on all walls of the elevator cabs that do not have controls or doors.
- Auditory signals shall be installed in all elevator cabs that sound the floor numbers as the elevator arrives on each floor.

Parking Standards

- Accessible parking shall be located in strategic locations in PSU parking facilities with accessible routes to enter/exit and parking pay-stations where needed.
- Accessible parking spaces and associated parking meters shall be in close proximity to each other and on an accessible route.
- PSU may exceed the minimum number of parking spaces required by law and shall monitor usage to determine the appropriate quantity of spaces to provide in excess of parking standards.
- Pay-stations, coin slots and credit card swipe parking meters shall be located at an accessible height between 24"-43".
- Accessible electric vehicle charging stations shall have all controls at a height between 24"-43". At least 1 vehicle charging station in a grouping shall be accessible.
- Design of parking areas shall avoid using parallel or angled accessible parking.

Driveways

- Driveways that cross sidewalks shall be designed such that the sidewalk at the top of the sloped driveway has a maximum cross slope designed to 1.5% (1:66.7) providing a continuous clear pedestrian access path.
- An option for narrow curbside sidewalks, although less desirable, would be to provide sloped 7.14% (1:14) ramps along the sidewalk on either side of the driveway (so the sidewalk is closer to the street grade) and slope the driveway up beyond the sidewalk. The sidewalk portion shall have a maximum 1.5% (1:66.7) cross slope.

Appendix 28.1 – Access Control

Part 1: General

1.1 Standards of Performance

- A. Contractor to provide, install, and activate access control low voltage cabling and devices.
- B. For all work completed AutoCAD Drawings, Submittals, O&Ms, Warranty certificates and a copy of any software programs shall be provided upon project closeout.
- C. Contractor to provide complete installation include conduit and boxes for card readers. Fire caulking, patching, and paint is to be provided by contractor to complete installations.
- D. The (6) major access control devices at doors are following:
 - a. Magnetic swipe or proximity card reader
 - b. Door contact
 - c. REX (request to exit motion detector)
 - d. Sounder
 - e. Electric lock or electric exit device
 - f. Power Transfer hinge.
- E. The (4) types of access doors
 - a. Card Reader Door (items 1-6)
 - b. Auto lock Door (items 1, 3-6)
 - c. Exit only Door (items 2,3,4)
 - d. Emergency Exit only Door (items 2,4)

1.2 Related Sections

- A. 08 31 00 Access Doors and Panels

Part 2: Products

1.1 Control Panel

- A. Manufacturer
Lenel or approved equal to provide seamless integration with existing systems.
- B. Description

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- a. Coordinate with PSU Project Manager to identify currently approved model numbers.
- b. Strike output relays shall be isolated from the electric locking devices they control.

1.2 Low Voltage Cabeling

- A. Manufacturer
Plenum or Approved Equal
- B. Description
Provide and coordinate all low voltage cabeling to all components for a complete working system.

1.3 Enclosures

- A. Manufacturer
Hoffman or approved equal.
- B. Description
Primary central panel enclosures shall be per installation, with cabinet tamper switches.

1.4 Cameras

- A. Manufacturer
Sony, Bosch or approved equal.
- B. Description
 - a. POE where applicable.
 - b. If exterior install, provide heater and blower as required.

1.5 POWER SUPPLIES

- A. Manufacturer
Altronix or approved equal.
- B. Description
None Specified

1.6 BATTERIES

- A. Manufacturer
PSU Approved
- B. Description

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Calculations and ruin time to meet a minimum of 12 hours.

PART 3 EXECUTION

1.1 INSTALLATION

- A. Install per manufacturer's specifications and recommendations.
- B. Contractor to provide record document to include accurate as-built information per PSU requirements.

END OF SECTION