University of Oregon
Huestis Hall

Renovation Feasibility Study

1425 East 13th Avenue
Eugene, OR 97401

UNIVERSITY OF OREGON

November 2017

Robertson | Sherwood | Architects PC

ACKNOWLEDGEMENTS

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1. Executive Summary

1. EXECUTIVE SUMMARY

GENERAL SUMMARY

As the research facilities on the University of Oregon Campus continue to expand and the existing research buildings age, the university is pressed to properly accommodate the needs of its researchers. As a result the University of Oregon has proactively procured three design teams to conduct an evaluation of three separate research buildings on campus, and has asked them to present a feasibility analyses for each. Robertson|Sherwood|Architects, in conjunction with its design partners, prepared the following building evaluation and a "like new" renovation proposal for Huestis Hall:

Centrally located on campus, Huestis Hall enjoys ideal adjacencies to other research buildings within the Lorry L Lokey Science Complex, and plenty of areas of natural respite with the large outdoor courtyard to the east. The brutalist nature of the building gives Huestis Hall a strong, yet simple, presence that is warmed with its brick veneer accents and large expanses of glazing. Unfortunately, the deteriorating exterior envelope and lack of a prominent main entrance gives Huestis Hall an unwelcoming feel and a lack of identity.

As with its exterior, Huestis Hall's interior has deteriorated. The interior finishes and utilities have been well used, are dated, and are in poor-fair condition. The space layout isn't conducive to an open, collaborative research environment. In addition the building doesn't meet today's accessibility, plumbing, mechanical, electrical, fire protection, seismic, or energy efficiency standards. To upgrade Huestis Hall into a safer, more comfortable, collaborative research building that will adequately support the building researchers a complete building overall is necessary.

ENVELOPE

The exterior envelope has cosmetic deficiencies that for the most part can easily be addressed. The structural concrete frame was coated with a membrane some time ago, but appears not to have been cleaned since then. The result is a building façade with severe water staining. Cleaning, recoating, and a schedule of regular cleaning will help maintain the building's appearance. The brick veneer wall panels also need regular cleaning and periodic repointing. In addition, the glazing should be replaced with insulated glazing units, and additional insulation should be installed on the interior side of the exterior walls to increase the building's energy efficiency.

Huestis Hall was originally designed to accommodate additional building stories. Consequently, the original roof deck is dead flat and drains poorly; on the other hand, this flat structure lends itself well to the addition of a new mechanical penthouse to enclose equipment on the roof. If the new penthouse is added, the inherent problems with roof drainage can easily be corrected. At the same time the leaking perimeter coping can be corrected, and a new OSHA-compliant guardrail can be added.

The proposed scope of the envelope upgrade includes addressing the absence of bracing to resist lateral seismic forces in the east-west direction, and also the incorporation of a clearly identifiable main entrance to Huestis Hall, as the building currently lacks a clear main public entry. These two issues can be addressed at the same time by enclosing the existing outdoor areas covered by the overhanging second and third floors with shear walls (for the seismic upgrades), and incorporating a new storefront-glazed main entryway. The southwest corner is the ideal location for a new main entry clearly visible and identifiable from 13th avenue.

STRUCTURAL SYSTEM

As is the case with most buildings built prior to 1984 in Oregon, Huestis Hall has a lateral force resisting system that was designed prior to the awareness of local seismicity exposure. Consequently, in its current state, the building is expected to sustain significant damage in the event of a major earthquake. Through the process of evaluating the building using ASCE 41-13 Seismic Evaluation and Retrofit of Existing Buildings, Equilibrium Engineers has identified the primary vulnerabilities in the building's lateral force resisting system. In addition, recommended retrofits of the identified vulnerabilities were developed and are described in more detail within the facility analysis and master plan sections of this assessment report.

In this feasibility study a tier one seismic evaluation was conducted, and the proposed new loads to the roof were breifly analyzed. A comprehensive review of the entire building structural system was not conducted.

HVAC SYSTEM

With the exception of mechanical systems serving the Zebrafish Laboratory and the Lokey Laboratory located at basement level, all mechanical systems in the building, with the minor exception of portions of the recently remodeled Adam Miller Laboratory on the third floor, are past the equipment service life and should be replaced.

To address issues in areas where equipment should be replaced, new fully-redundant heating, ventilating, and air conditioning systems will be required. Systems will include central air handling equipment located in a new rooftop mechanical penthouse and central hydronic systems located in the existing basement mechanical room. Some temporary services will be required to keep the Zebrafish and Lokey Laboratories operational during construction. Central service and control systems serving the Adam Miller laboratory will be replaced, although local HVAC equipment would remain.

PLUMBING SYSTEM

With the exception of the Lokey, Zebrafish, and Adam Miller Laboratories, all plumbing systems in Huestis Hall are generally at the end of their service life and should be replaced. In addition, some existing systems are inadequate to meet program needs.

Proposed upgrades include:

- Replacement of all existing piping systems including potable hot and cold water, laboratory hot and cold water, storm drain, sanitary and acid waste, natural gas, compressed air, and reverse osmosis water.
- Installation of separate, redundant potable and laboratory water heaters.
- Installation of new reverse osmosis water storage and distribution equipment.
- Installation of new compressed air dryers and filtration.
- Installation of a new laboratory vacuum system.

ELECTRICAL SYSTEM

POWER

The electrical service to Huestis Hall was upgraded in 2008, in preparation for the Zebrafish and Lokey Laboratory construction. The main power distribution system in the basement will remain. A new service will be added to provide a redundant system for the main 120/208V service.

The bus duct riser distribution system at each floor will be replaced with sub-distribution boards at each new electrical room. New panelboards will be located in each laboratory area and will be fed off the distribution boards located in the electrical room at each floor.

LIGHTING

All the existing lights in floors 1-3, except for Mccormick and Adam miller lab, will be replaced with LED fixtures. Lighting controls will be replaced with a new digital lighting control system.

FIRE ALARM / FIRE SUPPRESSION SYSTEM

FIRE ALARM

The existing fire alarm panel will be replaced. The replacement will cause minor disruption to the Zebrafish and Lokey Laboratories during the work. Existing notification and detection devices in the Zebrafish and Lokey Laboratories will be reused and connected to a new panel. New notification and detection devices will be provided on the first through third floors.

FIRE SUPPRESSION

A majority of the existing fire sprinkler system is adequate and can be used. Upgrades will include relocation of the existing fire protection service connection to allow access to the fire sprinkler riser, and relocation of piping and sprinkler heads to accommodate changes to the building floor plan.

I.T. INFRASTRUCTURE

The existing MDF room was installed in 2008 in preparation for Zebrafish and Lokey construction. The proposed upgrades will be limited to the first through third floors. Typical upgrades at each floor include:

- Replacement of the existing hallway cable tray.
- New IDF rooms with racks and horizontal distribution equipment.
- New raceways from the MDF room to each IDF room and from a cable tray in the hallway to each lab space.

VERTICAL TRANSPORTATION

The elevator within Huestis Hall is original to the building and received a partial upgrade in 2008. The elevator equipment appears to be in good shape and has been fairly well maintained. In its current condition the elevator is expected to provide another 10-12 years of reliable service. There is a desire to increase the capacity of the elevator and the elevator door size to better accommodate the moving of large equipment. The existing elevator shaft will accommodate a slightly larger elevator with some structural modifications. The larger elevator will accommodate a 42" door opening, rather than the existing 36" wide open. Due to this, it is proposed to replace the existing elevator with a 3,500 pound basement set traction elevator.

INTERIOR PROGAMMATIC SPACE

With the exception of the newly renovated Zebrafish Laboratory, Adam Miller Laboratories, and David McCormick Laboratories, the interior spaces in Huestis Hall have been well used; however, they do not properly accommodate the space use needs today. Due to this the interior spaces shall be replaced in their entirety to better accommodate the current and future research needs of the facility. The basic programmatic assumptions will be similar to the current program within the building. However, the research support spaces should be enhanced and allocated appropriate square footages to adequately serve the needs of the building users. The programmatic assumptions are as follows, research classrooms on the first floor that could be easily converted to research laboratories if ever desired, eight research laboratories on both the second and third floors, and research support spaces. The research support spaces shall be conference rooms, collaboration areas, kitchenette, freezer farm, housing facility, print rooms, mail room, a lactation room and bathroom facilities. In addition, electrical rooms and IDF Rooms should be located throughout the building.

INTERIOR FINISHES

The interior finishes in the building are dated, well used, and deteriorating, with the exception of the recently renovated Zebrafish Laboratory, Adam Miller Laboratories, and the David McCormick Laboratories. All the interior finishes and accessories shall be replaced with new finishes to give the building a "like new" feel.

SITE WORK

The existing site surrounding Huestis Hall has been updated during the recent Zebrafish Laboratory and Lokey Laboratory remodel. The site is in good condition, and provides areas of natural respite just outside of Huestis Hall. Very little changes will be necessary with the remodel of Huestis Hall. The changes that are required include the relocation and reworking of the bicycle parking at the south end of Huestis Hall.

COST SUMMARY

University of Oregon - Building Assessment Executive Summary - Direct Construction Budget Summary

Fall 2017

Building Name: Huestis Hall | Estimating Firm: GBC

Building GSF: 53,850

Yellow Cells are Self-Calculating

CSI SECTION	BUDGET CATEGORY	BUDGET RANGE (Assume Summer 2021 Mid Construction) Low		BUDGET RANGE High	Cost Per SF Low		Cost Per SF High
DIV 01	General Requirements	$ 601,245		$ 601,245	$ 11		$ 11
DIV 02	Existing Conditions (Demolition)	$ 483,950		$ 532,345	$ 9		$ 10
DIV 03	Concrete (Superstructure+Fnd+ Substr)	$ 1,784,825		$ 2,320,273	$ 33		$ 43
DIV 04	Masonry				$ -		$ -
DIV 05	Metals				$ -		$ -
DIV 06	Wood, Plastic, and Composites				$ -		$ -
DIV 07	Thermal and Moisture Protection (Roofing)	$ 716,674		$ 716,674	$ 13		$ 13
DIV 08	Doors and Windows (Exterior Encl)	$ 1,422,259		$ 1,848,937	$ 26		$ 34
DIV 09	Finishes	$ 4,726,373		$ 5,435,329	$ 88		$ 101
DIV 10	Specialties (with finishes)				$ -		$ -
DIV 11	Equipment				$ -		$ -
DIV 12	Furnishings				$ -		$ -
DIV 13	Special Construction				$ -		$ -
DIV 14	Conveying Equipment	$ 341,000		$ 375,100	$ 6		$ 7
DIV 15	HVAC Systems	$ 4,807,500		$ 6,009,375	$ 89		$ 112
	Water Supply Systems (Pluming)	$ 1,669,713		$ 1,669,713	$ 31		$ 31
	Sanitary Systems				$ -		$ -
	Storm Systems				$ -		$ -
	Fire Suppression Systems	$ 215,400		$ 215,400	$ 4		$ 4
DIV 16	Electrical Systems - Primary	$ 2,889,506		$ 3,611,883	$ 54		$ 67
	Electrical Systems - Standby (with elect)				$ -		$ -
	Fire Alarm Systems	$ 148,088		$ 185,110	$ 3		$ 3
	IT Systems	$ 646,200		$ 710,820	$ 12		$ 13
DIV 31-33	Site Work (Excavation, Landscaping, Flatwork)	$ 190,000		$ 209,000	$ 4		$ 4
Subtotal:	Direct Costs	$ 20,642,732		$ 24,441,202	$ 383		$ 454
	Construction Contingency	$ 3,922,119		$ 4,643,828	$ 73		$ 86
	General Conditions	$ 1,857,846		$ 1,857,846	$ 35		$ 35
	Contractor Fee (3.5%) incl. GL	$ 722,496		$ 855,442	$ 13		$ 16
	Builders Risk (.8%)	$ 165,142		$ 195,530	$ 3		$ 4
	Performance Bond (.9%)	$ 185,785		$ 219,971	$ 3		$ 4
	Subcontractor Default Insurance (1%)	$ 206,427		$ 244,412	$ 4		$ 5
Total Direct Construction:		$ 27,702,547		$ 32,458,231	$ 514		$ 603

2. Existing Conditions

2a. UNIVERSITY OF OREGON

The University of Oregon Campus opened on October 16, 1876. Since then the campus has grown into a a hub within the City of Eugene that is comprised of over 80 buildings, open natural spaces, and pedestrian paths. Over the years buildings have been added, expanded and overhauled to offer students and faculty a variety of services, recreational opportunities, and entertainment. Newer facilities on Campus include the recently renovated Student Recreation Center, the Matthew Knight Arena, and the Jane Sanders Stadium.

In addtion to the growing campus services, the Lorry I. Lokey Science Complex continues to expand to offer campus researchers state-of-the-art recearch facilities. New facilities include the Lewis Integrative Science Building (2016), the Zebrafish remodel (2014), and the Lokey Laboratories (2007).

UNIVERSITY OF OREGON CAMPUS MAP

MAP BY UNIVERSITY OF OREGON (MAP.UOREGON.EDU)

2b. HISTORY OF HUESTIS HALL

HISTORY

Huestis Hall, formally named Science III, was constructed in the early 1970's. The building designed by the firm Skidmore, Owings, and Merrill, would become the seventh science building in the expanding Science Complex on the University of Oregon's Campus. The architects designed the building's raw concrete façade with repetitive punched openings in the manner of the Brutalist architectural style popular from the 1950's to mid-1970's. The Brutalist style was especially popular on growing higher education campuses because the stripped-down aesthetic translated to shorter construction periods and lower costs ("Brutalist architecture"). The Brutalist design wasn't the first on the University of Oregon Campus, nor the first in the Science Complex.

The University renamed Science III in 1986 after Ralph R Huestis. Ralph Huestis was a professor and researcher on the University of Oregon Campus for over thirty-eight years, one of the longest-known tenures on campus. Ralph Huestis' list of accomplishments is extensive, and includes: Serving on the Board of Museum of Zoology for thirteen years; having an instrumental role in the formation of the Museum of Natural History in 1937; serving on the Advisory Council for nine successive terms; serving as Advisory Council chair for three years; and being a key member of the Trowbridge committee, which developed the University's curriculum (Shotwell, J.A.).

Ralph Huestis' research was influenced by Francis B. Summer who, providing some of the best evidence, validated the theory of evolutionary interpretations through the study of wild mice. One of Huestis' biggest research achievements occured in 1954 when he observed with Mrs. Ruth Anderson that the generic aspects mice inherited with the jaundice disorder were closely similar to those inherited in humans (Shotwell, J.A.).

The research and teaching principals practiced by Ralph Huestis over sixty years ago continue today within Huestis Hall and on the University of Oregon Campus. The seven-building Science Complex has more than doubled in size and is now named the Lokey Science Complex. The complex continues to grow strong, with older buildings such as Huestis Hall requiring an overhaul to support the changing needs of researchers today.

HUESTIS HALL 1973 (PHOTO CREDIT: OREGONDIGITAL.ORG)

BIKE PARKING AT SOUTHWEST

EAST ELEVATION FROM COURTYARD

FIRE LANE AT THE WEST

EAST 13TH AVENUE

Huestis Hall is nestled into the University of Oregon Campus within the Lorry I Lokey Science Complex. Huestis Hall connects directly to Streisinger Hall to the north, and the underground Lokey Laboratories to the east. The Streisinger Hall connection on the first floor is comprised of a covered exterior walkway flanked on both sides by archways, and a enclosed bridge on the second and third floors.

Huestis Hall is located along East 13th Avenue, which provides a convenient path for pedestrians, and delivery vehicles. On the west side of Huestis Hall is Willamette Hall and a walking path that also serves as a fire lane. On the east side of Huestis Hall is a large courtyard. Established deciduous trees and a few evergreen trees are dispersed around the site, along with established planting areas and benches.

ACCESS TO THE SITE

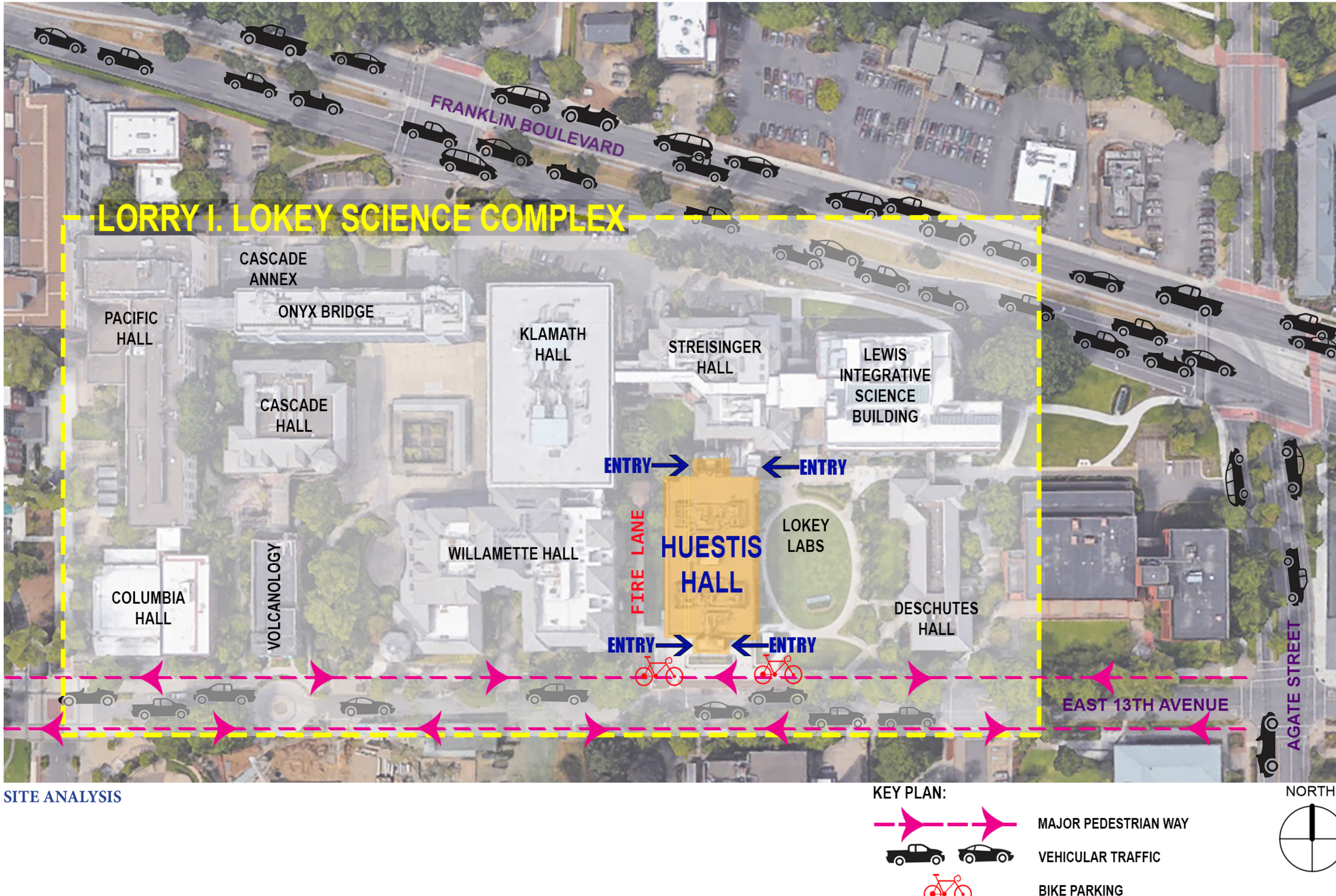
Huestis Hall is accessed mostly by pedestrians or bicyclists, as on-campus parking is generally limited to the campus periphery. Many exterior walking paths give pedestrians options to access the site, but the main pedestrian path is directly down East 13th Avenue. East 13th Avenue is also utilized by bicyclists as a portion of the street is closed to vehicular traffic. In addition to exterior access, Huestis Hall can also be reached through Streisinger Hall, which also has direct connections to a majority of the other buildings within the Lorry I. Lokey Science Complex.

BIKE PARKING

A number of bike parking options are provided at the southern end of Huestis Hall on both the east and west sides of the building. The bike parking options include uncovered spaces and spaces covered by Huestis Hall's second and third floor overhang. The bike parking styles include single loops and the older, non-code compliant, ribbon-style racks. Over 70 Bike Parking spots are provided.

PARKING

East 13th Avenue, directly outside of Huestis, is open to vehicles and includes parking spots on both side of the street. These spots are generally filled by people visiting the campus or contractors working on buildings on campus.



SITE ANALYSIS

2d. FACILITIES ANALYSIS: CODE ANAYLSIS

The following summarizes a preliminary review of the project criteria for zoning, and fire and life safety codes. The design team is just completing the conceptual design phase of the work. In this phase we have focused on determining the type, number, size and location of the key program elements. It is too early in the project to explore many of the key code issues that will guide the design moving forward. This summary focuses on zoning issues and some key fire and life safety issues.

The project must conform to the City of Eugene Code and the 2014 Editions of the Oregon Structural Specialty Code (OSSC), the Oregon Energy Efficiency Specialty Code (OEESC) and the Oregon Fire Code (OFC) along with a variety of other specialty codes.

ZONING SUMMARY

ZONE ORDINANCE EDITION:	City of Eugene Code
PROJECT ADDRESS:	1424 East 13th Avenue Eugene, Oregon 97401
ASSESSORS MAP NUMBER:	17033241
TAX LOT NUMBER:	06000
ZONE:	PL – Public Land
ZONE OVERLAY:	N/A
VEHICLE PARKING:	1 per every 3.5 full time equivalent students
BIKE PARKING:	1 per 5 full-time students 25% long term and 75% short term

*The University of Oregon's vehicle parking resources comply in aggregate with applicable City of Eugene codes regulating the supply of automobile and bicycle parking. Parking requirements are considered on a campus-wide, rather than individual building, basis

FIRE CODE ANALYSIS

Based upon the 2014 Oregon Fire Code (OFC).

FIRE ACCESS LANE (OFC 503.2.1/503.2.5):

- 20' fire access lane within 150' of all parts of the building.
- Building over 30' in height requires aerial access (26' fire access lane within 15-30' from edge of building)
- 150' maximum dead end without requiring a hammerhead.

FIRE SPRINKLERS:

The existing building is equipped thoughout with fire sprinklers. However, the system doesn't comply with the current NFPA 13 Standards. Refer to System West Engineer's Fire Protection Memorandum, dated May 3, 2017 for a complete list of fire sprinkler deficiencies identified in the building. The report includes Huestis Hall, Lokey Laboratories, and the Zebrafish Labs.

FIRE HYDRANTS (OR APPROVED WATER SUPPLY) (OFC 507, APPENDIX B & C)

In buildings equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 the maximum distance to a fire hydrant shall be 600'.

BUILDING CODE ANALYSIS
Based upon the 2014 Oregon Structural Specialty Code (OSSC).

OCCUPANCY GROUPS (OSSC CHAPTER 3):	Group B
CONSTRUCTION TYPE (OSSC CHAPTER 6):	Type IIB
BASE ALLOWABLE HEIGHT:	(3) story, 55 feet
BASE ALLOWABLE AREA (At):	23,000 SF
ALLOWABLE AREA WITH INCREASES (Aa):	80,730 SF with frontage increase and automatic sprinkler system increase

EXISTING BUILDING SQUARE FOOTAGE:

BASEMENT:	20,323 SF (Basement including Zebrafish Laboratory expansion area)
FIRST FLOOR:	13,242 SF
SECOND FLOOR:	15,743 SF
THIRD FLOOR:	15,743 SF
TOTAL:	65,051 SF

TOTAL HEIGHT: 53'-0" to top of Stair Tower

RATED CONSTRUCTION (OSSC TABLE 601):
Information listed below applies to Type IIB:

STRUCTURAL FRAME:	0 HOUR
BEARING WALLS, EXTERIOR:	
Building Separation Distance less than 10'	1 HOUR
Building Separation Distance greater than 10'	0 HOUR
BEARING WALLS, INTERIOR:	0 HOUR
NON-BEARING WALLS, EXTERIOR:	0 HOUR
NON-BEARING WALLS, INTERIOR:	0 HOUR
FLOOR CONSTRUCTION:	0 HOUR
ROOF CONSTRUCTION:	0 HOUR
INTERIOR EXIT STAIRWAYS:	2 HOURS
CORRIDOR/DEMISING WALLS:	1 HOUR*

* Corridor/Demising walls are required to be 1 hour-rated unless the building is equipped throughout with an automatic sprinkler system in accordance with OSSC Section 903.3.1.1 or 903.3.1.2 where allowed (OSSC Table 1018.1)

*The overall rated construction of the existing building meets or exceeds the rated construction requirements outlined above. The building is assumed to have a fire rated structural frame, floors, and roof, and the existing penthouse structural framing has fire-proofing.

INTERIOR EXIT STAIRWAYS
Interior Exit Stairways to be 2 hour-rated.

EXTERIOR WALL OPENING PROTECTION (OSSC TABLE 705.8):
Where Bearing Exterior Walls are required to be fire-rated, openings must comply with protection requirements (OSSC Table 705.8 and Section 706.8).

0-3 FEET:	Not permitted
3-5 FEET:	Not permitted unprotected 15% Protected
5-10 FEET:	10% Unprotected 25% Protected
10-15 FEET:	15% Unprotected 45% Protected

15-20 FEET:	25% Unprotected 75% Protected
20-25 FEET:	45% Unprotected No Limit Unprotected, Sprinklered & Protected
25-30 FEET:	70% Unprotected No Limit Unprotected, Sprinklered & Protected
30+ FEET:	No Limit

EXITING (OSSC CHAPTER 10):

Existing Building (without emergency voice/alarm communication system and non-compliant automatic sprinkler system)

EXIT WIDTH:	.2 inches per occupant .3 inches per occupant at stairs
MAXIMUM EXIT DISTANCE:	200 feet
COMMON PATH OF TRAVEL:	75 feet maximum

Building with automatic sprinkler system installed in accordance with OSSC Section 9.3.3.1.1 or 903.3.1.2 and an emergency voice/alarm communication system in accordance with OSSC Section 907.5.2.2

EXIT WIDTH:	.15 inches per occupant .2 inches per occupant at stairs
MAXIMUM EXIT DISTANCE:	300 feet
COMMON PATH OF TRAVEL:	100 feet maximum

PLUMBING FIXTURES (OSSC SECTION 2902.1):

REQUIRED PLUMBING FIXTURES FOR BUSINESS OCCUPANCY:

Water Closets: 1:25 for first 50 and 1 per 50 for remainder
Lavatories: 1:40 for first 80 and 1 per 80 for remainder
Drinking Fountains: 1 per floor

Approximately 625 occupants in the building requires:

- 8 Female Water Closets and Lavatories
  - 625/2=323
  - 323-50=273
  - 273/50=6
  - 2+6=8
- 6 Male Water Closets and Lavatories (1 Urinal per 2/3 Water Closets)
  - 625/2=323
  - 323-80=243
  - 243/80=4
  - 2+4=6
- 1 Drinking Fountain per floor (ADA)

*The existing plumbing fixture count for the first through third floors does not meet the code required plumbing fixture count.

PROPOSED PLUMBING FIXTURES:

6 Female Water Closets and Lavatories
6 Male Water Closets and Lavatories (1 Urinal per 2/3 Water Closets)
2 All Use (single occupant facility) with one Water Closet and Lavatory

2 Drinking Fountain per floor with filling station (one ADA)

* The proposed total amount of plumbing fixtures complies with the overall fixture count requirement for all genders.

BASEMENT CORRIDOR

FIRST FLOOR CORRIDOR

FIRST FLOOR CLASSROOM

BASEMENT

The basement of Huestis Hall is occupied by the recently renovated Zebra Fish Laboratory and a large mechanical room. The basement also provides a direct connection with the Lokey Laboratories located to the east of Huestis Hall. The Zebra Fish Laboratory is to remain intact and active during any Huestis Hall Remodel. During the expected building upgrades it is anticipated a large portion of floor space will be freed up by the relocation of mechanical units, allowing it to be transformed into laboratory support spaces.

FIRST FLOOR

MAIN ENTRANCES

The building's main entrances are located at the north and south ends of the building. There are four main entrances total, all of which hold equal importance. Three of the entrances occur under the second and third floor building overhang, and are tucked to the side next to the stair towers. The northeast entrance has become part of the new Lokey Laboratory entrance. Users entering Huestis Hall through this entrance need to walk through the new Lokey Laboratory foyer to the Huestis Hall entrance doors.

All four of the main entrances consist of full-lite glass doors with a clerestory and relites on both sides. The entrances lead into voluminous foyers with brick tile flooring, brick veneer and gypsum board wall finishes, and an uplit coved ceiling with wood planks. The wood planks slope up on four sides to a point in the center of the space. A few moveable benches are located in the foyers.

CORRIDOR

The central corridor on the first floor connects the two foyers on each end, and has a tunnel-like feeling. Between the foyers the corridor connects offices, classrooms, and support spaces. The doors to the offices, classrooms, and support spaces are solid wood and provide no visual connection to the corridor.

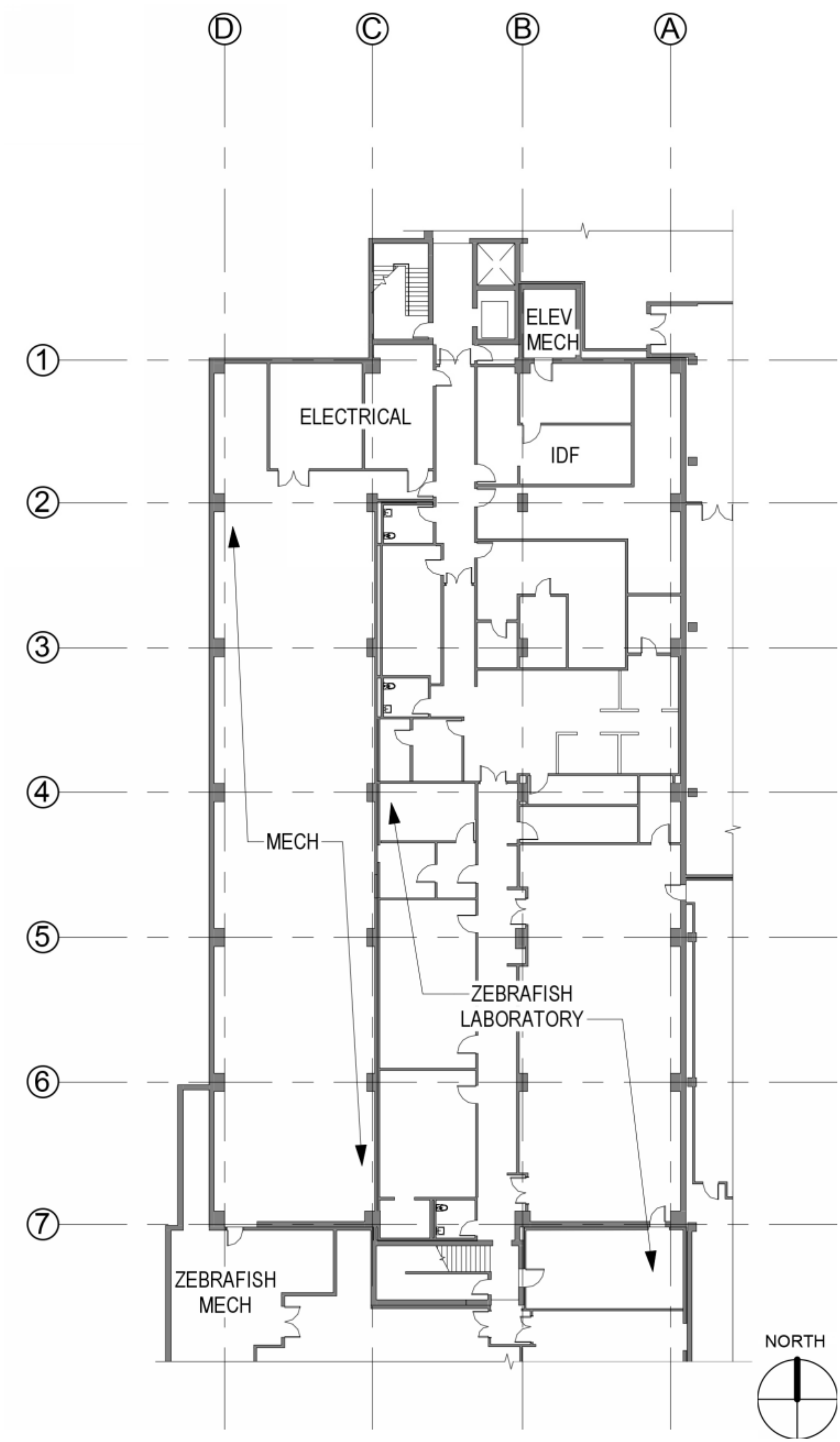
The corridor finishes are gypsum/plaster walls, vinyl tile flooring, and a somewhat tall ceiling finished with gypsum board and lay-in acoustical tile. The corridor is illuminated by utilitarian fluorescent fixtures, directed up and masked by dated wood fascia boards offset from the walls with metal brackets. Tack boards, display cases (mostly unused), and electrical panels are also installed on the walls.

CLASSROOMS

The laboratory classrooms are simple in design. They are comprised of dated casework, tall built-in workstation islands, and storage cabinets. The utilities in each lab include a couple of laboratory sinks, and air and gas turrets dispersed around the rooms. The classroom finishes include gypsum/plaster wall finish, wood veneer casework with epoxy tops, vinyl tile flooring, and acoustical lay-in ceiling tile. Most classrooms have some connection to the outdoors through rhythmically placed tall, thin windows punched in the exterior walls. The first floor exterior walls are setback from the building façade above, so a majority of daylight is blocked from entering the space by the overhanging structure above.

COMMON SPACES

The only common spaces on the first floor are the foyers with their benches. The spaces are sometimes used by students waiting for their classes to start.



EXISTING BASEMENT PLAN

SECOND AND THIRD FLOORS

SECOND FLOOR CORRIDOR

CIRCULATION

The circulation pattern on the second and third floors differs from that on the first floor, each consisting of a continuous corridor looping around internal core spaces. The looping corridor connects with the north and south stair towers, and also has an intermediate connection in the building's center. The corridors are approximately 6' wide; however, structural columns project into the corridor at regular intervals limiting the clear width to approximately 4'-6" where they occur. In addition, tall storage cabinets, freezers, mail stations, and other building amenities have been positioned between the structural columns. The net result is a narrow corridor that feels enclosed. The corridor ceilings are cluttered with ductwork, mechanical units, a cable tray, electrical bus duct, and piping.

Under the current fire & life safety code the corridor is required to possess a 1-hour fire-resistive rating; however, when the building was constructed this requirement didn't exist. Many remodels throughout the building's life have resulted in a mixture of fire-rated corridor construction and unrated corridor construction.

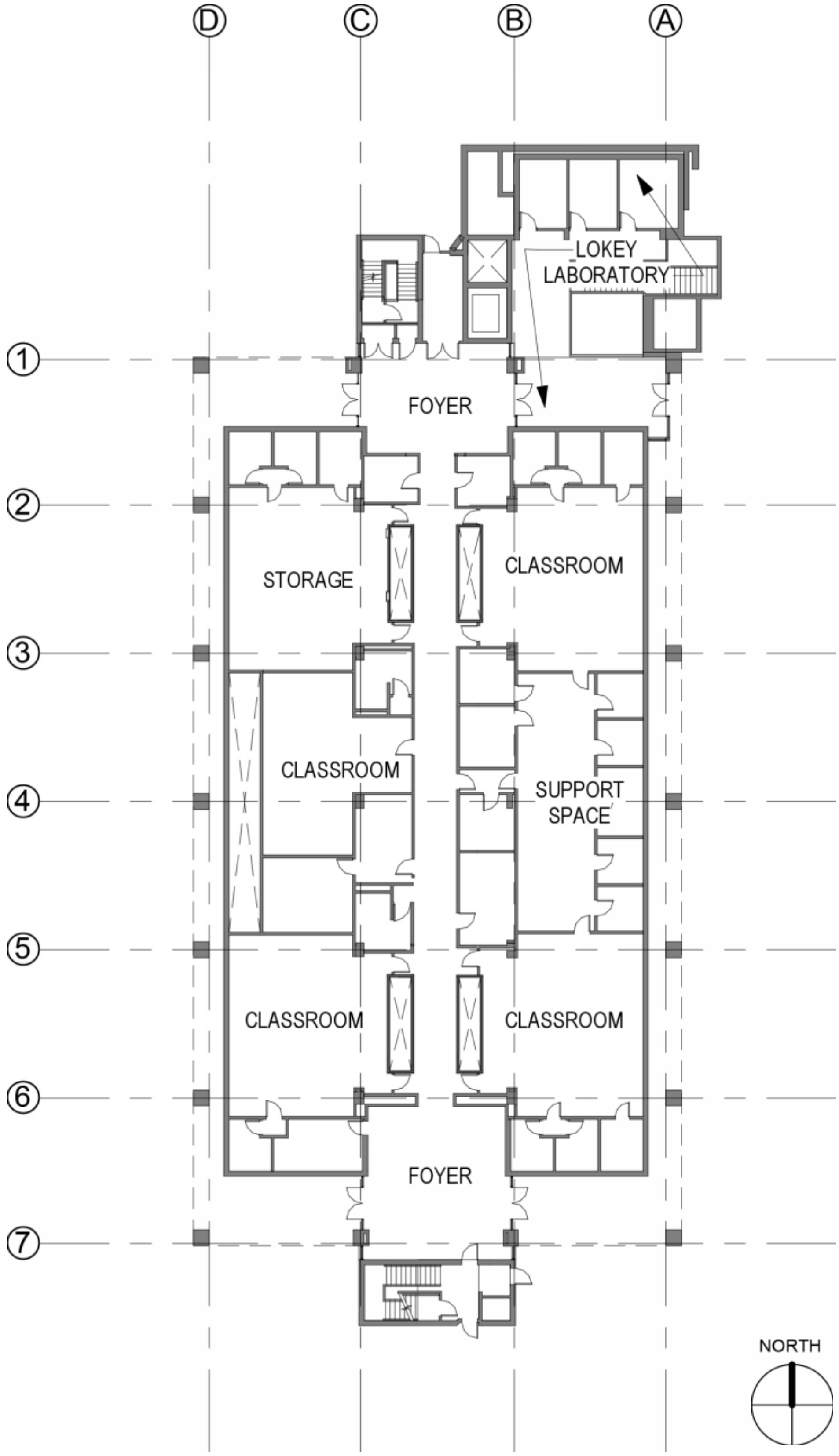
RESEARCH LABORATORIES

RESEARCH LABORATORIES

The research laboratories are organized along the east and west perimeter walls, and occasionally spill into the internal core. The research laboratories have various configurations throughout the building, but all are generally comprised of tall workbench islands/peninsulas with storage above in the center of the space surrounded by offices, researchers' desks, and built-in casework. In all laboratories, it is apparent storage space doesn't meet the storage demand, as research equipment, binders, and files overflow the shelves and cabinets.

The finishes include vinyl asbestos floor tile, dated wood veneer casework, epoxy tops, and open ceilings. The open ceilings are filled with mechanical units, ductwork, and piping. Sinks, electrical plug strips, air turrets, and gas turrets are also distributed around the space.

Two laboratories have recently been renovated, and will mostly be left untouched during any imminent building remodeling project. Another one of the laboratory spaces is being utilized as an office suite. It is assumed this office suite will be relocated to another building when the building is overhauled.



EXISTING FIRST FLOOR PLAN

SECOND FLOOR MEETING ROOM

MEETING ROOMS

There are two dedicated meeting rooms in Huestis Hall, which are located in the center of the building's internal core, on both the second and third floors. An intermediate corridor connection includes a central lounge area. This intermediate connection acts as a central node within the building.

The second floor meeting room is multi-use. It serves as a kitchenette, dining area, break room, and meeting area. This multi-use meeting room also has a direct connection to the informal lounge directly outside the space. This connection is through a large pass-through opening above the kitchenette countertop. The pass-though is flanked on each side by a single wood door leading to the central lounge space. These two spaces have recently been upgraded with new luxury vinyl flooring, paint, and casework.

THIRD FLOOR CONFERENCE ROOM

On the third floor the meeting room acts as a formal conference room. The room includes a large central table with tall bookshelves lining the walls. A headwall with marker boards and projection screen occupies one end of the room. The finishes in the space include gypsum/plaster wall finish, out-of-date carpeting, and a floating cloud ceiling.

The informal central lounges on the second and third floor are sandwiched between the corridors, and have an open ceiling with perimeter fluorescent lighting concealed behind dated wood fascia boards offset from the wall with brackets (similar to the lighting in the first floor corridor). The lounges include seating, printers, drinking fountains, and a coffee bar. Over time the lounges have become dated and compromised by the addition of laboratory support equipment, such as printers and freezers. Recently the University has made effort to reclaim and update the second floor central lounge.

THIRD FLOOR LOUNGE

SUPPORT SPACES

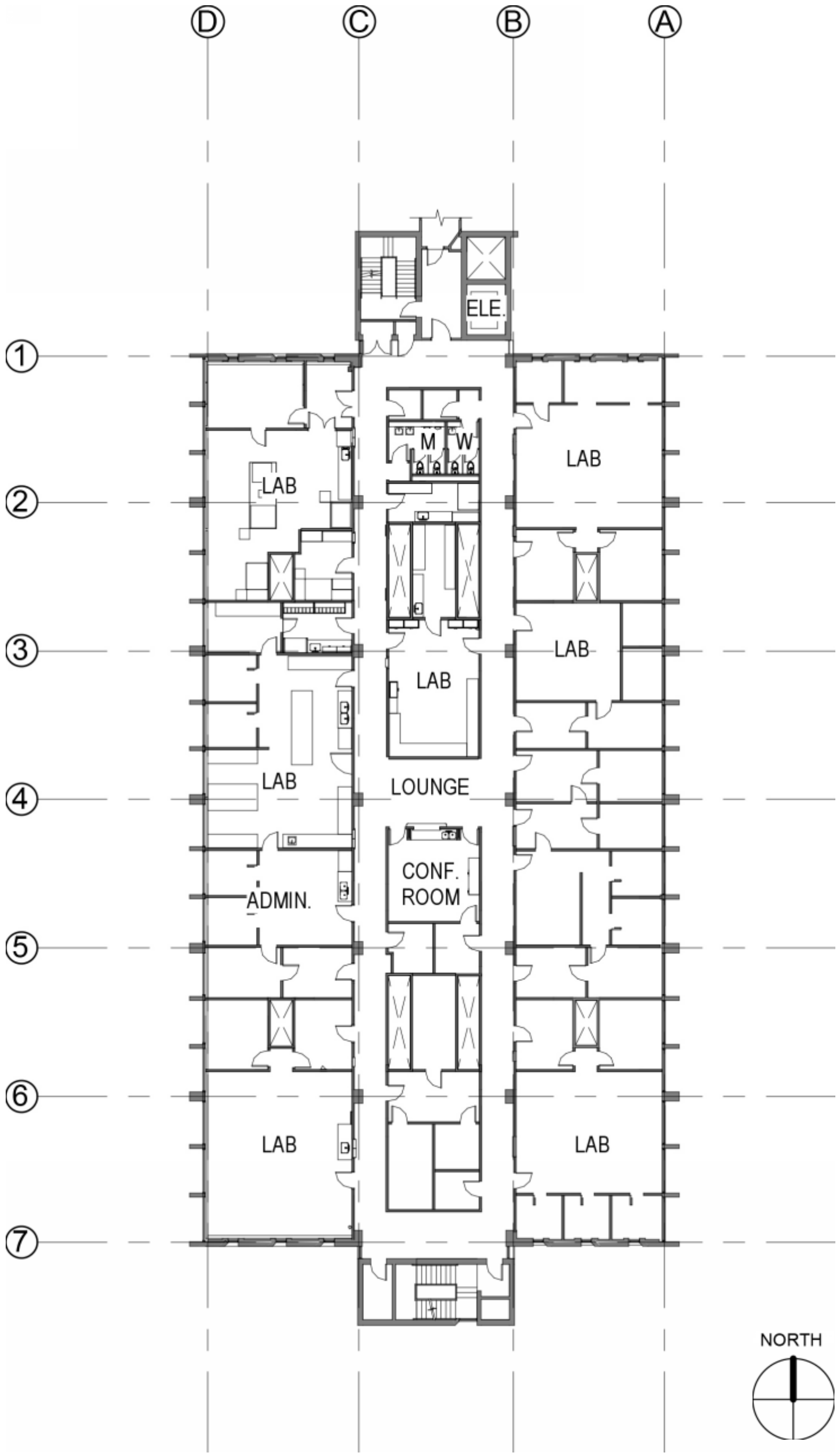
Support spaces, in general, are located within the core of the building.

A number of rooms located in the internal core had been utilized as environmental chambers for research purposes. The environmental chambers were controlled environments, fully enclosed by wood-framed walls, lined with sheet metal, insulated, and finished with fiberglass panels. The floors in the environmental chambers consist of topping slabs with a layer of insulation sandwiched between the topping and the floor structures below. These chambers are no longer in use and are slowly being remodeled into support and research spaces. The remodels are not easy as mechanical units tend to be installed above the ceiling and the topping slabs need to be demolished and replaced.

A necessary mail area is currently located at the second floor corridor. The mail station is comprised of over 100 mail slots that serve students and faculty. The mail station adds clutter to the corridor, and is proposed to be relocated during the building remodel.

MAIL STATION

Printers are often utilized by researchers and are necessary on both the second and third floor. It's apparent the printers haven't had a dedicated home as they have taken over some of the informal lounge space in the center of the building.   Recently, a print room has been dedicated on the second floor, but the printer on the third floor remains in the central lounge.



EXISTING SECOND FLOOR PLAN

RESTROOMS

Floors 1 through 3 each include a pair of restrooms, one for men and one for women. The restrooms are rather small, include tile finishes, wall-hung lavatories, wall hung-water closets, and ceiling-hung toilet partitions. They are not ADA-compliant. The restrooms will need to be reconfigured as part of any building renovation.

STAIRS

Fire-rated stair towers bookend the building at the north and south sides. The north stairs allow for uncontrolled connection to all floors, and have a secure access point to the roof. The south stairs provide uncontrolled connection to floors 1 through 3, have a controlled connection to the roof, and provide for egress-only at the basement. The egress-only arrangement at the basement is required due to the level of security required for the Zebra Fish Lab.

The stairs are monolithic concrete. The flights are open to one another with the exception of demising walls separating the stairs to the basement. Simple steel tube guardrails project from the stairs at the side, and non-code-compliant handrails are located on one side. The north stair tower is slightly different from the south stair tower, as a concrete wall projects above the First floor stair flight at the north stair. This concrete wall has a round cutout, which likely was intended for aesthetic interest and provides a visual connection.

BUILDING ACCESSIBILITY

Huestis Hall doesn't meet today's accessibility standards. The circulation paths through and to the building are of adequate width, and an elevator serves all floors; however, the lab and common spaces offer few accommodations for alternatively-abled persons. For example, the counters exceed maximum allowable heights, rooms lack adequate circulation and turning spaces, fume hoods and other lab equipment do not meet accessibility height and reach range requirements, handles throughout fail to comply because they require firm grasping and/or turning, and obstacles encroach on door approach clearances.

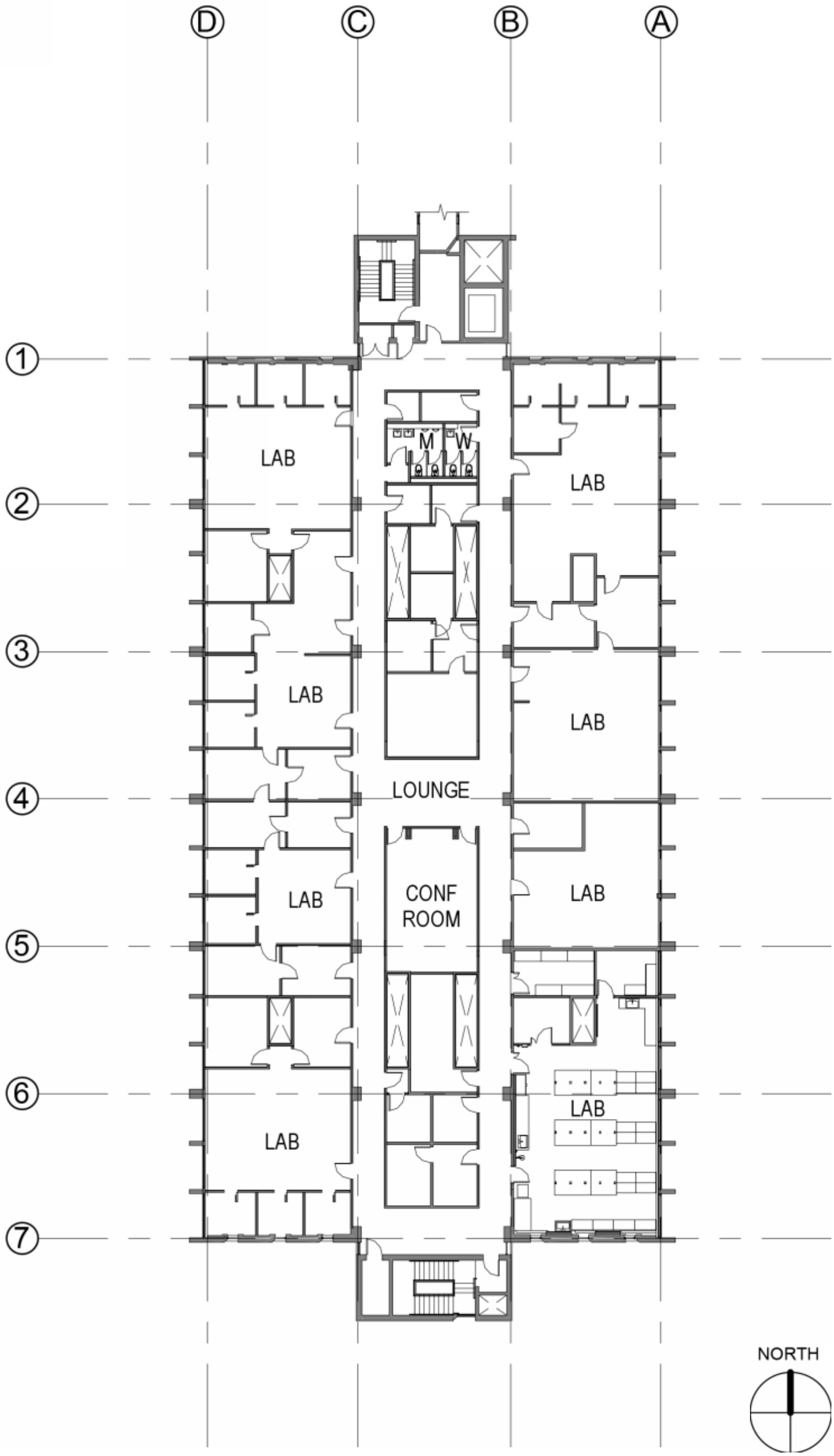
BUILDING SECURITY

The building is equipped with minimal security. The entry doors allow open access throughout the day and a few security cameras are located in the corridors. The doors to laboratories and offices are lockable. Alarms, access-controlled spaces, and improved surveillance will be proposed in the building remodel.

BUILDING WAYFINDING

The building provides few wayfinding cues. Rooms are numbered, with small placards at each entry door, floors are labeled within the stair towers at each floor landing, and signage is present to help locate other laboratory buildings connected to Huestis Hall; however, Huestis Hall would greatly benefit from improved signage and space identity.

STAIR TOWERS



EXISTING THIRD FLOOR PLAN

2f. FACILITIES ANALYSIS: ASBESTOS-CONTAINING MATERIALS BY THE UNIVERSITY OF OREGON

The University of Oregon conducted a preliminary asbestos assessment to determine the extent of asbestos-containing materials within Huestis Hall. The inspections were limited to accessible areas of the building, and were based on past sample data or presumed based on the judgement of the field personnel. The assessment concluded that the following materials contain asbestos:

- 12x12 floor tiles and mastic
- Cement-asbestos fume hood ducts and rope seals
- Tank insulation
- Duct joint tape
- Lab table tops
- Remnant fireproofing
- Rope seals
- Cement-asbestos board
- Waterprooing on sub-grade exterior walls

Items found to be not containing asbestos are as follows:

- Brick mortar
- Elastomeric paint on concrete

This assessment was not a comprehensive asbestos survey, and one must be conducted prior to the renovation work within the building. The comprehensive survey shall include all materials not previously tested, including recently installed building materials. Please refer to the Appendix Section 4b for a the complete Preliminary Asbestos Assessment.

2g. FACILITIES ANALYSIS: BUILDING ENVELOPE BY SODERSTROM ARCHITECTS, LTD

Huestis Hall is a rectilinear three story masonry building oriented with the long dimension north south. The exposed structural frame is cast-in-place concrete with wall infill panels of brick veneer and concrete. Both the north and south facades have full height monolithic brick stair towers flanked by brick infill panels, while the east and west facades have more glazing (recessed) and precast concrete infill panels.

ROOFING

Huestis Hall has a large dead flat main roof area with a concrete roof deck, very poor drainage and poorly located roof drains. The perimeter parapet is a low wide concrete coping with no waterproof covering. Attached to the inside face of this parapet is an aging metal railing of insufficient height for a guardrail. Penthouses are clad with brick veneer and metal wall panels.

The main roof area (Area A) has multiple mechanical units, ducts, and pipes installed above the roof. The concrete roof structural deck was originally designed as a future floor to accomodate a vertical expansion. The concrete structural columns are designed for the loads of future floors and protrude through the roof deck. The roof deck is flat with minimal vertical dimensions at parapets, to weeps at cavity flashings, and door jambs. There are two roof drains centered north and south in the roof. These factors limit the slope that can be achieved if the roof is restructured to provide adequate drainage.

Roof Area A was reroofed in 2007. Given the extent of above-roof deck equipment and limits on restructuring slope, the area was reroofed with a fluid applied membrane that turned up the concrete parapet wall and terminated approximately 8" above the roof deck. New 2 ½ inch concrete ballasted rigid insulation boards are installed above the roof membrane (approximate R = 12).

Leakage associated with the roof edge is evident. This water infiltration appears to be associated with infiltration through joints of the precast concrete parapet/cornice and absorption through the concrete. Membrane failure at the roof deck and cornice caused by differential building movement along with poor drainage may also be contributing to the leakage.

The parapets and rails protecting this area are not tall enough to meet the OSHA regulation for fall protection (42"). Fall control anchors have been installed at locations where microwave antennas have been installed at the roof edge, and maintenance of this equipment will require fall protection for safe access. The remaining roof edge fails to meet regulation.

Roof Area B has two large exhaust hoods concealed by an architectural metal panel screen. There are no noted issues with roof area B. This roof area drains to a single roof drain. It is recommended that this roof drainage remain as is and the area be reroofed at the same time as Area A.

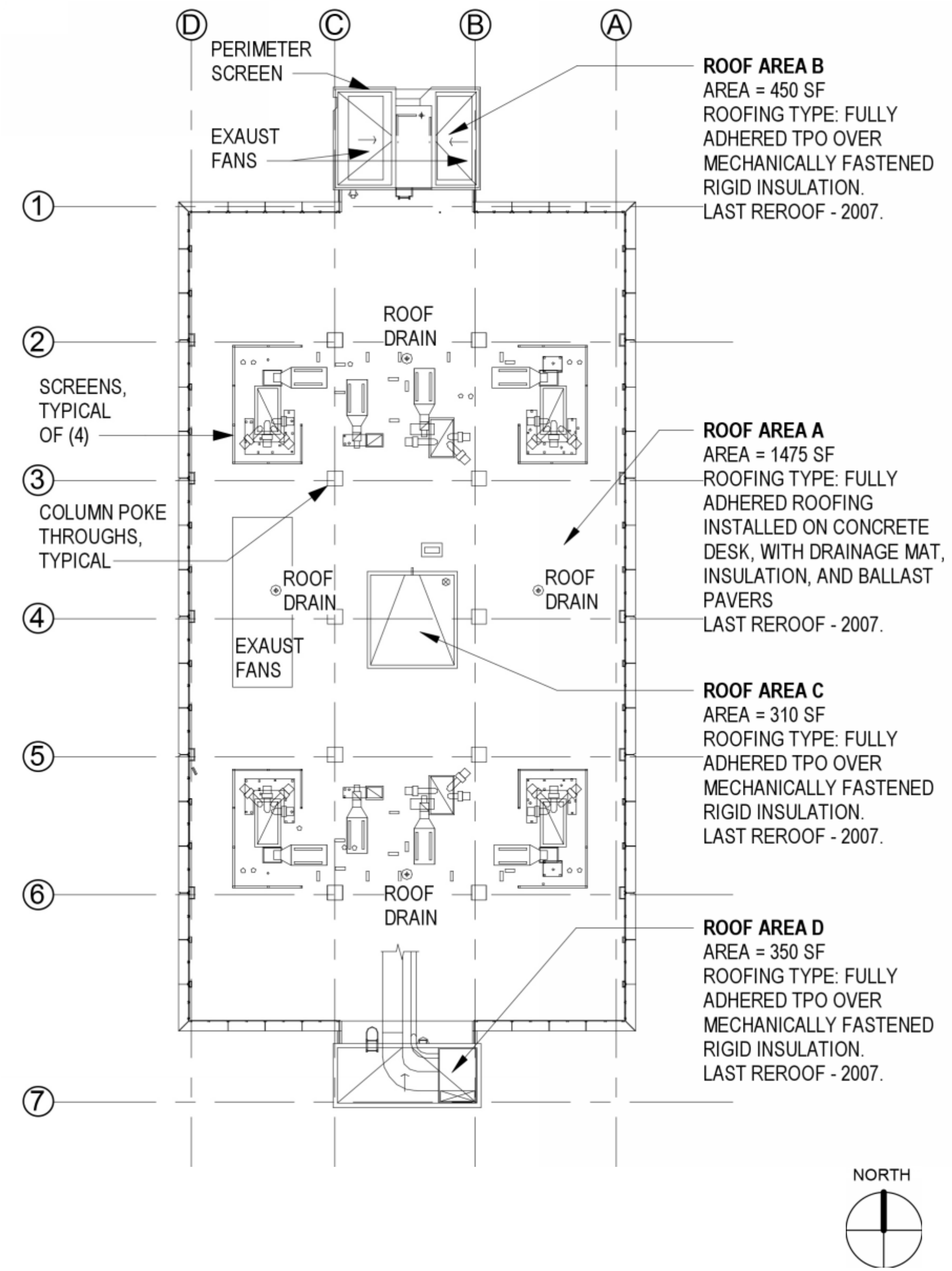
Roof Area C is the roof for a small rooftop electrical / mechanical equipment room. There are no noted issues with roof area C. This area drains directly to a leader box and downspout to Area A.

There are no noted issues with roof areas D. There is a large duct penetration of an above-deck duct coming from Roof Area A. It is recommended that this area's drainage be left as it currently is and that it be reroofed at the same time as Area A.

Existing Guardrail

Existing Precast Parapet

Existing Roof Drain



EXISTING ROOF PLAN

EXISTING ROOF FROM SOUTH STAIR TOWER

SOUTHWEST ENTRY

NORTHWEST ENTRY

WEST FACADE

EXTERIOR WALLS AND SOFFITS

The structural concrete frame of Huestis is exposed at the second and third floor and roof beam lines. In addition to this structural concrete, the façade has exposed cast-in-place infill wall panels and precast wall panels, all coated with elastomeric membrane. A lot of this concrete is heavily marred with black stains running down from above.

Brick infill panels are located all around the building at the ground floor and at the north and south facades. All of these brick walls need to be cleaned, coated with water repellant, and have the perimeter joints resealed. A small portion of these brick walls require tuck-pointing.

These walls are not thermally insulated and do not meet the code requirements. Interior insulation will be required to meet the prescriptive code requirements for insulating mass walls.

There are exterior suspended Portland cement soffits at three of the four entries and at the east and west sides of the building where the second and third floor are projected past the ground floor. These soffits have minimal cracking, chips and other damage. Only minor repairs and new elastomeric coating are required

Exterior concrete mass walls lack insulation and are exposed to the interior of the building. This condition does not meet the current energy code. The prescriptive code requirement is R11.4 achieved with continuous insulation. Given the high percentage of glazed area relative to opaque walls, we recommended that an energy analysis of the building envelope, internal loads, and mechanical systems be performed to optimize exterior envelope insulation relative to the overall building performance.

WINDOWS AND DOORS

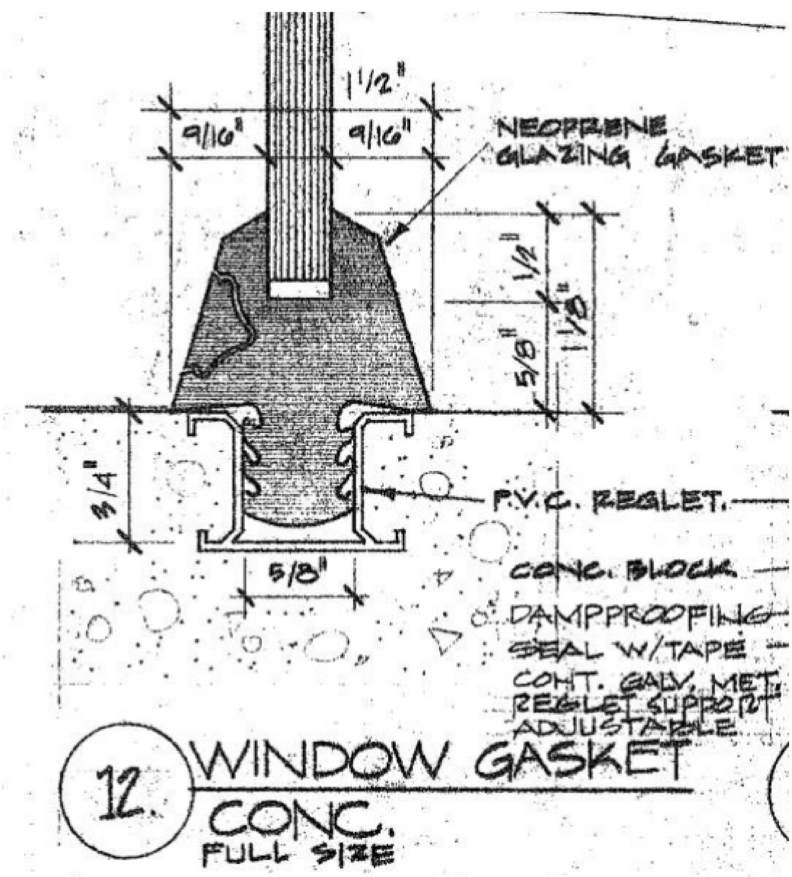
Huestis Hall has narrow slot single pane windows on the north and south facades and first floor of the east and west facades plus much larger windows on the second and third floors of the east and west facades. The glazing system of the original building is single paned widows with glazing gaskets set in aluminum u-channel frames. The exterior doors are hollow metal that are in need of replacement or at a minimum repainting.

The single pane float glass has performance rating below code requirements for commercial buildings. All openings are glazed with single pane of glass with and without vertical mullions. There are no noted failures or damage of the system. There are no noted areas of damage from water infiltration associated with the window system.

The minimum code requirements (Lane County Oregon – Climate Zone 4) for window systems is U-Value: .45 / SHGC: .40. The existing glazing system with single pane glass does not meet these requirements. Single pane glass windows (metal frame / non-tinted glass) typically provide U Value: > 1.0 / SHGC: >.60

Glazed Opening Area Summary (Existing)			
Elevation	Glazed Opening Area	Area of Elevation	% of Glazed Area
North	255 SF	4185 SF	6.1%
East	2795 SF	8050 SF	34.7%
West	2920 SF	8600 SF	34.0%
South	320 SF	3965 SF	8.1%
Total	6290 SF	24800 SF	25.4%

There are a small percentage of openings in areas of interior renovations that have been re-glazed with 1" double pained thermal units glazed into existing glazing channels with retrofit rubber glazing stops. These units are manufactured with non-tinted, non-coated float glass.



HUESTIS HALL EXISTING WINDOW DETAIL

2h. FACILITIES ANALYSIS: STRUCTURAL BY EQUILIBRIUM ENGINEERS, LLC

Huestis Hall is a 4 story cast-in-place concrete building with one level below grade and three levels above grade. The primary structure is comprised of a concrete columns supporting a cast-in-place concrete joist and girder system. The building was originally designed to accommodate 7 stories, but to-date only consists of 3 stories above grade. The overall structural design allows for a mostly open floor plate and fairly tall floor levels.

The lateral force resisting system in the building consists of reinforced concrete moment frames in both orthogonal directions. The frames occur on Grids A and D between Grids 2 and 6, Grids B and C between Grids 1 and 7, and on Grids 1 and 7 between Grids A and B as well as between Grids C and D. The moment frames terminate at the ground floor where they are tied to the perimeter basement wall.

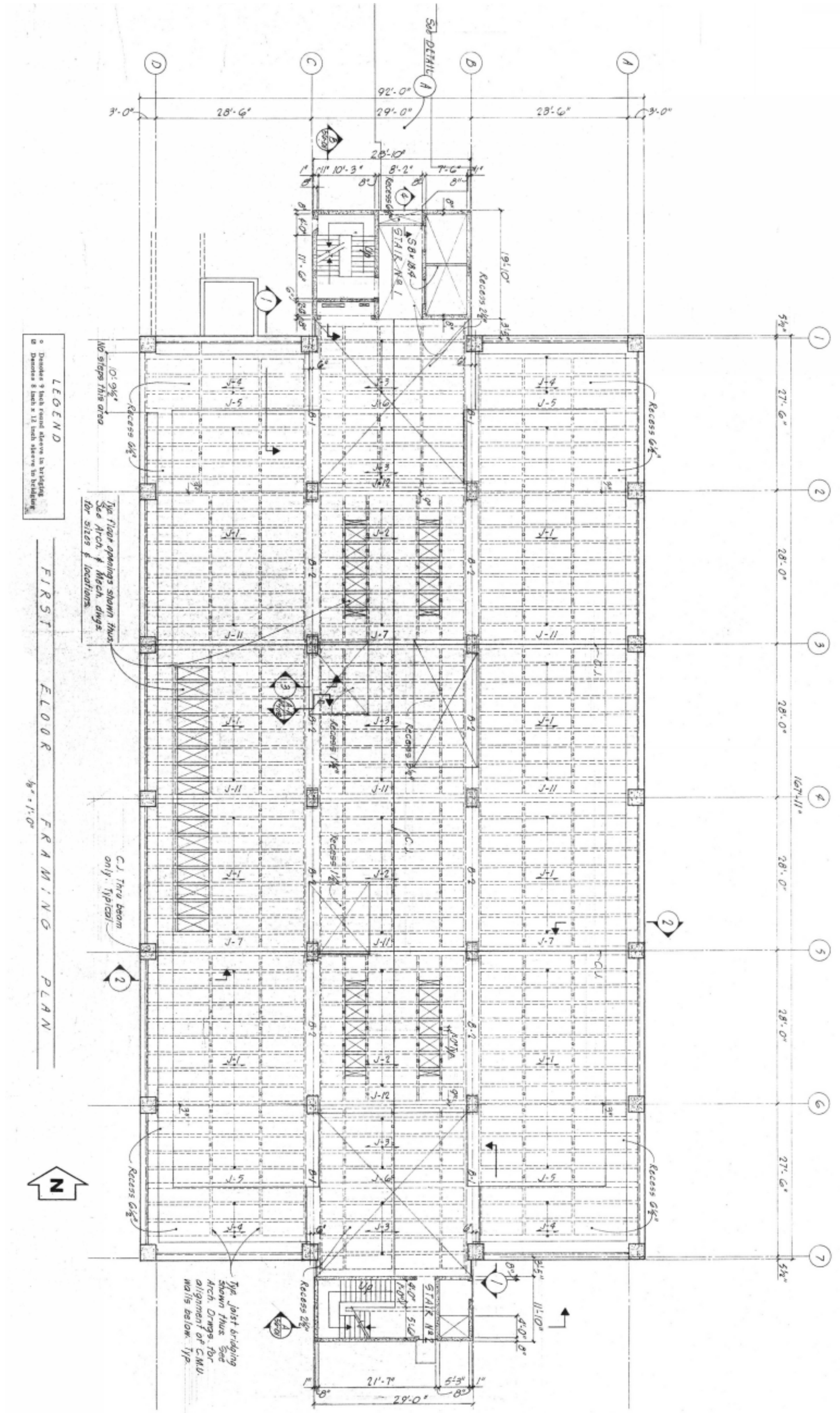
The moment frames on grids 1 and 7 are infilled with concrete wall piers above the second floor. This creates what is referred to as a stiffness irregularity, where upper floors are stiffer than lower floors. Buildings with this type of irregularity have been proven to perform poorly in earthquakes, and are prone to failure at the lower, “softer” level. Once the lower level fails, the support of the upper levels is lost, creating a significant collapse hazard.

The moment frames on Grids A through D appear to have adequate strength to resist anticipated seismic forces. However, the vertical reinforcing bars in the columns are not confined by reinforcing ties to the level required by current code. In past earthquakes, concrete frame columns that do not have closely spaced ties around the vertical reinforcing have sustained significant damage, and in some cases, lost their ability to support the weight of the building during the event. The lack of proper confinement of reinforcing in the Huestis Hall columns elevates the potential for significant damage and potential collapse of the building during a significant earthquake.

In addition to the evaluation of the primary structure, Equilibrium Engineers evaluated the seismic vulnerability of the building’s non-structural components, including suspended piping, ductwork, ceilings and lights, tall shelving, fall prone materials, hazardous substance containment, and heavy exterior veneer anchorage. The following deficiencies were identified:

- Breakable containers with acid and other lab chemicals are on open shelves and not protected from falling.
- Brick veneer does not appear to be anchored to the back up wall for out of plane forces
- Tall, narrow cabinets are not anchored or braced for seismic loads
- Fall prone contents are evident in most classrooms, with some being located adjacent to the doors into the corridor.
- Suspended ductwork and piping did not appear to have sufficient lateral bracing in all locations.

Lastly, Equilibrium Engineers was asked to assess the capacity of the existing roof structure to support the new penthouse and mechanical equipment that is being proposed as part of a building remodel study. According to sheet 51.02 of the original drawings, the existing roof was designed originally to serve as a floor with a live load capacity of 150 PSF.



HUESTIS HALL FIRE FLOOR STRUCTURAL FRAMING PLAN

2i. FACILITIES ANALYSIS: ELEVATOR
BY ELEVATOR CONSULTING SERVICES, INC

The elevator at Huestis Hall is a basement-set traction elevator with a capacity of 3,000 pounds and speed of 350 feet per minute. The elevator was originally installed in 1971 and received a partial upgrade in 2008. As part of the modernization, the original 1971 hoist machine was retained but received new thrust bearings, worm shaft bearings and sheave seals. The original DC motor and motor generator set was replaced with an AC variable frequency hoist motor. The brake was disassembled, cleaned and reassembled with new pins and brake linings. The original Montgomery relay logic controller was replaced with a new Motion Control Engineering controller. A new over-speed governor, tail sheave, governor ropes, hoist ropes, door operator, door rollers, interlocks, and roller guides were also provided as part of the 2008 upgrade. Other major components were retained and refurbished where required. The elevator equipment appears to be fairly well maintained and in its current condition and configuration should be expected to provide another 10-12 years of reliable service. A detailed report of the current elevator condition is provided in the appendix for further review.

ELEVATOR ENTRANCE

2j. FACILITIES ANALYSIS: HVAC
BY SYSTEMS WEST ENGINEERS, INC

Heating, ventilation, and air conditioning systems generally include heating water systems connected to campus steam, chilled water systems connected to campus chilled water, and air handling equipment.

Systems and equipment will be replaced with the exception of the following:

- Portions of the recently remodeled third floor Adam Miller Laboratory suite in Huestis Hall.
- The basement Zebrafish Laboratory
- The basement Lokey Laboratory

Following is a description of existing systems including the potential for reuse:

HYDRONIC PIPING

HEATING WATER SYSTEMS

Heating water systems serve three independent users, the original Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory. A description of each follows:

HUESTIS HALL

Central equipment for Huestis Hall is located in the basement. Heating water is provided through three distribution systems at different temperatures. One temperature is provided for the air handlers, the second for reheat coils, and the third for baseboard convectors. Each distribution system includes steam service from the campus distribution system, a single steam-to-water heat exchanger, redundant heating water pumps, and heating water distribution piping.

Existing heating water converters, pumps, and other equipment are past their expected service life, and related piping is not properly routed to match the proposed floor plan. Replacement of all equipment and piping will be required.

HOT WATER PUMPS

ZEBRAFISH LABORATORY

The large majority of the Zebrafish Laboratory space is served from a new heating water service installed as part of the Zebrafish Laboratory project. However, a portion of the north basement includes rooms supporting Zebrafish that have not upgraded and are currently served by the Huestis system. Systems serving these spaces will be replaced as part of the Huestis upgrade but will need to remain operational during the construction process. The new heating water service installed as part of the Zebrafish project is in good condition; however, only a single heat exchanger is installed and the system is not entirely redundant. Connection of the Zebrafish Laboratory to the new Huestis systems is recommended to provide additional redundancy, simplify mechanical systems, and reduce maintenance. The existing service will be removed.

LOKEY CHILLED WATER PUMPS

LOKEY LABORATORY

The Lokey Laboratory service originates in the Streisinger building mechanical room north of Huestis. Two steam-to-water converters are installed in Streisinger, and related heating water piping is routed through the campus tunnel system into the Huestis basement and then into the Lokey main fan room. Redundant heating water pumps are installed in the fan room. The Streisinger system is entirely independent of Huestis. Equipment serving the Lokey Laboratory is relatively new, appears to have appropriate redundancy, and can be reused.

ROOFTOP EXHAUST FANS

CHILLED WATER SYSTEMS

Chilled water systems also serve the same three independent users. Each service includes a fully redundant pumping system and piping connected to the campus chilled water system.

HUESTIS HALL

Existing chilled water pumps and equipment are past their expected service life and related piping is not properly routed to match the proposed floor plan. Replacement of all equipment and piping will be required.

ZEBRAFISH LABORATORY

New chilled water pumps and related piping and equipment was installed as part of the Zebrafish addition. The equipment is in good condition and suitable for reuse. However, connection of the Zebrafish Laboratory to the new Huestis systems is recommended to simplify mechanical systems and reduce maintenance. The existing service will be removed.

AIR HANDLING EQUIPMENT

The Huestis, Zebrafish, and Lokey facilities are each equipped with independent air supply and exhaust systems. Following is a description of each.

HUESTIS HALL

Huestis Hall is served by three (3) air handling systems. One serves the east exposure, one serves the west exposure, and the third serves the core. Each air handler has dual fans and air paths providing full redundancy. Runaround loop preheat coils were added as an energy conservation feature. Supply ductwork is routed up through vertical chases located in the building core. Exhaust ductwork is routed up in both the core and the exterior chases. Air handlers provide a constant amount of air to terminal reheat coils located throughout the building.

Originally, various fume hoods and general exhaust outlets were connected to a large number of rooftop exhaust fans. As part of an exhaust system upgrade, individual fume hood exhaust fans were removed and a single fume exhaust system was installed to serve all hoods. The original general exhaust fans remain.

While the single fume exhaust fan is in good condition and could be reused, the unit is undersized to serve the mixed-use exhaust approach that is planned and will not be reused. No other existing air handling and exhaust systems serving Huestis will be reused.

ZEBRAFISH LABORATORY

The Zebrafish Laboratory is served by independent, fully redundant air handling and exhaust systems with the exception of support spaces in the north part of the basement and two fume hoods which are connected to Huestis systems. The main air handling systems are in good condition and will be reused. The north basement supply air systems, general exhaust fans, and the Zebrafish Laboratory fume hood exhaust ductwork and fans will be replaced as part of the Huestis project. Both the north basement supply air systems and Zebrafish fume hoods will have to be kept operational during the construction project.

LOKEY LABORATORY

The Lokey Laboratory is served by independent, fully-redundant air handling and exhaust systems. The systems are in good condition and will remain.

2k. FACILITIES ANALYSIS: PLUMBING BY SYSTEMS WEST ENGINEERS, INC

Extensive upgrades to plumbing systems in Huestis Hall will be required, with the exception of the following:

- The recently remodeled third floor Adam Miller Laboratory suite
- The McCormick Laboratory suite on the second floor, which is currently under renovation
- The basement Zebrafish Laboratory
- The basement Lokey Laboratory

The existing piping, equipment and plumbing fixtures in these spaces are relatively new and in good condition, but main services to these spaces will be replaced as described in the remainder of this section.

The existing plumbing water, waste, and laboratory process services for Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory are described individually below with brief description of services that will be demolished and replaced. A discussion of which systems must remain in service for the Zebrafish Laboratory and/or the Lokey Laboratory is also included.

DOMESTIC COLD WATER

An existing water service supplies Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory.

HUESTIS HALL

The existing domestic water system in Huestis Hall is the primary water source for the Zebrafish Laboratory and the only domestic water source for the Lokey Laboratory. With the exception of the piping feeds to the Zebrafish and Lokey Laboratories, the existing domestic cold-water system will be replaced. Service from the basement of Huestis to the Zebrafish and Lokey Laboratories will need to be maintained with minimal interruption during the construction period.

ZEBRAFISH LABORATORY

The Zebrafish Laboratory's domestic water system is connected to the Huestis water service and does not have a backup domestic water source. The Zebrafish system is in good condition and will remain. The complete Zebrafish domestic water system must remain in service throughout upgrades to Huestis Hall.

LOKEY LABORATORY

The Lokey Laboratory's domestic water system is connected to the Huestis water service and does not have a backup source. The Lokey system is also in good condition and will need to remain in service throughout upgrades to Huestis Hall.

DOMESTIC HOT WATER

An existing domestic hot water system serves both Huestis Hall and the Zebrafish Laboratory, while the Lokey Laboratory has its own local domestic hot water system.

HUESTIS HALL AND THE ZEBRAFISH LABORATORY

An existing semi-instantaneous steam-to-water heater provides domestic hot water for both Huestis Hall and the Zebrafish Laboratory. The existing water heater and piping networks serving Huestis will not be reused. However, the hot water supply to the Zebrafish Laboratory must remain in service throughout upgrades to Huestis Hall.

LOKEY LABORATORY

Hot water is provided in the Lokey Laboratory by point-of-use water heaters at lavatories and sinks. The existing hot water system will remain in service and is not affected by work in Huestis Hall.

LABORATORY AND INDUSTRIAL COLD WATER

HUESTIS HALL

Laboratory spaces and equipment in Huestis are supplied with domestic cold water. There is no separate laboratory or industrial water system for Huestis Hall.

ZEBRAFISH LABORATORY

The Zebrafish Laboratory has a primary laboratory cold water source located in the south end of the Huestis basement, separate from the main Huestis service. There is also a laboratory cold water backup connection to the Huestis domestic cold-water system as well as a small industrial water system connected to the laboratory cold water system through a backflow preventer. The industrial water system only supplies a few fixtures.

The laboratory and industrial cold-water systems are in good condition and will remain.

The complete Zebrafish water systems must remain in service throughout upgrades to Huestis Hall.

LOKEY LABORATORY

The industrial cold-water system for Lokey Laboratory is supplied from Streisinger Hall and is routed through the basement of Huestis. The industrial cold-water system is in good condition and will remain in service. Since it is not connected to services in Huestis Hall, it will not be affected by work in Huestis.

LABORATORY AND INDUSTRIAL HOT WATER

HUESTIS HALL

There is no separate laboratory or industrial water system for Huestis Hall.

ZEBRAFISH LABORATORY

An existing semi-instantaneous steam-to-water heater provides laboratory hot water for the Zebrafish Laboratory. The steam water heater is redundantly supplied from an independent service located in the south end of the Huestis basement and a backup connection directly to the Huestis service. The hot water supply to Zebrafish must remain in service throughout upgrades to Huestis Hall.

LOKEY LABORATORY

Industrial hot water for the Lokey Laboratory is provided by supply and return connections to the service located in the Streisinger Hall mechanical room and is routed through the basement of Huestis. The industrial hot water system is in good condition and will remain in service. Since it is not connected to a service in Huestis Hall, it will not be affected by this project.

REVERSE OSMOSIS WATER

The Zebrafish Laboratory contains a complete Reverse Osmosis (RO) water filtration and treatment system that supplies RO water to Huestis Hall, the Zebrafish and Lokey Laboratories, and several other science buildings.

HUESTIS HALL

Huestis has an existing RO tank and distribution system supplied by the Zebrafish Laboratory RO system. The current system is not suitable for reuse and will be demolished and replaced.

ZEBRAFISH LABORATORY

The Zebrafish Laboratory RO system serves several science buildings in addition to the Zebrafish Laboratory itself. Feedwater for the RO system is supplied by the Zebrafish Laboratory cold-water system. The RO water supply to other buildings is delivered by booster pumps located in the Huestis basement mechanical room and distributed through the campus utility tunnels. This system will need to remain in operation throughout upgrades to Huestis, although portions of the connection to the campus supply will need to be relocated to facilitate other work in the basement. The necessary valves to isolate the booster pumping system are in place to accomplish this, but there does not appear to be a valve to isolate the campus supply from piping inside Huestis.

LOKEY LABORATORY

RO piping in the Lokey Laboratory is connected to the existing Huestis Hall system. RO piping inside Lokey will remain in operation throughout upgrades to Huestis Hall, but will need to be reconnected to the campus RO supply.

NON-POTABLE WATER

The Zebrafish Laboratory RO system produces a significant quantity of warm greywater, which is re-used to preheat incoming RO feedwater and then discharged to an existing storage tank in the basement of Huestis. The stored non-potable water is used for toilet flushing for the restrooms associated with the Zebrafish Laboratory. Make-up non-potable water is supplied to the storage tank by a connection to the Huestis domestic water service. This system will remain in service and will need to remain operational throughout upgrades to Huestis Hall. A temporary make-up water connection to the separate Zebrafish water supply will be necessary until the make-up water can be connected to the new Huestis water service.

SANITARY WASTE AND VENT

The sanitary waste and vent systems for Huestis Hall and the Zebrafish Laboratory are connected. The Lokey Laboratory's sanitary waste and vent piping is independent of Huestis.

HUESTIS HALL

The above-grade sanitary waste and vent system at Huestis Hall is not suitable for reuse. The basement sewage ejector pumps will be replaced, and the existing receiver basin will be refurbished.

ZEBRAFISH LABORATORY

The Zebrafish sanitary waste piping discharges to the existing Huestis sewage ejector receivers, and sanitary vent piping is connected to the Huestis sanitary vent system. The only fixtures in the Zebrafish Laboratory currently connected to the Huestis receivers are the water closets and lavatories in the basement restrooms. The existing restroom fixtures and sanitary piping will remain, but temporary restroom facilities will need to be provided while the Huestis sewage ejectors are replaced, the receiver basins refurbished, and sanitary vent piping connected to new Huestis sanitary vents.

LOKEY LABORATORY

The sanitary waste and vent systems in the Lokey Laboratory are completely independent of the Huestis Hall systems. The sewage ejector discharges to the Lokey acid waste piping system, while sanitary vent piping is connected to the Streisinger Hall sanitary vent system. The existing sanitary waste and vent are not affected by work in Huestis, and will remain in use throughout upgrades to Huestis Hall.

ACID WASTE AND VENT

Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory have separate acid waste systems. However, the Zebrafish Laboratory's acid vent system is connected to the Huestis system.

HUESTIS HALL

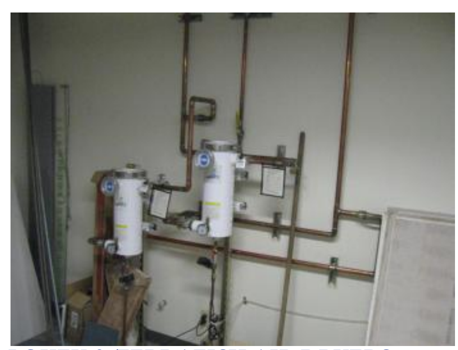
The Huestis Hall existing acid waste and vent system will not be reused.

ZEBRAFISH LABORATORY

The Zebrafish Laboratory has a dedicated acid waste sewage ejector which discharges to site sanitary waste. The acid vent piping from the laboratory connects to the Huestis acid vent system. Since the acid waste sewage ejector is an independent system, it can remain in service throughout the Huestis upgrades. The existing acid vent piping will need to be connected to new acid vent piping prior to complete demolition of the existing Huestis acid vent system.

ACID WASTE SEWAGE EJECTOR

LOKEY LAB VACUUM COMPRESSOR



LOKEY & ZEBRAFISH AIR DRYERS

RO STORAGE AND PUMP CONTROLS

LOKEY LABORATORY
The Lokey Laboratory is equipped with a dedicated acid waste ejector with no interconnection to the acid waste systems in Huestis or the Zebrafish Laboratory. The Lokey acid vent connects to the acid vent system in Streisinger Hall. The Lokey acid waste and vent systems will remain in operation throughout construction of Huestis upgrades.

STORM WATER
Huestis Hall and the Zebrafish Laboratory are served by a common storm water system, while the Lokey Laboratory is served by a stand-alone groundwater collection and discharge system.

HUESTIS HALL AND THE ZEBRAFISH LABORATORY
Huestis Hall has existing roof drains and storm water piping which are not suitable for reuse. Huestis and the Zebrafish Laboratory have a common groundwater collection and discharge system. The existing under-slab groundwater collection piping will remain in place for both Huestis and the Zebrafish Laboratory. The basement groundwater sump pumps in Huestis will be demolished and replaced, and the existing sump basin will be refurbished.

LOKEY LABORATORY
The Lokey Laboratory is equipped with groundwater collection piping and sump pumps with no interconnection to groundwater collection or storm water systems in Huestis or the Zebrafish Laboratory. The Lokey storm water system will remain in operation throughout Huestis upgrades.

COMPRESSED AIR
Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory are all served by the campus compressed air distribution system.

HUESTIS HALL
The existing compressed air system in Huestis Hall will be demolished and replaced. The campus piping supply from the utility tunnel currently does not have adequate shut-off provisions to allow compressed air piping and equipment in Huestis to be completely replaced without affecting other buildings. A temporary shutdown of the compressed air service to other buildings will be necessary to allow installation of the required isolation valves.

ZEBRAFISH LABORATORY AND THE LOKEY LABORATORY
Compressed air is supplied to both the Zebrafish Laboratory and the Lokey Laboratory by a connection to the Huestis system with separate air dryers for each laboratory. There does not appear to be a redundant compressed air service for the Zebrafish Laboratory. The compressed air system in both laboratories will need to remain operational throughout upgrades to Huestis Hall.

NATURAL GAS
Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory are all served by the campus natural gas distribution system.

HUESTIS HALL
The existing natural gas system in Huestis Hall will be demolished and replaced. The campus gas piping supply from the utility tunnel currently does not have adequate shut-off provisions to allow gas piping in Huestis to be replaced without affecting other buildings. A temporary shutdown of gas service to other buildings will be necessary to allow installation of the necessary isolation valves.

ZEBRAFISH LABORATORY
Natural gas is supplied to the Zebrafish Laboratory from the Huestis gas piping. There does not appear to be a redundant natural gas service for the Zebrafish Laboratory. The natural gas piping in the Zebrafish Laboratory will need to remain operational throughout upgrades to Huestis Hall, and will require a direct connection to the campus utility service to allow demolition and replacement of the Huestis service.

LOKEY LABORATORY
Natural gas is supplied to the Lokey Laboratory by a connection to the Huestis gas piping. Based on a discussion with the current laboratory director, the laboratory does not currently use natural gas. The existing natural gas service for the Lokey Laboratory can be interrupted as necessary and reconnected to the campus utility service prior to completion of the Huestis upgrades.

VACUUM

Existing vacuum compressors serve one laboratory suite on the third floor of Huestis Hall and the Lokey Laboratory.

HUESTIS HALL

A vacuum compressor was installed in 2017 in the mechanical penthouse to serve a laboratory suite on the third floor. The compressor is in like-new condition and will be reused.

LOKEY LABORATORY

A vacuum compressor located in the Huestis north basement Wet Mechanical Room 45 provides vacuum service for the Lokey Laboratory. The compressor serves only the Lokey Laboratory and must remain in service throughout upgrades to Huestis.

NITROGEN

An existing nitrogen supply from the utility tunnel at the northwest corner of the Huestis basement serves the Lokey Laboratory, with no connections to either Huestis Hall or the Zebrafish Laboratory. Upgrades to other services in Huestis Hall may require relocation of portions of the nitrogen service to the Lokey Laboratory, but there are necessary isolation valves to allow work on the nitrogen supply to Lokey without interruption of service to other buildings. Nitrogen service to Lokey can be interrupted for short periods, with nitrogen cylinders used as a backup source until the main service is restored.

2I. FACILITIES ANALYSIS: ELECTRICAL AND I.T. BY SYSTEMS WEST ENGINEERS, INC

MAIN DISTRIBUTION BOARD

BUS DUCT RISER

HUESTIS CABLE TRAY

The existing electrical, lighting, telecom, and fire alarm services for Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory are described individually below, with brief discussions of services that are to be demolished and replaced, and which systems must remain in service for the Zebrafish and Lokey Laboratories. Following is a description of systems including the potential for reuse.

ELECTRICAL MAIN SERVICES

There are two normal and one standby services supporting Huestis Hall and the Zebrafish and Lokey Laboratories as follows:

- Normal Service #1: Normal electrical service #1 is derived off the UO medium voltage Feeder 10. A 1500 KVA pad-mounted transformer is used to step down to the main building service voltage of 120/208V. The main distribution board is a 120/208V, 3ph, 4w 4000A and is located in the basement of Huestis Hall. The 4000A board feeds all the normal 120/208V panels in Huestis Hall, and the Zebrafish and Lokey Laboratories. The service was upgraded in 2008 as part of the Integrated Science Complex under Phase 1. The equipment is less than 10 years old and is able to support proposed renovations to Huestis.
- Normal Sevice #2: Normal electrical service #2 is derived off the UO medium voltage Feeder 4. A 750 KVA pad-mounted transformer is used to step down to the main building service voltage of 277/480V. The main distribution board is a 277/480, 3ph, 4w 1000A and is located in basement of Huestis Hall. This 480V services the normal power 277/480V panels and all the 480V mechanical loads and feeds all normal power to the ATS switches. The service was upgraded in 2008 as part of the Integrated Science Complex under Phase 1. The equipment is less than 10 years old and is able to support proposed renovations to Huestis.
- Standby Power Service: The standby service is derived off the UO standby feeder. A 750 KVA pad-mounted transformer is used to step down to the main building service voltage of 277/480V. The standby service is separated into Life Safety and Standby as required by NEC. The service was upgraded in 2008 as part of the Integrated Science Complex under Phase 1. The equipment is less than 10 years old and is able to support proposed renovations to Huestis Hall. The Zebrafish and Lokey Laboratories are fed from the main life safety service located in the basement of Huestis Hall.

HUESTIS HALL DISTRIBUTION SYSTEM

All normal power to Huestis first through third floors is derived off the 4000A, 120/208V main distribution board. Power to all existing normal panelboards is routed through a bus duct system. The bus duct system consists of two (2) 2000A, 120/208V and (2) 1000A, 120/208V bus ducts. The two (2) 2000-amp bus ducts are used to distribute power to the second and third floors and the penthouse. The bus duct runs along the east and west hallway of the second and third floor. All panelboards are fed from the bus duct via fused disconnect. The two (2) 1000-amp bus ducts are used to distribute power to the basement and first floor. The bus duct runs along the east and west hallway of the basement only. The majority of the panelboards in the Zebrafish Laboratory are fed from this bus duct. The penthouse on the roof houses an MCC and two panelboards to serve the mechanical loads located on the roof.

The existing bus duct distribution system will be removed. The existing panelboards are also original and will be replaced as part of the proposed renovation along with the existing MCC on the roof. The existing distribution system can be referenced on the attached One-Line Diagram – Demolition plan.

The existing bus duct in the basement will be removed. It presently feeds only three panelboards in the Zebrafish Laboratory.

A discussion of emergency power system follows:

- Life Safety: The life safety branch is used to serve all egress lighting, mechanical control panels, hood controls and fire alarm. All life safety circuits to the first through third floors are served from panel 2LS-1 located in the basement. Panel 2LS-1 is a 225 amp, 120V/208V and was installed as part of the work in 2008. The existing circuits serving the first through third floors will be removed for the proposed Huestis renovation. In addition, a new 480/277V panel was installed in 2013 to serve exhaust fan EF-2. The exhaust fan is used for the laboratory hoods which will need to remain operational during a power loss. The panel is served from the main life safety distribution board 4L1.
- Standby: There are two standby panels at each floor on the first through third floors. The feeder to the standby panels was relocated to panel 2S1 located in the basement. Panel 2S1 is a 400 amp 120/208V panel and was installed in 2008. The existing panelboards on the first through third floors are old and will be replaced as part of the Huestis renovation.

ZEBRAFISH LABORATORY

The existing panelboards feeding the Zebrafish Laboratory are fed from the same normal, life safety and standby distribution boards. However, it is fed off it's own breaker at each distributon board. The renovation of the first through third floors is not expected to impact the Zebrafish Laboratory since there is no new work necessary for the existing services, only for the local panelboards.

The Zebrafish Laboratory will experience minor disruption on three of their panelboards with the removal of the bus duct. Disruption is expected to be minor and less than a day.

LOKEY LABORATORY

The upgrade to the electrical distribution was done as part of the previous Lokey Laboratory project. The existing panelboards feeding the Lokey Laboratory are fed from the same normal, life safety and standby distribution boards. However, it is fed off it's own breaker at each distributon board. The renovation of the first through third floors is not expected to impact the Lokey Laboratory since there is no new work necessary for the existing services, only for the local panelboards.

LIGHTING

Most of the existing lights in Huestis are fluorescent except for the two (2) newly remodeled laboratories on the second and third floors. The lighting in most spaces is manually controlled, except for the recently remodeled laboratories, which have occupancy sensors.

COMMUNICATIONS

The main telcom room (MDF room) with all backbone cabling is located in the basement of Huestis Hall. The room was added as part of the electrical improvements in Huestis to support Huestis Hall and the Zebrafish and Lokey Laboratories. All horizontal Cat 5E cable installed in the Zebrafish and Lokey Laboratories is terminated in the main telecom room. There are no IDF rooms in the Zebrafish and Lokey Laboratories.

The horizontal cabling in the first through third floors of Huestis is distributed back to each floor's IDF room. Each floor has an IDF closet on the north side of the building. A ladder-type cable tray is located on each floor in the east and west hallway and is used to route all horizontal cabling into laboratory and office spaces. Conduit is typically routed from the cable tray into each space and to each device.

A renovation will require new cabling. The existing cable tray will be replaced to accommodate more space in the hallways for other systems.

FIRE ALARM

The existing fire alarm panel is located in the basement of Huestis Hall. The panel presently serves the Zebrafish and Lokey Laboratories. The panel is outdated and does not have enough capacity to serve the additional devices required on the first through third floors.

The existing floors do not meet Code, as the existing notification devices do not provide enough coverage.

2m. FACILITIES ANALYSIS: FIRE SUPPRESSION BY SYSTEMS WEST ENGINEERS, INC

FIRE RISER ACCESS

NORTH STAIR FIRE RISER

The existing fire suppression systems for Huestis Hall, the Zebrafish Laboratory, and the Lokey Laboratory are described individually below, with brief discussions of demolition and replacement scope and areas requiring coverage during the construction process.

HUESTIS HALL

Several aspects of the current fire suppression system do not meet current NFPA 13 requirements, as detailed in the "Existing Fire Protection System" memorandum from Systems West Engineers, dated May 3, 2017 and included in Appendix Section 4e.

Portions of the existing Huestis suppression system will be reused, including the basement and first through third floor zone stations and most of the main piping. Existing runout piping and sprinkler heads serving Huestis Hall, including the basement mechanical rooms, storage spaces, and laboratory spaces outside of the Zebrafish Laboratory, will be demolished and replaced. In addition, the existing fire riser will be demolished and relocated requiring a new fire service connection to new site fire piping.

ZEBRAFISH LABORATORY

A fire suppression system was provided for the Zebrafish Laboratory as part of the 2013 project, and is supplied from the existing Huestis fire service as a separate zone. The existing fire suppression system for the Zebrafish Laboratory will need to remain in service throughout the Huestis Hall upgrades.

LOKEY LABORATORY

A fire suppression system was provided for the Lokey Laboratory in 2007, and is supplied from the existing Huestis fire service as a separate zone. The existing fire suppression system for the Lokey Laboratory will need to remain in service throughout the Huestis Hall upgrades.

3. Renovation Master Plan

3a. GOALS AND PROGRAM

Huestis Hall's stout structure and strong connection to the outdoors, through its large expanses of glazing, offer a promising building future. Huestis Hall's future vision includes a full transformation from a dated and inadequate research laboratory into a top notch, "like new" research facility that will enhance research, connections, and collaboration.

GOALS

- Transform the dated 1970's building into a "like new" research facility.
- Fully comply with or exceed current building and energy standards.
- Provide clean, simple, typical layouts that accommodate flexibility and foster space familiarity.
- Design with sustainability in mind.
    - Select durable finishes and furnishings that have a long life expectancy.
    - Select local products.
    - Select products with low VOC's.
    - Select products from reputable manufactureres with "green" manufacturing processes and practices.
- Upgrade the mechanical systems to be redundant, efficient, effective, and controllable.
- Upgrade the electrical services in the building to better accommodate a changing environment and limit disruption.
- Upgrade the plumbing services to best accommodate a changing environment that limits disruption to the entire facility.
- Upgrade the building envelope to meet or exceed the current energy efficiency standards.
- Transform the dated interior environment to enhance functionality and increase its attractiveness.
- Provide contained support areas that are easily accessible from all parts of the building.
- Facilitate collaboration.
- Improve accessibility.

SUSTAINABILITY

Building energy-efficient laboratory facilities is not just about being "green." It is about providing high-performance facilities that are safe, healthy, and conducive to learning. It is also about building facilities that are cost-effective from their inception and in the long term. With careful planning, facilities and construction departments can build research buildings that encourage learning, reduce long-term operating costs, and lessen the effect on the environment while controlling up-front construction costs.

Green building practices offer an opportunity to create environmentally-sound and resource-efficient buildings by using an integrated approach to design. Green buildings promote resource conservation, including energy efficiency, renewable energy, and water conservation features; consider environmental impacts and waste minimization; create a healthy and comfortable environment; reduce operation and maintenance costs; and improve access to public transportation and other community infrastructure systems. Sustainable design considers the entire life-cycle of the building and its components.

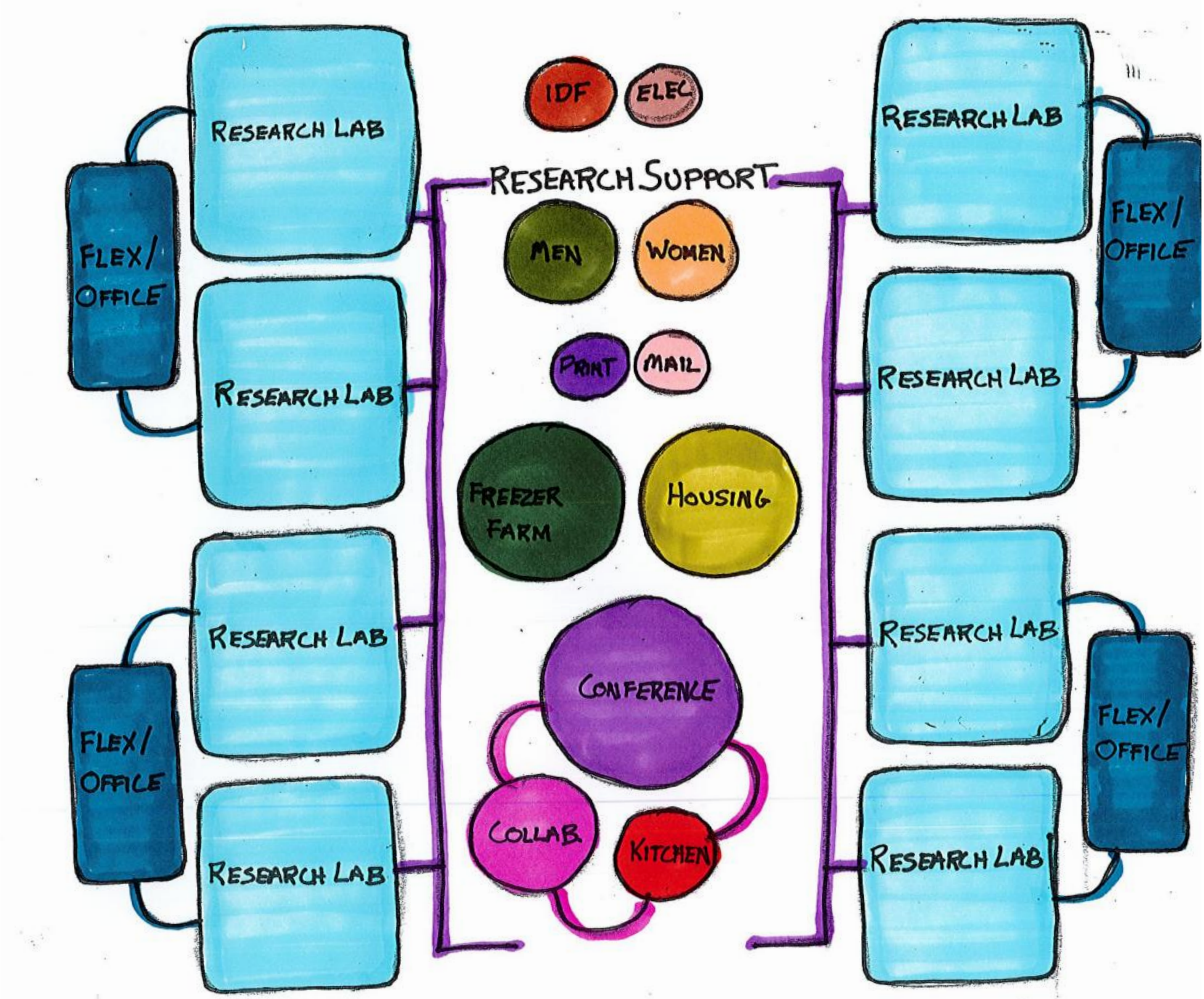
PROGRAM

The following spaces and adjacenies are anticipated for the Huestis Hall Remodel:

- Basement Reclaimed Space
  - Zebra Fish Quarantine Rooms
  - Autoclave Room / Media Kitchen

- First Floor should remain research classrooms with the ability to easily convert to research laboratories
  - Classrooms
  - Offices
  - Toilet rooms
  - Collaboration areas
  - Electrical Room

- Second and Third Floors
  - (8) Research Laboratories per floor
  - Conference spaces
  - Offices
  - Toilet Rooms, including single use, all-use toilet rooms
  - Electrical Room
  - IDF Room
  - Freezer Farm
  - Housing facility
  - Kitchenette
  - Printer Room (each floor)
  - Mail Room
  - Collaboration areas



CONCEPTUAL BUBBLE DIAGRAM WITH ADJACENCIES

3b. PROPOSED IMPROVEMENTS - INTERIOR ARCHITECTURE

The proposed interior renovation of Huestis Hall will involve demolishing of a majority of the dated laboratory spaces, rearranging and defining support spaces to better serve the users, creating a fresh environment that promotes collaborations and enhances research, and providing a superb work environment that meets the needs of all users. The proposed improvements will result in a "like new" building and will address the research needs of building users for years to come.

STANDARDS AND GUIDELINES

The following standards and codes have been utilized in the master planning of this design proposal:

- 2014 Oregon Structural Specialty Code
- ICC A117.1-2017 Accessible and Usable Builidng and Facilities
- Guide for the Care and Use of Laboratory Animals
- ANSI/AIHA Z9.5 2003 - Laboratory Ventilation Standard

BASEMENT

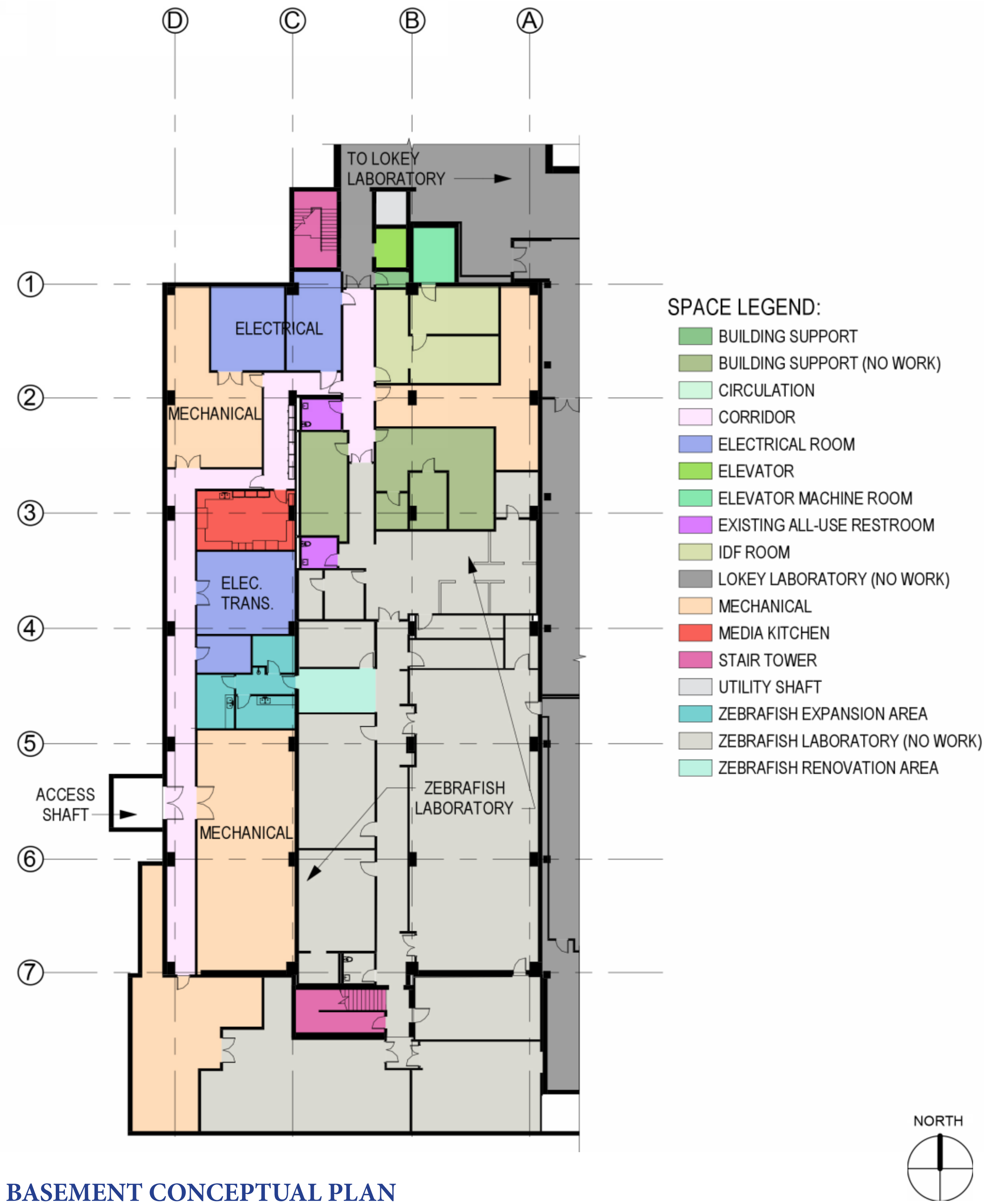
The proposed improvements to the basement include reclaiming a large chunk of floor space by the relocation of air handling units to the new rooftop penthouse. The relocation of the air handlers will free up approximately 1,400 square feet. The additional square footage was of high commodity, as was quickly claimed. Approximately 650 square feet will become an electrical transformer room and an electrical distribution board room. The remaining 750 square feet is slated for laboratory support purposes. The additional laboratory support space will be utilized for an expansion of the Zebrafish Laboratory Suite to accommodate quarantine rooms and a Media Kitchen to wash and sanitize laboratory equipment. Ideally the square footage of the new laboratory support space will increase once the design and layout of building's mechanical, plumbing, and electrical equipment is more refined. In addition, to the new laboratory support spaces, a secondary egress path is required by Code, and a new access shaft is proposed on the west side of the building to facilitate the removal and installation of new mechanical and plumbing systems. An existing access shaft is located at the north end of the building, but a previous electrical remodel has hindered the usability of the access shaft.

The proposed Zebrafish expansion necessitates remodeling a few rooms within the existing Zebrafish Laboratory to provide a direct connection to the new expansion area. The programmatic needs of the expansion area include a vestibule with emergency shower and eyewash, two quarantine rooms with a sink and floor drain, and a mechanical area to properly separate the plumbing services to the new quarantine rooms from the main plumbing services. The vestibule is required to provide the proper space pressurization and ensure the quarantine area doesn't contaminate the main laboratory.

The new Media Kitchen is designed to accommodate two medium autoclaves, three small autoclaves, multiple sinks, including one large deep sink, work surfaces, a fume hood, and plenty of storage for clean equipment. The finishes will include rubber sheet flooring, plastic laminate casework with stainless steel countertops, and wash-down rated walls and ceilings. Additional, space could be potentially reclaimed for the Media Kitchen, but a more in-depth study is required to determine exactly where

The existing configuration of the basement includes a short dead end corridor allowing access to the building support spaces and the secure Zebrafish Laboratory. This portion of the basement only provides one mean of egress. Once inside the Zebrafish Laboratory suite two means of egress are provided. In addition measures have been taken in the existing Huestis Hall mechanical room, on the west side of the building, to provide a secondary means of egress through the southern end of the Zebrafish Laboratory mechanical room to the south stair tower. However, this secondary means of egress is only limited to staff who have access to the Huestis Hall mechanical room, and is for emergencies only. Due to the addition of the Autoclave Suite a secondary means of egress must be provided for building users. This is accommodated through the existing Huestis Hall mechanical room southern emergency egress path, by a new hallway located along the west side of the building. Due to the security measures required in the Zebrafish Laboratory this new egress path should be only utilized for emergencies only, and the doors into and through the Zebrafish Laboratory should be alarmed.

To facilitate the removal and installation of the existing and new mechanical and plumbing equipment a new access shaft is proposed on the west side of the building, outside the building foot print. This new shaft will be approximately 12'x12' and be comprised of concrete retaining walls, with a concrete floor and drain, and capped with a metal grate. To access Huestis Hall new doors double doors should be cut into the existing foundation wall and a direct path though the new corridor should be provided to the mechanical room.



BASEMENT CONCEPTUAL PLAN

FIRST FLOOR

MAIN ENTRANCES AND FOYERS

Three of the four existing main entrances are proposed to be altered during the building renovation. The revisions are needed to address upon the existing seismic deficiencies of the building and the desire to give Huestis Hall a clearly identifiable main entrance to let people know how to enter the building, and make the building more welcoming to its users and visitors.

The new main entrance will be located at the south west corner of the building. The intent is to utilize the existing exterior covered space below the second and third floor overhang. This space is slated to be enclosed with a new storefront system that allows the new main entry doors to be reoriented to face directly onto the main pedestrian and vehicular way, East 13th Avenue. The new entry doors will be set back a few feet from the second and third floor overhang above to provide cover. The new entry will entail expanding the existing foyer. Upon entering the new doors, building users and visitors will be welcomed with signage installed on the existing brick veneer wall. A lounge area will be located to the west and the new interior space will spill into the existing foyer. The expanded foyer will be refinished with walk-off-mats, luxury vinyl flooring, and an updated ceiling with linear metal acoustic ceiling planks.

Other southern foyer upgrades will include improving the connections between the foyers and the stair towers and corridors. The improved connections between the foyer and stair tower including installing a door on a hold open and a new fire-rated window. Improved connections between the foyer and corridors include setting back the corridor walls to increase sight lines and help eliminate the tunnel feel.

The existing south east entrance of the building is proposed to be removed. A new seismic shear wall is proposed at the south end to connect the overhanging second and third floor to the basement foundation wall. In addition to the new seismic shear wall, a wall to the east will be constructed to enclose the exterior space reclaiming the space to be a new interior storage space.

Due to the infill of the existing exterior spaces covered by the second and third floor building overhang at the south end, the bike parking will need to be relocated.

The existing northwest entrance is proposed to be revised. The revisions include adding a new seismic shear wall at the north end to connect the overhanging second and third floor to the basement foundation wall. To eliminate an enclosed exterior walkway, the existing entrance doors will be relocated from being aligned with the stair tower to being at the outside west face of the second and third floor exterior walls. The relocation will result in entry doors similar to that at the new Lokey Laboratory entrance.

The existing north east entrance is intended to remain as currently configured with the Lokey Laboratory main entrance.

The north foyer upgrades include updating the finishes and ceiling with the finishes proposed for the southern foyer, and improving the connections between the foyer and the north stair tower and the corridor. The improved connections between the foyer and the stair tower include demolishing the existing IT closets, and the demising walls between the first floor and basement stairs to allow for double doors to be installed with hold opens, facing the foyer.

At the north end of the north foyer is a short hallway which provides access to the elevator, to the east, and the stair tower, to the west. This area is enclosed on both ends. At the south end is a fire rated wall and doors and at the north end is an exterior covered walkway providing a direct connection to Streisinger Hall. It is proposed that the fire-rated walls and doors be relocated to the north end, allowing the removal of the wall and doors to the south. At the west wall it is proposed that the stair tower entrance is relocated to the south, as outlined above, and a new fire rated glazed opening is installed, providing a new visual connection between the hallway and the stair tower. At the east wall modifications will be required to provide a wider elevator entrance door. New flooring and a linear metal panel ceiling with appropriate lighting should also be installed in this space to give it a fresh look.

CORRIDOR

Proposed improvements to the corridor include upgrading the sprinkler system to allow the corridor fire rating requirement to be eliminated. This will allow for glazing in the walls and doors, providing visual connections between the laboratory classrooms and the corridors. In addition to adding glazing in the walls, setbacks can be incorporated into the corridor walls between the utility shafts to define the entries to the classrooms and create breakout spaces for students use. The wall articulations will also improve sightlines and help eliminate the present tunnel-like feel. The proposed finishes for the reconfigured corridors include luxury vinyl flooring, linear metal acoustic ceiling planks, and custom metal panel clouds defining classroom entries and breakout spaces.

SOUTH FOYER

CLASSROOMS
The proposed improvements to the classrooms are to open up the interior floor plate, realign walls, and relocate the offices. The reconfiguration will result in five large and two medium sized open classrooms that could be redefined as research laboratories, if ever desired. The classroom configurations are simple with built-in counters and casework around the perimeter, a teaching headwall with instruction podium, and an open interior space that allows for modular furniture to be located wherever desired. Utilities and safety fixtures in each classroom include a fume hood, emergency shower and eyewash, and air/gas/vacuum turrets dispersed around the room.

To improve the connection from the classrooms to the outdoors includes removing a majority of the east and west infill walls and replacing them with full-height storefront.

The proposed finish improvements to the laboratory classrooms will include installing rubber sheet flooring, exposing the ceiling structure, and introducing some acoustical panels inside the space.

COMMON SPACES
The proposed renovation includes the addition of multiple small breakout spaces on the first floor. The breakout spaces vary from work and meeting tables to lounge spaces. The furniture in these spaces will be modern, complement the sleek finishes, and be enhanced by custom metal panel clouds floating above with ambient lighting.

SUPPORT SPACES
The proposed office locations supplement the layout of the classroom spaces, and provide a central location for a majority of the offices. The offices are proposed to be furnished with gypsum board walls, carpeting, and a simple 24"x24" lay-in acoustic ceiling tile.

SECOND AND THIRD FLOORS

CORRIDORS
The proposed improvements to the corridor include upgrading the sprinkler system to eliminate the corridor fire rating requirement. This change will allow for large expanses of glazing to be installed in the corridor walls, providing visual connections between the research laboratories and the corridors, as well as allowing connections between the outdoors and the corridors. In addition, the storage cabinets and building support elements (such as printers and freezers) will be relocated from the corridor to reduce clutter and provide a more open feel. The exposed ceiling space will be tidied up by removing a majority of the ductwork, piping, and other mechanical equipment.

The proposed new finishes and furnishings for the corridor include new luxury vinyl flooring, signage, display areas, and collaboration boards.

At the north end of the building is a short hallway which provides access to the Elevator, to the east, and the stair tower, to the west. This area is enclosed on both ends. At the south end is a fire rated wall and doors and at the north end is an entry door leading to an enclosed bridge providing a direct connection to Streisinger Hall. It is proposed that the fire-rated walls and doors be relocated to the north end, allowing the removal of the wall and doors to the south. At the west wall it is proposed that the stair tower entrance is relocated to the south, and a new fire rated glazed opening is installed, providing a new visual connection between the hallway and the stair tower. At the east wall modifications will be required to provide a wider elevator entrance door. New flooring and a linear metal panel ceiling with appropriate lighting should also be installed in this space to give it a fresh look.

RESEARCH LABORATORIES
The proposed redesign for the research laboratories targets the spaces along the east and west exterior walls. These spaces, with the exception of the newly remodeled labs, are slated to be gutted and reconfigured. The reconfiguration consists of equally dividing the spaces into four research laboratories per side, for a total of eight research laboratories per floor. The spaces between the external chases in the laboratory areas are designated as flex spaces that could accommodate offices or larger research spaces, depending on the needs of the researchers occupying the area.

The built-in elements of the research laboratories are intended to be typical, such that users will be familiar with the configuration of the laboratories, no matter which space they are in. The typical layout is simple in design and includes perimeter casework with storage, sinks, emergency fixtures, and one fume hood per lab. Mobile furniture including work benches can be configured to best suit the users' needs.

TYPICAL LABORATORY

The proposed finishes in the laboratories include rubber sheet flooring, plastic laminate casework, epoxy tops, and a few suspended acoustic ceiling panels. The ceilings will be opened to structure and the mechanical, plumbing, and electrical utilities will be organized in a neat, typical layout.

MEETING ROOMS

The meeting spaces proposed in this study include two private conference spaces and multiple informal spaces. The private conference spaces will remain in the same locations they are presently found because their central position is ideal. Although located in the same locations on the second and third floors, their proposed redesigns vary slightly to provide each conference space its own identity.

On the second floor the kitchenette will be removed from the meeting space, so the room will purely become a conference room. The entry doors to the meeting space will be relocated from the central lounge to the corridor, improving the functionality of the central lounge, and providing a better connection to the conference room to the corridors. The conference room is intended to be furnished with casework along the perimeter, luxury vinyl flooring, acoustic ceilings with custom metal accent clouds, and headwalls on opposing sides to promote flexibility, collaboration, and pin-up space.

The proposed changes to the second floor central lounge include a built-in coffee bar, lounge seating, and work table space. The elimination of the entry doors to the meeting room will help to better define the breakout space and provide more useable area. The proposed central lounge finishes include luxury vinyl flooring, a wall-mounted tv, wall-mounted collaboration boards, and custom metal ceiling clouds with acoustic backing.

On the third floor the meeting space will be redesigned into a transformable conference space that can be used as a formal conference room or opened up to the central lounge to form a larger meeting or collaboration space. This transformable connection will be achieved by the installation of a folding glass wall, creating a multipurpose space in the center of the building. The existing entry doors to the conference room will be relocated to the corridor, matching the proposed design on the second floor. The finishes in these spaces will also match the proposed second floor finishes, but feature a different color palette.

A few other informal lounge/meeting spaces have been located at the north and south ends of the corridor loop, at each floor. These lounges will be utilized as breakout spaces for researchers, and will be accented with custom metal ceiling clouds and ambient lighting.

SUPPORT SPACES

Support spaces throughout the building will be located in the internal core, assigned specific functions, and designed to best suit users' needs. The support spaces include the mail room, printer rooms, kitchenette, IDF room, electrical room, freezer farm, lactation room, and housing room.

<u>Second floor</u>

A combined mail room and printer room will be located on the second floor. This room will house a tall printer, a countertop printer, and mail slots for over 100 researchers and faculty. The mail/printer room will span between the two corridors, improving the circulation efficiency of the building. The finishes will be luxury vinyl flooring, and plastic laminate casework with solid surfacing countertop.

The housing room is proposed to be located at the southern end of the second floor. The security of this room is of high importance, access controls and security surveillance shall be provided. The housing room will consist of a vestibule, procedure room, and housing room. The vestibule is required to ensure the environment in the housing area meets AAALAC standards. All finishes in these rooms shall be wash-down rated.

THIRD FLOOR CORRIDOR AT CENTRAL LOUNGE

Third Floor

The kitchenette will be located on the third floor, with direct adjacencies to the conference room and central lounge. The kitchenette is linear in design and spans between the two corridors improving the circulation efficiency of the building. The space will accommodate a double sink, refrigerator, and dishwasher. The proposed finishes in the kitchen are luxury vinyl flooring, and plastic laminate cabinets with a solid surfacing countertop.

The proposed print room/storage will also span between the two corridors, improving the circulation efficiency of the building. The finishes of the generously sized print room will include luxury vinyl flooring, plastic laminate casework, and a solid surface countertop.

A freezer farm is proposed at the south end of the third floor. The freezer room is designed to accommodate at least 13 freezers, and has doors on each side opening to the flanking corridors, improving access from all laboratories.

A lactation room is proposed to be located on the third floor just outside of the women's restroom. This room will be furnished with a sink, plastic laminate casework with a solid surfacing countertop, carpet, and a suspended acoustic ceiling.

An electrical room and IDF room will be located on both the second and third floors, stacked in the same centralized location to best accommodate service routing.

RESTROOMS

The proposed remodel of the restrooms on each floor will involve enlarging the spaces to remove barriers to accessibility. The proposed finishes for the restrooms are mosaic floor tile, subway wall tile with accents, ceiling-suspended toilet partitions, and built-in lavatories with solid surfacing countertops.

The rearrangement of the first floor restrooms will include relocating the plumbing chase to accommodate larger toilet stalls. The proposed layout for the second and third floor restrooms retains the existing plumbing chase. Unblocked sightlines from the corridor will be limited to the lavatory areas only. The existing building's size constraints and the desirability of retaining the existing plumbing chase on the second and third floors preclude the complete elimination of sightlines into the restrooms.

In addition to the redesigned shared toilet rooms, an all-use toilet room (single person occupancy) will be located on the southern end of the internal core on both the second and third floors. The all-use toilet rooms provide privacy for users and also provide a toilet room option at the southern end of the building. The finishes proposed for the all-use toilet rooms are the same proposed for the shared restrooms.

STAIRS

The stair towers will be reused, updated, and modified to improve connections to adjacent spaces, meet code requirements, and improve aesthetics. The code required changes include replacement of the handrails and installation of new handrails on both sides of the stairs. The aesthetic changes include replacing the dated pipe guardrail system with a more modern custom steel guardrail system, adding rubber stair treads, and repainting.

In addition to finishes, improved connections between the foyers and elevator lobby are proposed. These improvements are outlined in the main entry and foyer section of this analysis.

BUILDING ACCESSIBILITY

Improved accessibility is a primary goal for the proposed redesign of Huestis Hall. Improvements will include newly renovated fully accessible shared and single use toilet restrooms, counters and sinks meeting accessibility standards in every space, proper door approach clearances, lab equipment and services within the required reach ranges, accessible handles, and fully accessible fume hoods.

BUILDING SECURITY

Laboratory building security is of high importance. Security is necessary to protect research, hazardous spaces, and is often necessary for grant funding. The following security measures should be incorporated into Huestis Hall during the building renovation:

ACCESS CONTROL

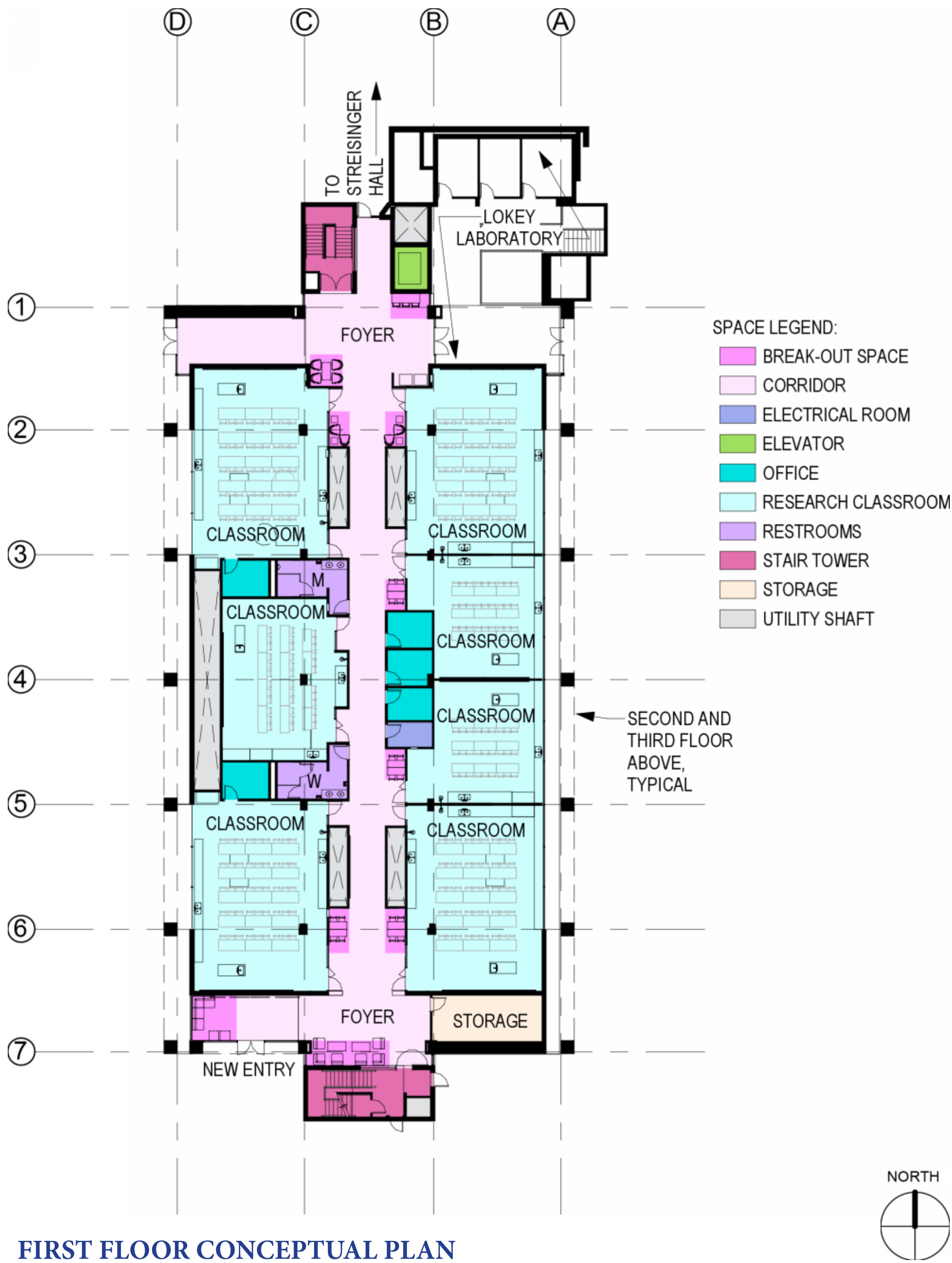
- Each research laboratory should be equipped with a card reader at the main laboratory entry door.
- All housing rooms, off public circulation should be equipped with a card reader, with dual authentication capabilities
- All freezer farms should be equipped with a card reader
- The AMAG system currently being used should remain
- A panel/controller is required for every 8 doors equipped with card readers. Each panel requires 42" of floor wall/floor space, and shall be mounted on plywood.

SECURITY

- CCTV shall be located at all the Lokey Laboratory, and Streisinger Hall connections.
- 1 Bosch panel per floor for IDF intrusion alerts. This is to accommodate hazardous spaces and requirements necessitated for grants, including motion detection, glass breaks, etc.
- Assume four cameras on both the second and third floor, covering circulation and stair connections.
- Assume six cameras at the ground level to cover building entries and 5' beyond the building
- CCTV storage will be on the UO network

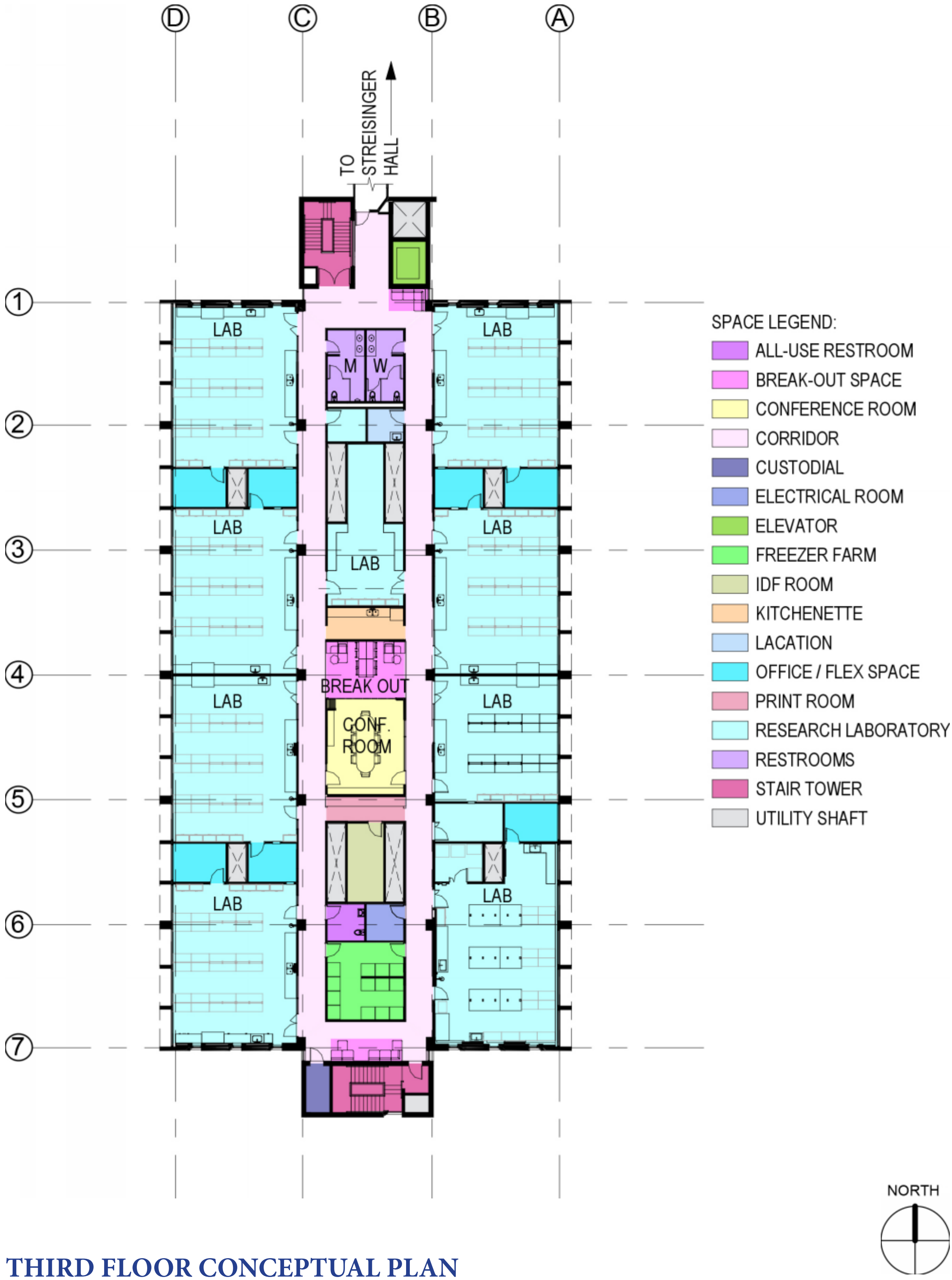
BUILDING WAYFINDING

Improving the wayfinding within the building will assist building users, identify spaces uses, and promote a cohesive building wide appearance. Improvements include main entrance graphics and signage, larger room placards that meet the University of Oregon standards, and signage locating conference rooms and support spaces.



FIRST FLOOR CONCEPTUAL PLAN

SECOND FLOOR CONCEPTUAL PLAN



THIRD FLOOR CONCEPTUAL PLAN

3c. PROPOSED IMPROVEMENTS - ENVELOPE
BY SODERSTROM ARCHITECTS LTD

ROOF

Because of construction type and complications with adequate drainage caused by a dead flat roof and roof drain locations, roof top mechanical equipment and ductwork, roof edge conditions, and weep holes it is recommended that a penthouse be constructed allowing the roof to be re-roofed in away to address current deficiencies. It is recommended that a penthouse be sized so to cover the majority of the building area and be roofed with its own drainage system that is independent of the roof area. This penthouse will clad with architectural metal siding to match similar penthouses on many of the adjacent buildings. The panel spacing and gray color will match the adjacent buildings. The new penthouse will have metal stud framed walls, metal siding and insulated with batt insulation.

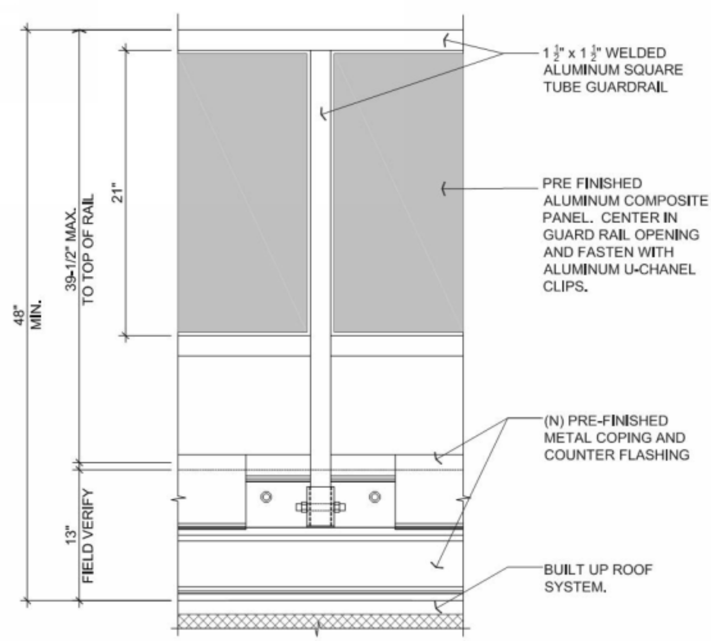
With a penthouse in place, the remaining Roof Area A can be properly restructured with rigid insulation to provide proper drainage. This will require the installation of 8 new roof drains at the perimeter of the building. The number of drains is driven by the maximum possible height of the tapered insulation without requiring modifications to the existing roof edge construction. The use of ridged insulation will increase the thermal performance of the building. It is recommended that a base layer of 2" insulation be used for conceptual design cost estimating. The optimal amount of insulation will need to be determined by detailed energy performance calculations.

A 3 ply SBS modified built-up roof membrane with a highly reflective LEED certified mineral cap sheet is recommended for all areas. This will be applied to an adhered cover board over adhered 2" polyiso rigid insulation base layer and tapered insulation to provide drainage. (The insulation for the penthouse can be mechanically fastened).

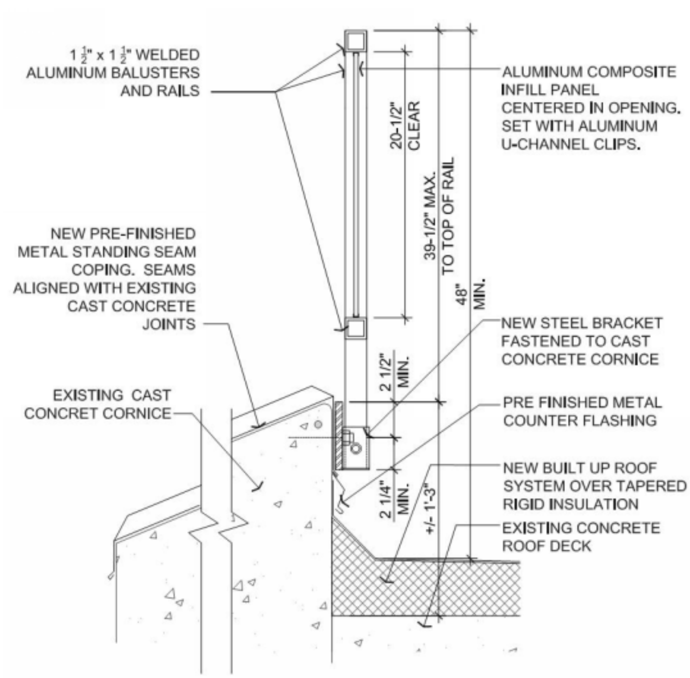
Roof area C will be removed when the equipment in the penthouse is incorporated into the new penthouse or elsewhere in the building. Roof areas B and D will be reroofed with the same roofing system. Roof area D will require a single fall protection anchor.

It is recommended that the perimeter metal panel rail system be replaced with a new min. 42" guard aluminum square tube guard rail that meets OSHA safety recommendation with an aluminum composite panel that preserves the architectural intent of the original rail. The below detail indicates the suggested guard rail construction. The rail system will be fastened to the interior face of the precast parapet.

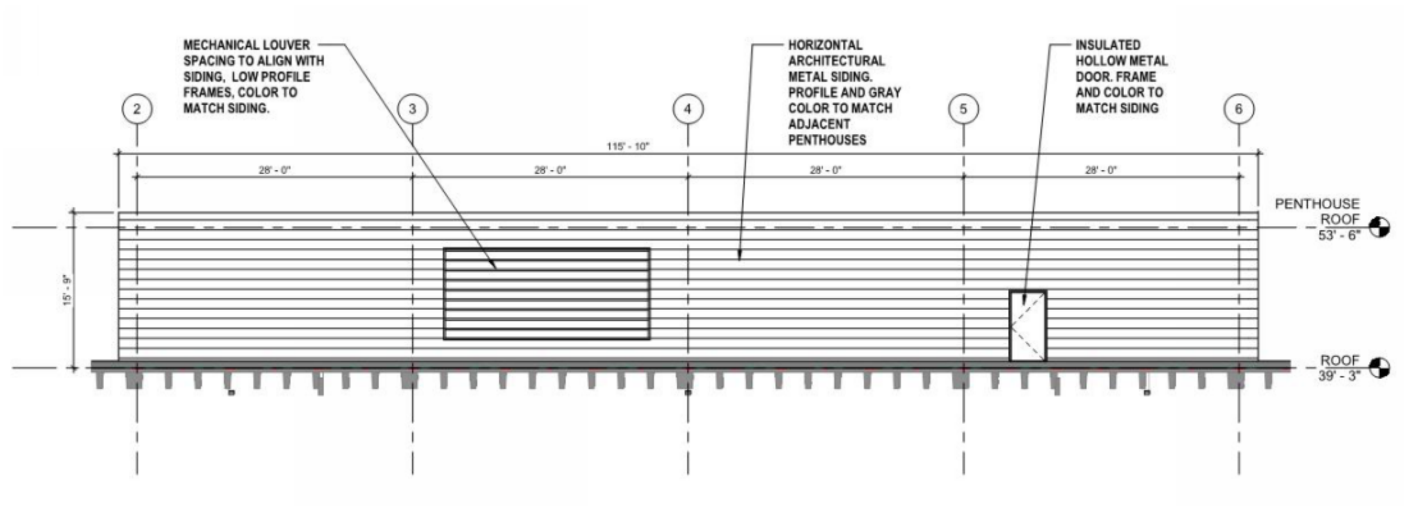
It is recommended the existing precast concrete parapet be covered with a pre-finished metal coping and metal wall paneling with counter flashing covering the roof membrane termination. The new guard rail will be installed after the installation of the sheet metal coping so through penetrations can be sealed with a non-hardening sealant.



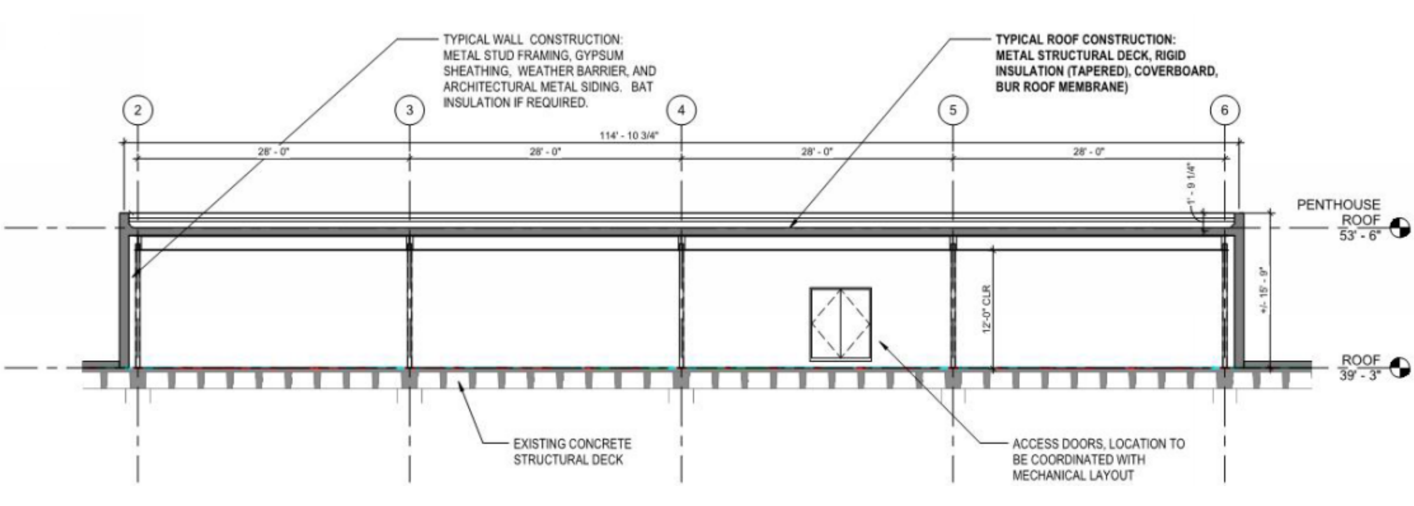
GUARDRAIL ELEVATION



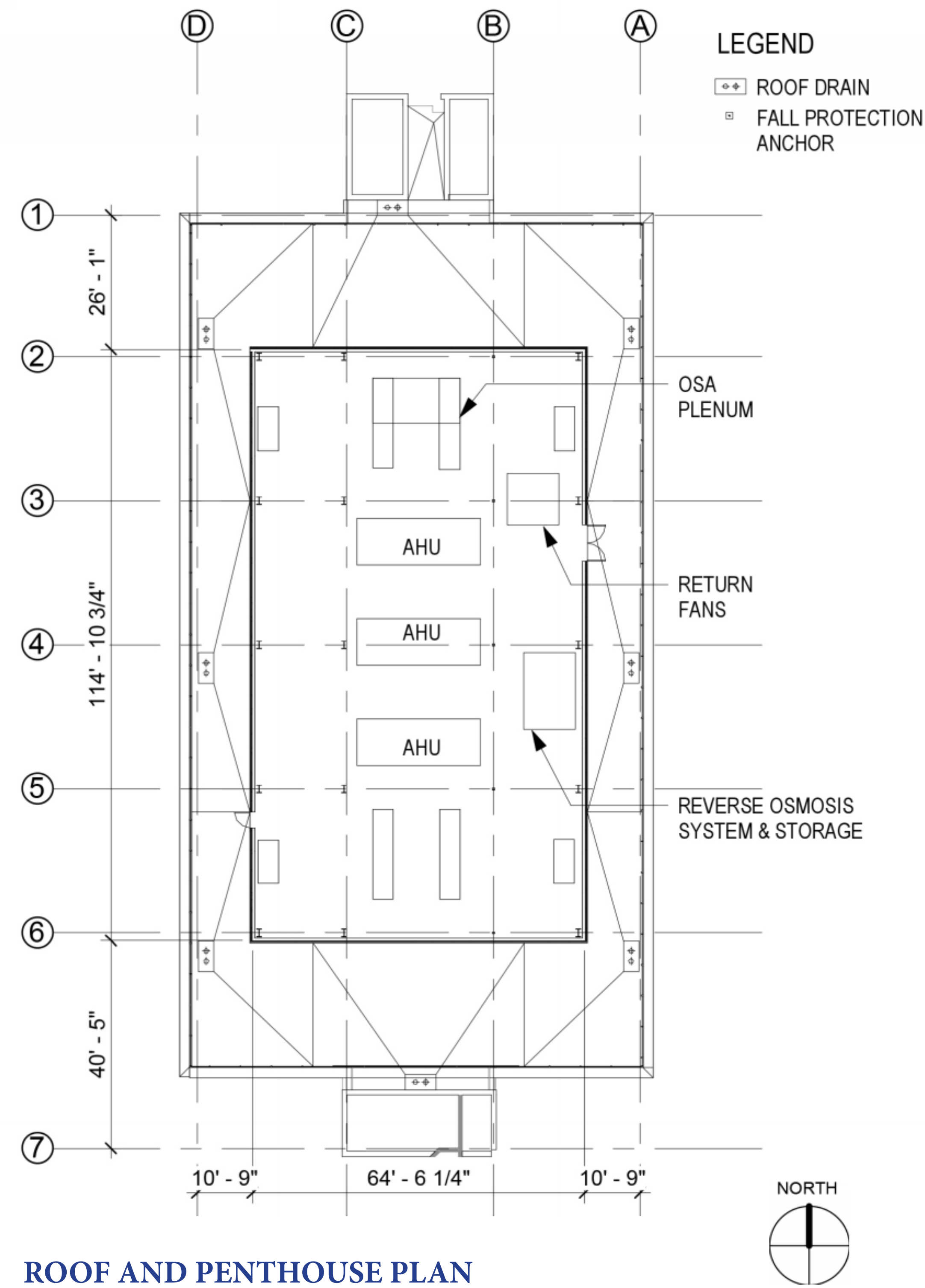
GUARDRAIL SECTION



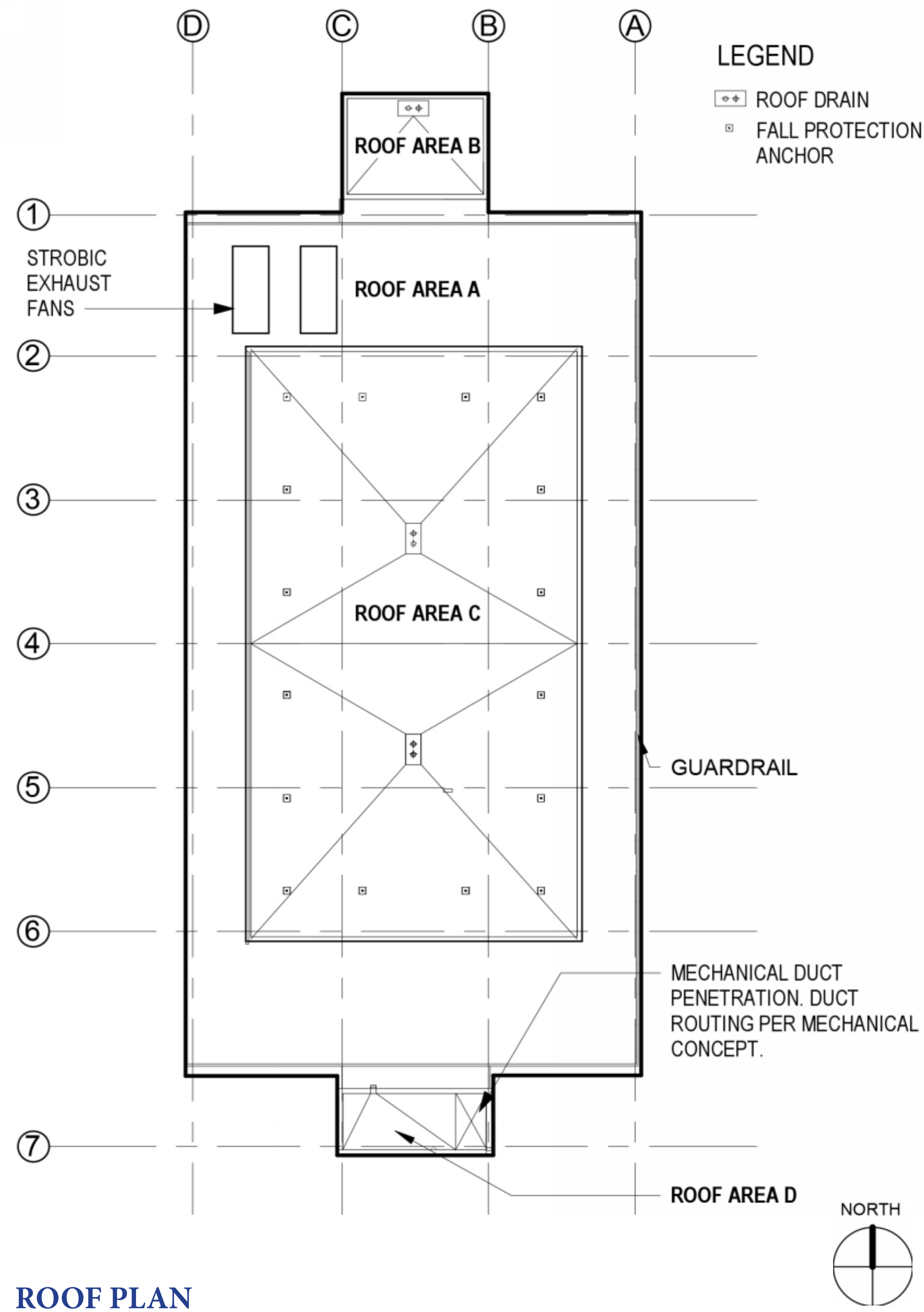
PENTHOUSE EXTERIOR ELEVATION



PENTHOUSE SECTION



ROOF AND PENTHOUSE PLAN


D
C
B
A
LEGEND
ROOF DRAIN
FALL PROTECTION ANCHOR
ROOF AREA B
1
STROBIC EXHAUST FANS
ROOF AREA A
2
3
ROOF AREA C
4
5
GUARDRAIL
6
MECHANICAL DUCT PENETRATION. DUCT ROUTING PER MECHANICAL CONCEPT.
7
ROOF AREA D
NORTH

ROOF PLAN

EXTERIOR WALLS

The immediate work will include:

- Cleaning, repointing (15% of mortar joints), re-seal caulk joints, apply clear breathable water repellant coating.
- Cleaning, prep and application of new elastomeric coating on all painted concrete surfaces.
- Cleaning and application of opaque elastomeric coating on all exposed cast and pre-cast concrete architectural elements.
- Repair of exterior soffits and new elastomeric coating

INSULATION OF EXTERIOR WALLS

Exterior concrete mass wall exposed to the interior of the building can be furred out and insulated. It is recommended that 2 1/2" metal stud framed walls be constructed at these locations with studs set a minimum of 1" away from concrete surfaces and then a minimum of 2" spray-applied open cell polyurethane foam insulation be installed in all cavities and behind studs. This application will provide a thermal break for the metal studs and insulation (approximate R-value: R-12) that will allow the concrete to breathe.

BUILDING STURCTURAL COLUMNS AND NEW SHEAR WALLS

The main structural columns exposed on the exterior of the building will be wrapped in an epoxy/carbon fiber fabric system. This system will have a lose fabric weave texture and gloss that will not match the adjacent elastomeric coated concrete components. It is recommended that these surfaces be skim coated with a polymer modified mortar with a smooth texture and then painted with an elastomeric coating to match adjacent concrete surfaces.

There are locations on the north and south facades where existing brick veneer will need to be removed to install the carbon fiber fabric. These bricks should be carefully removed and salvaged for reinstallation. All damaged bricks will need to be replaced with an identical match to the existing. It should be assumed that these bricks will need to be custom manufactured. (See elevations on the following page for locations.)

There are new concrete shear walls that will be installed at the east side of the south ground level entrance and the west side of the north ground level entrance. These concrete walls will be clad with brick veneer that is an identical match to the existing. (See elevations on the following page for locations.)

The second and third floor exterior wall on the north and south walls will require shotcrete reinforcement on the interior side of the wall. It is recommended that the new concrete be finished smooth and tapered into the existing window opening. The wall will then be insulated per recommendations above.

WINDOWS

In order for the energy performance of the glazed openings to meet the standards of the current energy code and University expectations, it is recommended that all glazed openings be re-glazed with new 1" thermal units with a minimum of Low-E coating on one interior glass face. Given that the existing glazing channels at the major structural columns will be covered with the resin/carbon fiber fabric system, it is recommended all window openings on the second and third floor be reglazed with a 2"x4" thermally broken aluminum storefront glazing system and the first floor be reglazed with a 2"X6" thermally broken aluminum storefront glazing system.

The glass color and additional coatings will need to be evaluated during design. The following glass unit type is recommended as a basis of design for preliminary planning and budget establishment.

1" Thermal Glazing Units with PPG Solarban 70XL (2) Solarbronze on outside and Clear on interior side
Performance Data: U Value: .28/.26, SHGC . 21, VT 40%

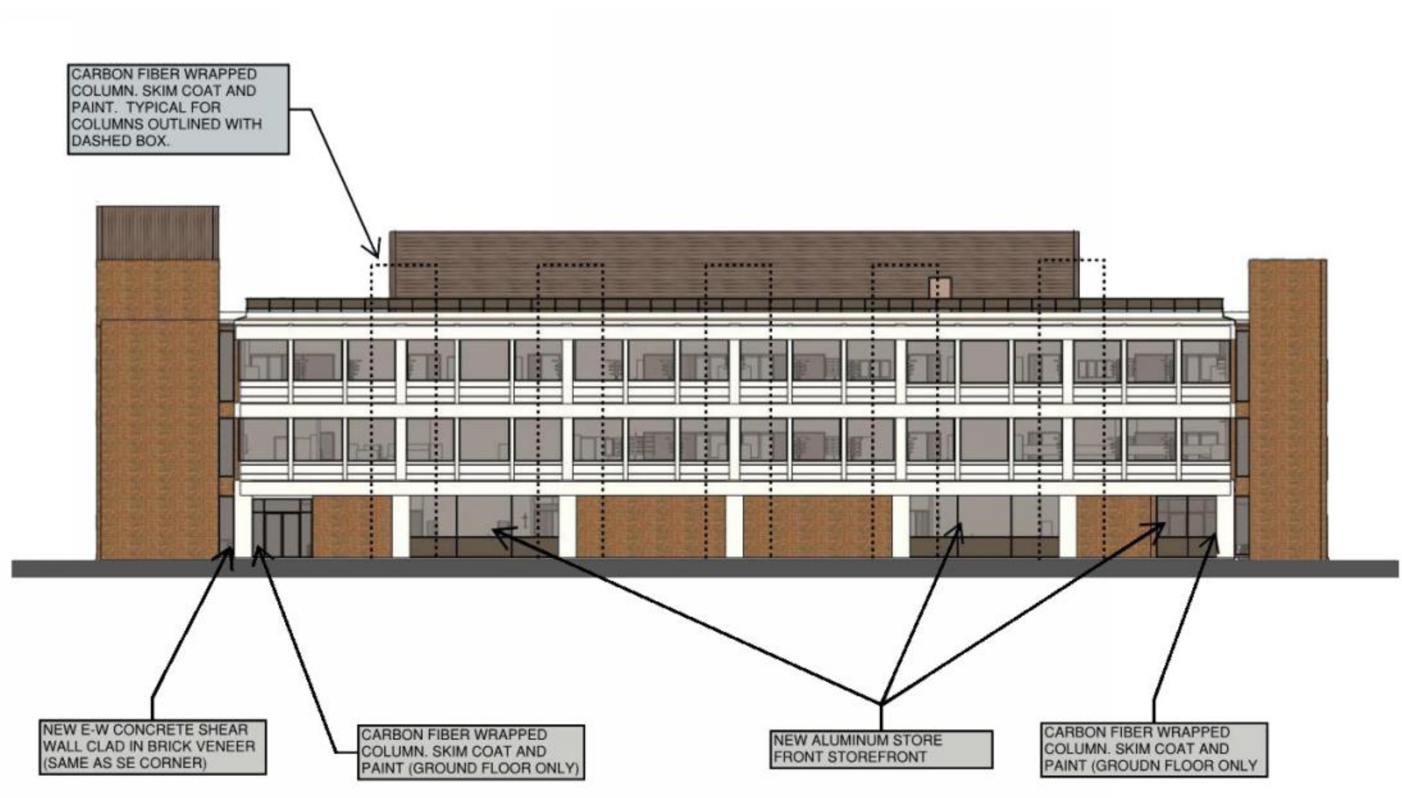
The design of the first floor has multiple narrow glazed openings between the columns at each structural bay. The University of Oregon has a desire to increase the size of these opening. It is recommended that the masonry/concrete wall infill between the narrow glazed openings on the ground floor of the east and west elevation be removed and replaced with a 2"x6" thermally broken aluminum storefront glazing system.

It is recommended that all hollow metal doors be replaced with new insulated factory finished galvanized metal doors. These door and frame assemblies will exceed the code minimum of U=.7.

SOUTHWEST ENTRY

The southwest entry of the building will be modified so that the entry doors to a glass enclosed vestibule will face south and create an understandable entry facing the fronting street and main pedestrian walk. This entry component will be constructed with 2"X6" thermally broken aluminum storefront glazing systems. The lower opaque panels will be 1" insulated metal composite panels with aluminum brake metal enclosure panels on the inside. See images.

SOUTH ELEVATION (NORTH ELEVATION SIMILAR)



EAST ELEVATION (WEST ELEVATION SIMILAR)

SOUTHWEST CORNER VIEW SHOWING NEW MAIN ENTRANCE

SOUTHEAST CORNER VIEW SHOWING SEISMIC IMPROVEMENTS

3d. PROPOSED IMPROVEMENTS - STRUCTURAL BY EQUILIBRIUM ENGINEERS LLC

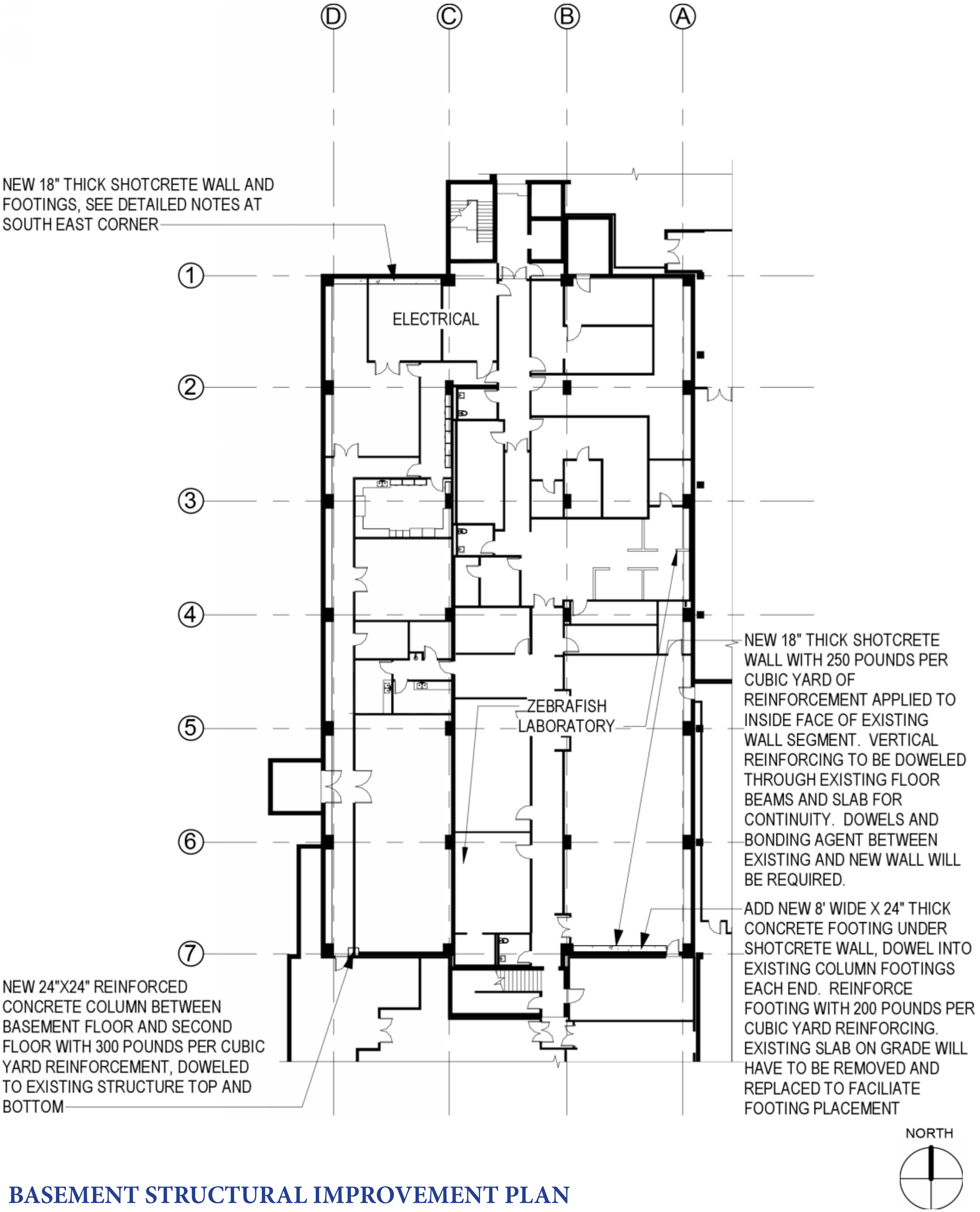
To address the identified seismic deficiencies and vulnerabilities, Equilibrium Engineers developed retrofit/repair recommendations, that if implemented, will allow the existing building to perform to the Life Safety standard that is the basis for new building design. The recommendations related to the primary lateral force resisting system are as follows:

- A new 30" thick concrete shear walls should be installed on the first floor along grid 1, between grids A & B and along grid 1, between Grids C & D to connect the overhanging second and third floors to the basement foundation wall. At the basement, second, and third floors the existing foundation and concrete walls (second and third floor) should be reinforced with the installation of a new 18" thick shotcrete wall. The new shear wall and reinforced existing walls should be tied together to provide continuity
- The existing second and third floor walls along Grid 1, between Grids A & B, and Grid 7, between Grids C and D shall be reinforced with 18 inch thick shotcrete to improve the shear strength of the walls.
- A new 24"x24" reinforced concrete column should be installed at Grid 7 and C.9 to add additional support to the concrete girder beam supporting the seismically improved second and third floors above. The concrete girder beam should also be reinforced with carbon fiber, the full length.
- All moment frame columns shall be wrapped with two layers of carbon fiber reinforcement, full height. Fill all reveals with epoxy grout prior to wrapping columns. Skim coat all surfaces exposed to view per Architect's direction.

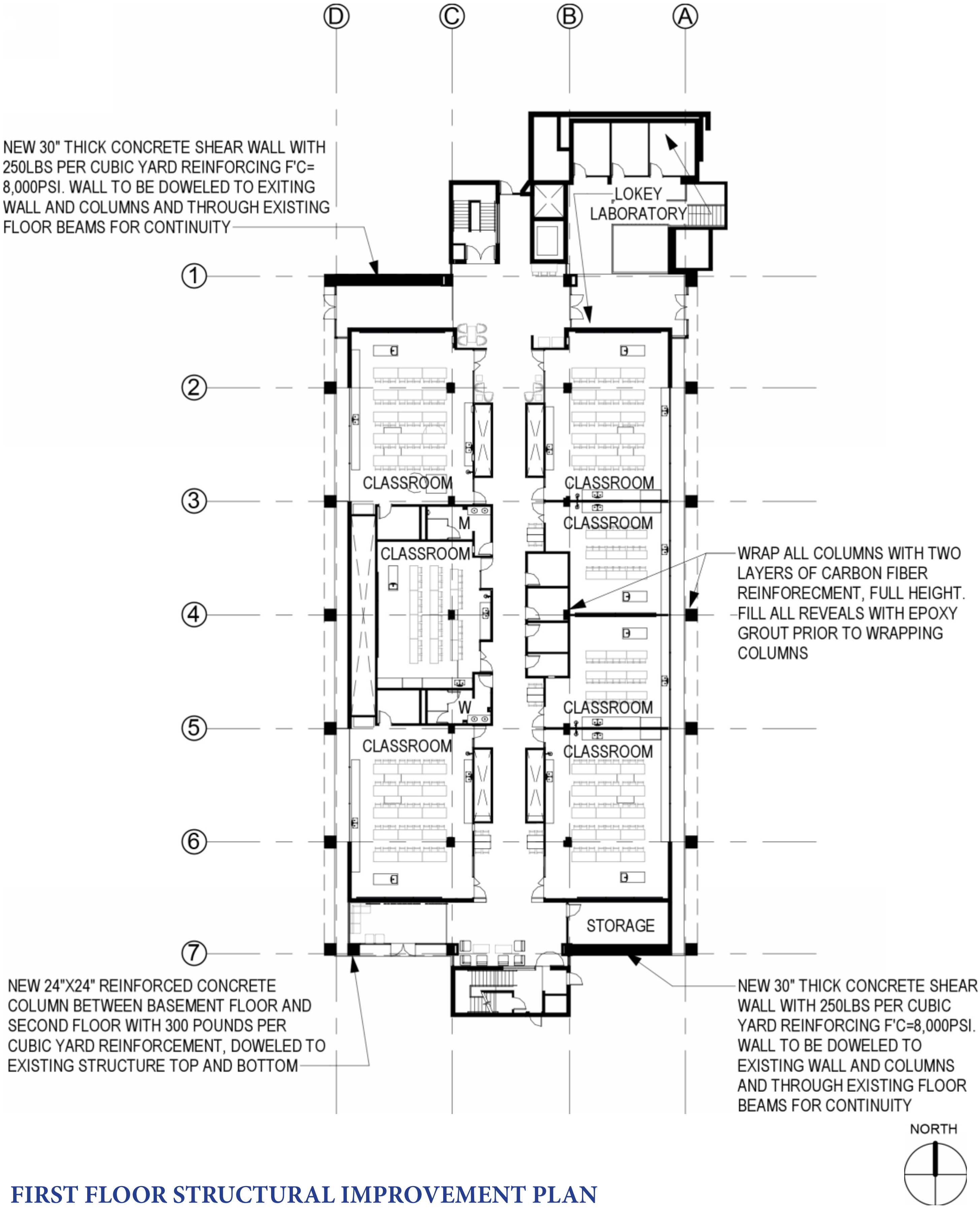
To address the vulnerabilities in the existing non-structural systems of the building, the following improvements are recommended:

- Remove or store fall-prone materials in cabinets with latched doors. Secure all containers with hazardous materials in a cabinet with latched doors.
- Anchor or otherwise laterally brace tall, narrow shelving units over 6 feet tall.
- Anchor all brick veneer at 16" o.c. each way to concrete back-up wall with Helifix anchors.
- Install lateral bracing at all unbraced ductwork, piping and mechanical equipment that is suspended from but not braced to the structure

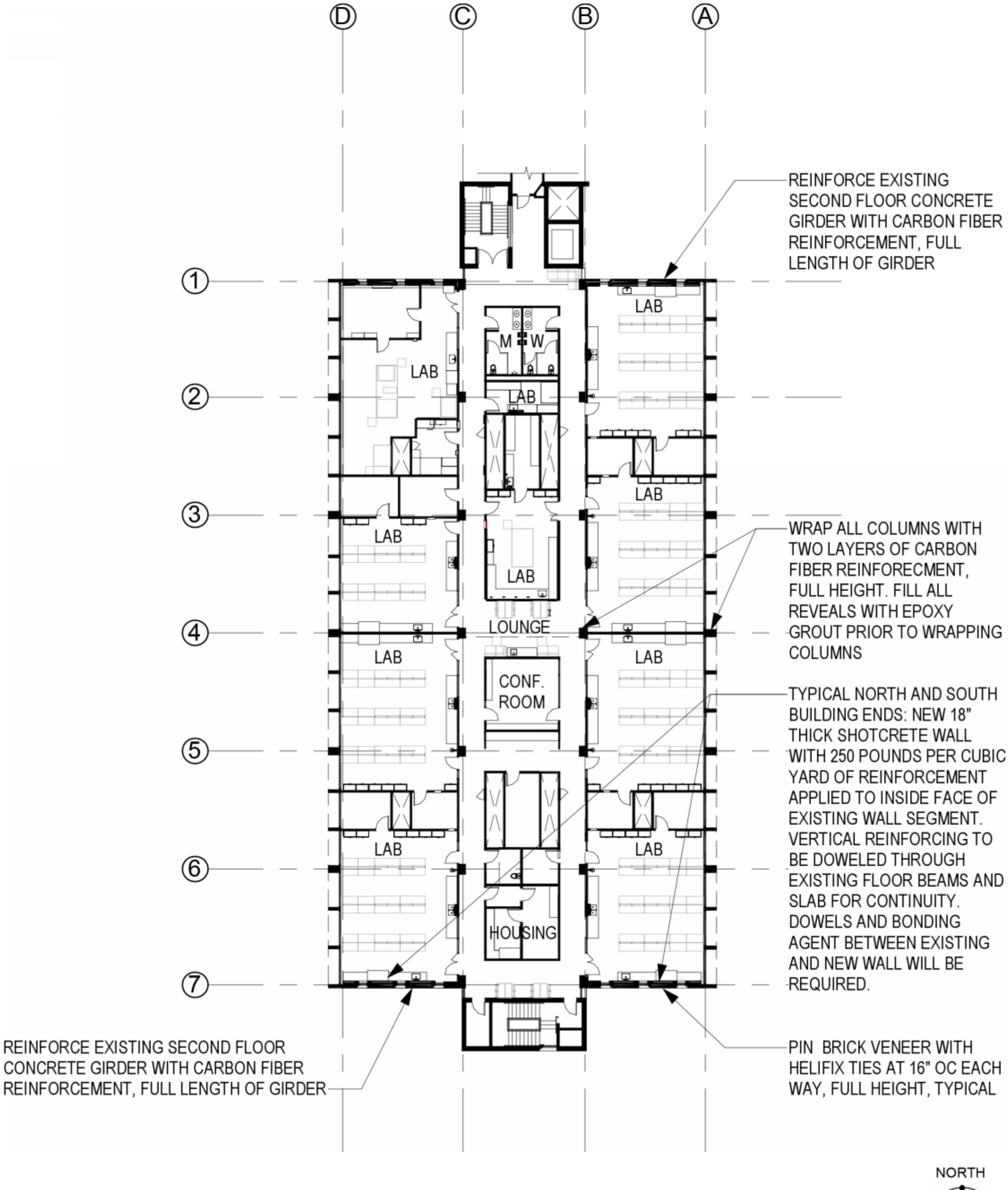
With respect to the proposed future roof additions, the roof structure should have adequate capacity to support a light-framed penthouse and new mechanical equipment weighing less than 125 PSF on its footprint. According to the mechanical engineer, the proposed exhaust fans will weigh in excess of 125 PSF. Consequently, the fans will be supported by steel framing that is elevated above the existing roof. This framing will span to existing building columns without loading the roof joists and girders.



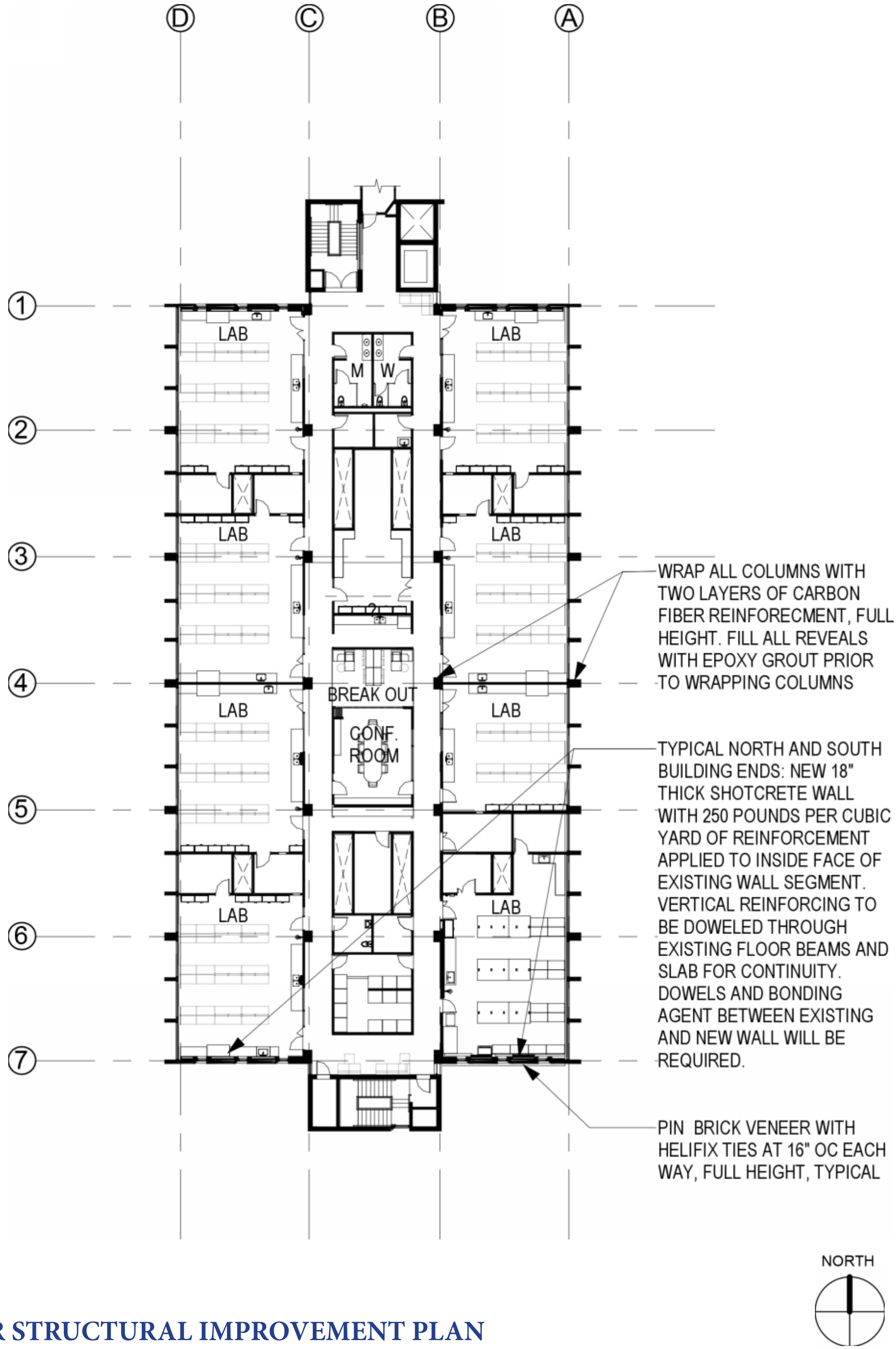
BASEMENT STRUCTURAL IMPROVEMENT PLAN



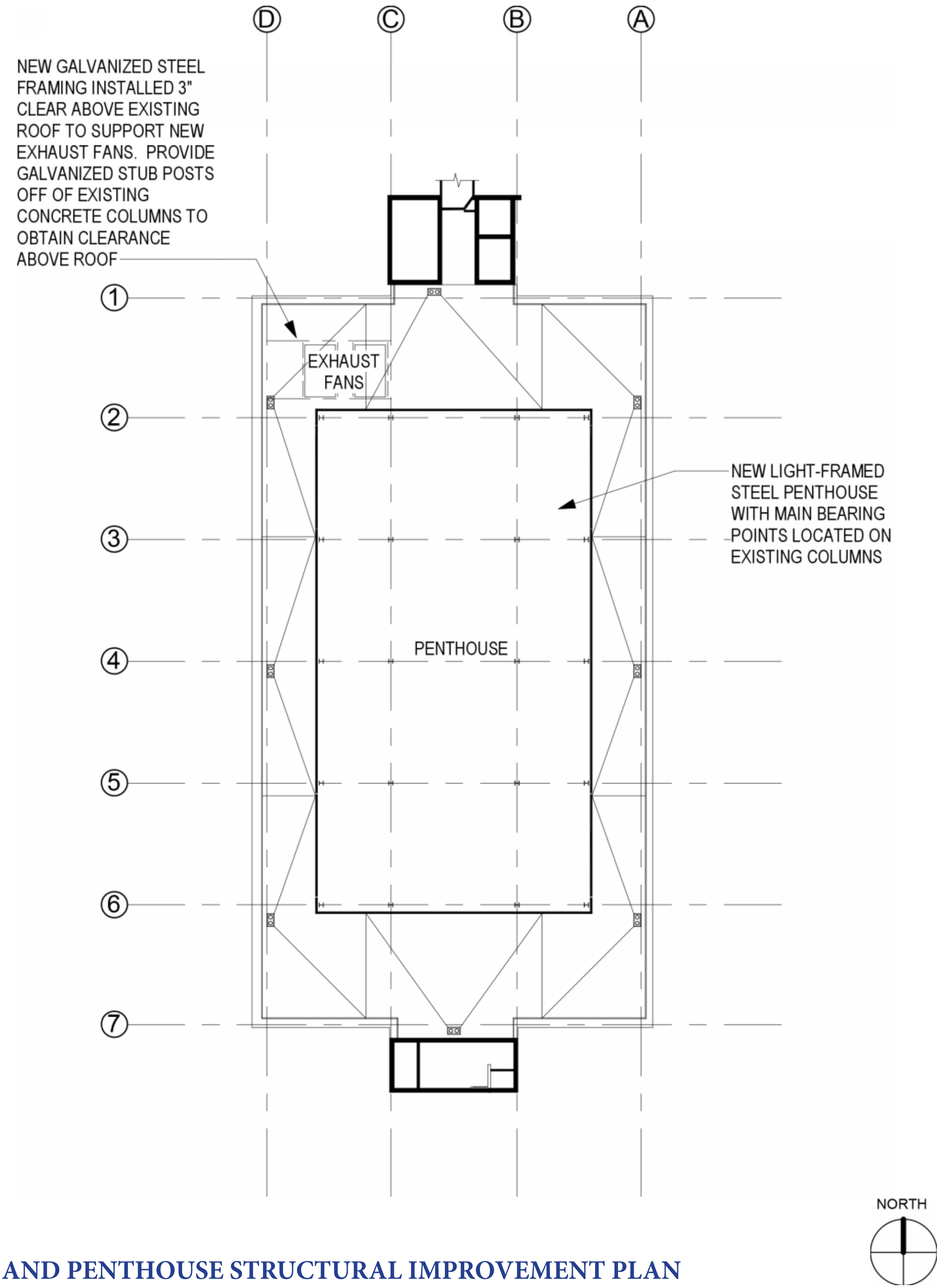
FIRST FLOOR STRUCTURAL IMPROVEMENT PLAN



SECOND FLOOR STRUCTURAL IMPROVEMENT PLAN



THIRD FLOOR STRUCTURAL IMPROVEMENT PLAN



ROOF AND PENTHOUSE STRUCTURAL IMPROVEMENT PLAN

3e. PROPOSED IMPROVEMENTS - ELEVATOR BY ELEVATOR CONSULTING SERVICES, INC

Although the existing elevator is expected to provide another 10-12 years of reliable service, it is recommend to completely replace the elevator, as outlined in Option 2 of this summary. The recommendation is based upon the desire that the Huestis Hall Renovation will result in a "like" new building and the desire to maximize the opening width and size of the elevator. Option 1 is outlined in this summary as an alternative option. Both options will result in a renewed elevator life cycle of 20-30 years.

ELEVATOR RENOVATION OPTION #1 - MODERNIZATION

Since Huestis Hall is undergoing major renovations, if the intent is to update the elevator along with the rest of the building, the elevators could undergo a complete modernization with the current size and configuration. A complete modernization of the existing equipment would cost an estimated $260,000 for the elevator work. The hoistway would not need to be modified in any direction, and many of the main structural components such as rails, overhead sheave beams, car sling/platform, entrances, and cab enclosure can be retained and reused. All controls, wiring, fixtures, doors, and cab finishes will be new. Since the elevators were modernized just 10 years ago, the ancillary work is expected to be very minimal.

ELEVATOR RENOVATION OPTION #2 - REPLACEMENT

ECS was asked to investigate the feasibility of enlarging the size of the existing elevator. To add size to an elevator platform requires an increase in the capacity of the elevator. This is a code driven requirement. The current hoistway dimensions are seven feet one inch (7' 1") deep, but with only six feet one inch (6' 1") clearance from where the basement-set machine protrudes into the hoistway, and eight feet seven and one fourth inches (8' 7¼") wide. To increase the elevator size to a 3,500 pound capacity elevator, the hoistway would need to be widened by a minimum of three-fourths inch (¾"), or possibly wider.

There is approximately eight inches (8") of extra room on the left side of the hoistway looking in from the front. There are horizontal spreader beams used for rail bracket attachments at every landing and in the overhead that will need to be relocated to provide the extra space in the shaft. Widening the elevator, the counterweight and car rope drops will also have to shift accordingly. This means all new overhead sheaves and sheave beams will be required. The car sling will need to be replaced with a wider sling as well as the platform. In order to do that work, the entire cab will need to be removed. Essentially, the entire existing elevator will need to be removed and a new basement traction elevator will need to be installed. All old entrances will also need to be removed and new three foot six inch (3' 6") wide entrances installed. This option would gain six inches (6") of width in the elevator cab interior.

Basement-set traction elevators are not standard products for elevator companies and custom design engineering and drawings will be required to size the actual fit. The estimate cost for a new basement set 3,500 lbs. capacity elevator is $350,000.00 to $ 375,000, for the elevator work alone. In addition, the following work would be required that is not elevator scope:

- Move horizontal spreader beams to widen shaft
- Remove existing entrances
- Reconstruction of overhead sheave supports
- Increased capacity of electrical feeders and disconnects
- Other ancillary items needed to bring elevator to current building codes, since it would be a complete replacement.

3f. PROPOSED IMPROVEMENTS - HVAC
BY SYSTEMS WEST ENGINEERS, INC

DESIGN REQUIREMENTS

With the exception of systems and equipment serving the Zebrafish and Lokey Laboratories, virtually all heating, ventilating, and air conditioning systems will be completely replaced. Design requirements that will be applied to the project follow.

STANDARDS AND GUIDELINES

In general, the laboratory design guidelines have been developed using information from the following standards and codes:

- ANSI/AIHA Z9.5 2003 - Laboratory Ventilation Standard
- OSHA 29 CFR Part 1910 - Occupational Exposures to Hazardous Chemicals in Laboratories
- American Society of Heating, Refrigeration, and Air-conditioning Engineers
  - 62.1 - Ventilation for Acceptable Indoor Air Quality
  - 110-1995 - Method of Testing Performance of Laboratory Fume Hoods
- National Fire Protection Association (NFPA) guidelines and standards
  - NFPA 30 - Flammable and Combustible Liquids Code
  - NFPA 45 - Fire Protection for Laboratories Using Chemicals
  - NFPA 54 - National Fuel Gas Code
  - NFPA 72 - National Fire Alarm Code
  - NFPA 90A - Standard for the Installation of Air conditioning and Ventilating Systems.
  - NFPA 101 - Life Safety Code
- Occupational Safety and Health Administration (OSHA)
- Guide for the Care and Use of Laboratory Animals

OUTDOOR DESIGN CONDITIONS

The following ambient outdoor conditions will be used as a basis of design:

Design Conditions	Criteria	Values
Project Site	Eugene, Oregon	
Site Elevation	Above sea level	450 ft
General Building Design Criteria		
Winter Heating	Mean of extremes	18°F
Summer Cooling	0.4% dry bulb / mean coincident wet bulb	92°F / 67°F
Summer Evaporation	0.4% wet bulb / mean coincident dry bulb	72°F / 91°F
Summer Dehumidification	0.4% dew point / mean coincident dry bulb	63°F / 75°F

INDOOR DESIGN CONDITIONS

The following indoor environmental conditions will be used as a basis of design:

Space	Temperature			Humidity	
	Heating (°F)	Cooling (°F)	Range (°F)	Min (rh)	Max (rh)
Office/Admin Support	69	75	+/- 2.0	None	None
Classroom/Auditorium	69	75	+/- 2.0	None	None
Circulation	68	76	+/- 2.0	None	None
Lab/Lab Support	69	73	+/- 2.0	None	60%
Lab Clean Room	68	68	+/- 2.0	None	60%
Lab Microscope	70	70	+/- 2.0	None	60%
Vivarium	70	70	+/- 2.0	35%	60%
Telecom/IT	72	72	+/- 2.0	None	60%
Mech/Elec/Elevator	60	85	+/- 3.0	None	None

LOAD CALCULATIONS

Interior Heat Gain:

Space	Equipment (Watts/sf)	Lighting (Watts/sf)
Office/Admin Support	2.0	1.0
Conference Rooms	1.0	1.5
Classroom/Auditorium	0.5	1.0
Breakrooms	1.0	1.0
Circulation	0.0	1.0
Laboratory	6.0	1.5
Laboratory Equipment Rooms	30.0	1.5
Vivarium	6.0	2.0
Telecom/IT	0.5	1.0
Mech/Elec/Elevator	0.5	1.0

OCCUPANCY

Occupant density will be based on the maximum occupant density per room. The occupancy heat rejection will be based on ASHRAE Handbook of Fundamentals for moderately active office work, or as listed below:

- General: Sensible – 250 Btuh/person, Latent – 200 Btuh/person
- Auditorium: Sensible – 245 Btuh/person, Latent – 155 Btuh/person

OCCUPANCY SCHEDULE

- General:
  - 6:00am – 10:00pm per day
  - 365 days per year
- Laboratory Spaces:
  - 6:00am – 10:00pm per day
  - 365 days per year

AIR CIRCULATION RATES

- Laboratories and Laboratory Support Areas: Six (6) air changes per hour.
- Vivarium Spaces
  - Holding Rooms: Fifteen air changes per hour
  - Procedure Rooms: Fifteen air changes per hour
  - Vivarium Corridor and Entry: Ten air changes per hour

OUTSIDE AIR VENTILATION RATE

Laboratory Spaces: The proposed mechanical systems will include recirculation of non-laboratory air to the building supply air handlers for circulation to laboratory spaces. Recirculation will affect the percentage of outside air delivered depending on the amount of ventilation air used in non-laboratory spaces at a given time. Systems will be controlled to provide an outside air rate of no less than 1 cfm/sq. ft to laboratory spaces, but will generally operate at a higher rate. Preliminary calculations indicate the outside air rate will average approximately 50% of the way between 1 cfm/sq. ft. and six (6) air changes per hour.

AIR EXHAUST

General Exhaust: Air from spaces where odors, contaminates, or excess humidity is present will be exhausted directly to the outdoors. These spaces include:

- Toilet rooms
- Break rooms
- Copy/print rooms
- Janitor's closets

Laboratory Exhaust: Laboratory spaces and equipment will be provided with specialized exhaust systems as required to support the required function.

- Fume Hood Exhaust Rate: Exhaust air requirements for fume hoods will be based on maintaining a face velocity of 100 fpm through the sash opening with the sash positioned at 18" above the bottom of the hood.
    - Hood Type: Constant volume bypass, assuming one hood per laboratory is used as shown in the current plan. If additional hoods are added to any lab causing the total hood exhaust to exceed the unoccupied circulation rate, variable volume hoods will be used.
    - Hood Airflow: 850 cfm per six-foot fume hood
    - Hood Sash Control: If a variable volume hood is required, automatic sash closure may be desirable for unoccupied periods.
- Fume Hood Density: The laboratory exhaust system will be designed to accommodate a laboratory fume hood design as follows:
    - Basement: Reconnect two (2) existing fume hoods in the Zebrafish laboratory. Provide one (1) new hood in the new fish quarantine area.
    - First Floor: One fume hood per teaching classroom. Six (6) six-foot hoods total.
    - Second Floor: One fume hood per laboratory suite. Eight (8) six-foot hoods total.
    - Third Floor: One fume hood per laboratory suite. Eight (8) six-foot hoods total.
- Laboratory Equipment: Exhaust air will be connected to specialized laboratory equipment such as chemical storage cabinets, biological safety cabinets, point exhaust (snorkels), etc. No specific equipment has been identified at this time.
- Filtered Fume Hoods: None
- Perchloric Acid Fume Hoods: None

LABORATORY HVAC SYSTEM DIVERSITY AND FUTURE CAPACITY
Variable air volume systems serving the laboratory spaces will be sized with operational diversity factor and future capacity allowances as follows:

- Operational Diversity Factor: Based on the current program that includes one hood per room, the hood exhaust rate will always be below the laboratory supply rate even during unoccupied hours. As a result, lab hoods can be constant volume to reduce cost and complexity, and no diversity will be applied since the hood exhaust rate will not change.
- Future Capacity: HVAC equipment and systems will be sized to accommodate a 20% increase of fume hood quantity in excess of the Fume Hood Density listed above.

LABORATORY HVAC SYSTEM REDUNDANCY
HVAC systems serving laboratory spaces will be designed with redundant equipment so that 100% of the peak load can be delivered if any single capacity element fails, and will have limited redundancy in distribution pathways.

HVAC equipment and accessories will be served from the building standby power distribution system.

Individual equipment capacity elements will have independent DDC standalone controls. Controls will be powered by UPS power supplies.

BUILDING PRESSURIZATION
HVAC systems will be designed to maintain a positive building pressure relative to the outdoors to reduce infiltration of outside air through exterior doors and openings in the building envelope.

SPACE PRESSURE

Air distribution systems will be designed to provide pressure relationships as described below:

- General Occupancy:
  - Offices — Positive
  - Corridor — Positive to Laboratory
  - Laboratory — Negative
  - Laboratory Support — Negative
  - Cell Culture — Positive
  - Toilets, Janitor Closets, Lockers — Negative
- Animal Holding Room Suite:
  - Internal Corridor — Negative
  - Animal Holding Room — Positive
  - Procedure Room — Positive
  - Entry — Negative

AIR FILTRATION

Air distribution systems will be equipped with filtration as described below.

- Main Air Distribution Systems Serving Laboratory and Non-Laboratory Spaces: Minimum filtration efficiency of MERV 13.
- Heat Recovery Exhaust Air Systems: Exhaust air entering heat recovery devices will be provided with particulate filters with a minimum filtration efficiency of MERV 8.

STEAM AND CONDENSATE RETURN SYSTEMS

The facility will be heated using steam from the campus 60-psi steam distribution main that enters the building in the northwest corner of the basement. Steam at 60 psi will be delivered directly to a clean steam generator for use in proposed autoclaves. Remaining steam will be regulated to 10 psi then distributed to the remaining uses including heating water converters, domestic water heaters, laboratory water heaters, and other equipment. A flash tank will be provided to capture flash steam from 60 psi condensate for use in the 10-psi system. Low pressure condensate will return to vented condensate receivers and pumps then be pumped back to the campus condensate return main.

The converters, steam traps, condensate receivers, condensate pumps, and related equipment will be fully redundant.
The new system will be sized to serve both Huestis Hall and the Zebrafish Laboratory. To allow the Zebrafish Laboratory to remain operational, a temporary heating water service needs to be provided while the new system is constructed.

A separate clean steam generator producing 50-psi clean steam with 60-psi campus utility steam will be required to provide clean steam to new autoclaves located in the basement.

A schematic is shown on Drawing M-7.

EQUIPMENT AND MATERIALS

- Steam-to-Water Converters: Shell and tube type. Two, each with the capacity to heat approximately 160 gpm of water from 140 to 180oF using 10 psi steam.
- Condensate Pumps: Two, each sized for 57 gpm.
- Piping:
  - Steam: Schedule 40 steel
  - Condensate: Schedule 80 steel

HEATING WATER SYSTEM

A heating water system will be provided to serve both Huestis Hall and the Zebrafish Laboratory. Heating water will be produced by the two steam-to-water converters. Since the Zebrafish Laboratory equipment is designed with a heating water temperature of 180oF, the new primary heating loop will be designed to supply this temperature. A secondary heating loop producing water at 130oF will be installed to serve reheat coils and any secondary building heating loads. New air handling equipment for Huestis will be connected to this system. Both the primary and secondary heating water loops will include two fully-redundant pumps.

A schematic is shown on Drawing M-8.

EQUIPMENT AND MATERIALS

- Heating Water Pumps: Base-mounted, end suction type. Two, each sized for 160 gpm.
- Piping: Schedule 40 steel.

CHILLED/PROCESS WATER AND CHILLED BEAM WATER SYSTEMS

The chilled water systems will also include two loops. The primary loop will distribute water from campus chilled water distribution piping at 45oF and will serve air handling unit cooling coils, fan coil units, and any process needs. A secondary loop producing water at 56oF will serve laboratories equipped with chilled beams. Both the primary and secondary chilled water loops will include two fully-redundant pumps.

A schematic is shown on Drawing M-8.

EQUIPMENT AND MATERIALS

- Chilled Water Pumps: Base-mounted, end suction type. Two, each sized for 182 gpm.
- Chilled Beam Water Pumps: Base-mounted, end suction type. Two, each sized for 70 gpm.
- Chilled Water Piping: Schedule 40 steel.
- Chilled Beam Water Piping: Schedule 40 steel main piping. PEX piping for final runouts from zone manifolds to chilled beams.

AIR DISTRIBUTION SYSTEMS

Air distribution systems will include three supply air units, two (2) rooftop exhaust units, and two (2) return fans. A schematic is shown on Drawing M-9.

SUPPLY AIR UNITS

Three (3) 100% outside air supply fans will be provided, each with the capacity to meet 50% of the building load. Fans will include a MERV 8 pre-filter, runaround loop preheat coil, heating coil, cooling coil, fan wall, and final MERV 13 filter in that order. Fans will include variable frequency drives and will be identical, including fully-redundant control systems. The supply fans will serve both laboratory and non-laboratory spaces. Approximate capacity for each:

- Airflow: 22,000 cfm.
- Heating Coil: 15°F to 85°F.
- Cooling Coil: 95°F to 55°F.

LOCAL HEATING AND COOLING EQUIPMENT

Local heating and cooling equipment will vary by space use as follows:

- Research Laboratories: Research laboratories are located on the second and third floors. Supply and exhaust airflows will be maintained using a Phoenix laboratory airflow system or similar system approved by the University. During occupied times, a supply air rate equal to six (6) air changes/hour (1,250 cfm) will be introduced into the laboratory through an airflow control valve and a duct-mounted heating coil.

  Given the very large windows on the second and third floors, the six (6) AC/hour rate is not sufficient to meet cooling demand for zones on the building perimeter, and cooling-only chilled beams will be installed to provide supplemental cooling. For interior research laboratory areas, the systems will be similar, but chilled beams will not be required.

  Two airflow control valves will be provided for exhaust; one for the laboratory hood, and one for general space exhaust. The hood exhaust airflow valve will be set to maintain the occupied hood exhaust rate of 850 cfm. The general exhaust air flow valve will be set to maintain an exhaust rate that will maintain a negative space pressure in the laboratory.

  During unoccupied periods, the supply air rate will be reduced to four (4) air changes/hour (855 cfm) which essentially matches the hood exhaust rate. Additional general exhaust will be provided to maintain a negative space pressure.

  Given that the hood exhaust rate is less than the supply air rate during unoccupied periods, hood turndown is not required. A preliminary layout or an exterior research laboratory is shown on drawing M-6.

- Teaching Laboratories: Teaching laboratories are located on the first floor. Mechanical systems will be the same as interior research laboratories and chilled beams will not be provided. Utilities will be sized and configured to allow conversion to research laboratories in the future.

- Vivariums, including the mouse habitat and zebrafish areas: The vivarium areas will include holding, procedure, and anteroom spaces. Each will have a supply airflow control valve, reheat coil, and exhaust airflow control valve. Air exchange rates and pressure relationships will be maintained as previously described. A local electric humidifier will be provided for space humidity control in the mouse habitat area.

- Non-laboratory Spaces: In non-laboratory spaces where recirculation of air is allowed, a variable volume reheat system approach will be used. The systems will include a standard variable volume terminal unit with reheat coil to control the flow and temperature of delivered air as required to meet space demand. A return airflow terminal unit with a control damper alone will be provided to match each supply air terminal unit.

- Freezer Room: The freezer room will be cooled using air from the low temperature chilled water loop. Depending on the freezer selection, chilled water could be used directly if compressors are water cooled. If compressors are air cooled, a fan coil will be provided to remove heat rejected to the freezer space.

EQUIPMENT AND MATERIALS INCLUDE

- Chilled Beams: 6-foot beams, at approximately 900 Btus cooling/lineal foot.
- Supply and Return Ductwork: G60 galvanized steel.
- Laboratory Exhaust Ductwork: 18 gauge, welded stainless steel.
- Non-laboratory Exhaust Ductwork: G60 galvanized steel.

RETURN AIR FANS

Return fans will be provided to recirculate air from non-laboratory spaces back into the inlet of the main building supply fans or directly to outdoors if economizer cooling desired. The approach provides a number of potential benefits including:

- Airflow into laboratory spaces can be maintained at the optimum six (6) air changes/hour rate while maintaining a somewhat lower outside air rate. The exact outside air rate will depend on the amount of air delivered to non-laboratory spaces to meet ventilation requirements. Preliminary analysis shows the outside air rate to laboratories will be around 1,125 cfm compared to the 1,250 cfm needed to provide six (6) air changes/hour or the 1,000 cfm needed to provide 1 cfm/sq.ft.
- Air supplied to non-laboratory spaces will have a very high percentage of outside air providing exceptional air qualities in these areas.
- All building zones will be equipped with supply and exhaust airflow control allowing precise control of space pressure relationships.

Two return fan units will be required to provide full redundancy. Each will include dual air paths with each path including a fan capable of returning 50% of the non-laboratory maximum supply rate of approximately 7,000 cfm.

EXHAUST AIR SYSTEMS

A mixed-use laboratory exhaust system will be provided. The system will include two (2) roof-mounted exhaust fan packages in parallel. Each package will have two (2) exhaust fans. Fans will be sized so that three (3) of the fans operating together will have the capacity to meet the entire facility laboratory exhaust requirement of 42,000. Each package will include a heat recovery coil for connection to the heat recovery system.

HEAT RECOVERY SYSTEM

A runaround heat recovery system will be provided to capture energy from laboratory exhaust to preheat outside air at building supply fans. The systems will include fully redundant recovery pumps and an automatic glycol solution feed system.

CONTROLS

Heating, ventilating, and air conditioning system controls will be provided as an expansion of the campus Siemens direct digital control system. A Phoenix laboratory airflow control system will be provided to control supply and exhaust rates in laboratory spaces.

3g. PROPOSED IMPROVEMENTS - PLUMBING
BY SYSTEMS WEST ENGINEERS, INC

DESIGN REQUIREMENTS

With the exception of systems and equipment serving the Zebrafish and Lokey Laboratories, and inaccessible piping located below the basement of Huestis, virtually all plumbing systems will be completely replaced. Services for teaching laboratories on the first floor will be configured to allow straightforward conversion of these spaces to standard laboratories. Design requirements that will be applied to the project follow.

STANDARDS AND GUIDELINES

In general, the laboratory design guidelines have been developed using information from the following standards and codes:

- National Fire Protection Association (NFPA) guidelines and standards
  - NFPA 30 - Flammable and Combustible Liquids Code
  - NFPA 54 - National Fuel Gas Code
  - NFPA 101 - Life Safety Code
- Occupational Safety and Health Administration (OSHA)
- Guide for the Care and Use of Laboratory Animals

STORM DRAINAGE

The storm drainage system will be sized based on a maximum rainfall rate of 2 inches per hour, which corresponds to a 100-year return, 60-minute rainfall.

SANITARY WASTE AND VENT

The sanitary waste system will be designed to maintain a minimum velocity of 2 feet per second (fps). The sanitary vent system will be designed so that the differential pressure at any point in the building does not exceed one-inch water column.

ACID WASTE AND VENT

Plumbing fixtures in laboratories and laboratory support spaces will be provided with a drainage system separate from the sanitary drainage system. The laboratory waste system will gravity-drain to an acid neutralization tank, and will then drain to five (5) feet outside the building wall. Each laboratory waste system shall have a grade cleanout for sampling. The laboratory waste will connect to the site sanitary system outside the building. Acid waste and vent piping basis of design shall be IPEX Labline.

DOMESTIC WATER

Domestic water will be provided to all fixtures that require a potable water supply, including but not limited to the following:

- Toilet room lavatories
- Water coolers and drinking fountains
- Breakroom sinks

Piping will be sized to limit the velocity in any section of the system to a maximum of 8 fps for cold water systems and 5 fps for hot water systems at a distribution temperature of 120°F.

Each water heater will be sized for 100% of the design hot water load. The hot water recirculation system will be configured to maintain wait times at fixtures to a maximum of 20 seconds.

TEPID WATER

Emergency showers and eyewashes will be supplied by a recirculating tepid potable water system, which will maintain system water temperature between 70°F and 90°F. The system will be designed to minimize stagnant water and will periodically flush the supply piping with fresh water during unoccupied periods to control the growth of Legionella bacteria. Flush water will be discharged to the existing non-potable water storage tank in the basement.

The piping will be sized to limit the velocity in any section of the system to a maximum of 5 fps.

INDUSTRIAL WATER
Industrial water will be supplied to laboratory sinks, fume hoods, and equipment. Piping will be sized to limit the velocity in any section of the system to a maximum of eight (8) fps for cold-water systems and four (4) fps for hot-water systems at a distribution temperature of 140°F.

Each water heater will be sized for 100% of the design hot water load. The hot water recirculation system will be configured to maintain wait times at fixtures and equipment to a maximum of 20 seconds.

Submetering will be provided for the industrial water supplies for the building. Water meters will be connected to the building automation system.

HIGH PURITY WATER
The existing Zebrafish Laboratory reverse osmosis (RO) system provides ASTM D1193 Reagent-grade Type III water for Huestis Hall and other nearby science buildings. The Huestis RO system will continue to be supplied by the Zebrafish Laboratory system.

The capacity of the storage tank(s) and distribution piping will be based on the programmed fixtures and equipment. The storage tank(s) will be sized to provide storage for 24 hours of estimated usage.

The distribution system will be designed to continuously circulate water at a velocity of four to six (4-6) fps and maintain the temperature of the water under 80°F.

Reagent-grade Type I water will not be provided.

NATURAL GAS
Natural gas will be provided to Huestis Hall by the campus natural gas distribution system at two (2) psig. The campus pressure will be reduced to a building pressure of five (5) inches water column. The distribution system will be sized based on one (1) cfm per outlet plus any flow required for individual pieces of equipment, with a maximum pressure drop of 0.5 inches water column. A diversity factor will be applied based on the number of fixtures or connections on any specific piping section in accordance with industry standards. Each laboratory will have an emergency gas shutoff as required by Code.

LABORATORY COMPRESSED GASES
Oil-free, dry, clean air will be provided to the building from the 120 psig campus industrial air supply from the central plant.

Air drying, filtration, and pressure regulation will be provided to supply compressed air to the building with a pressure of 60 psig at -40°F dew point, with a maximum oil concentration of 0.8 ppm.

The compressed air piping system will be sized based on one (1) scfm per outlet plus any flow required for individual pieces of equipment. The piping system will be sized to limit pressure drop across the system to a maximum of 10% of pressure-regulator outlet pressure.

LABORATORY VACUUM
A laboratory vacuum system will be required and will be sized based on 0.5 scfm per outlet plus any flow required for individual pieces of equipment. A diversity factor will be applied based on the number of fixtures or connections on any specific piping section in accordance with industry standards.

The piping system will be sized to limit pressure drop across the system to maximum of 3 inches of mercury vacuum.

The lead pump will be sized for 100% of the maximum total demand. The pumps will be controlled on lead/lag basis.

DOMESTIC HOT, COLD, AND TEPID WATER

Huestis Hall will be supplied with cold water from the existing service entrance location, with redundant backflow preventers to allow continuous operation of the facility. New piping will be provided throughout the building to serve potable water fixtures in restrooms, breakrooms, and for coffee sinks. Cold water will also be connected to the tepid water system.

A backup domestic water source for the building can be provided by a connection to the Zebrafish primary laboratory water source at the south end of the building and will include a new backflow preventer. The backup source will supply domestic water to the Zebrafish Laboratory during upgrades to the Huestis domestic water system and will be integrated into the final system.

Domestic water for the Lokey Laboratory will be provided by a new connection to the Streisinger domestic water service so that all water systems in Lokey have the same source. Domestic hot water will be provided to both Huestis and the Zebrafish Laboratory by a set of redundant semi-instantaneous steam domestic water heaters.

Emergency fixtures in laboratory spaces throughout the building will be connected to a tepid water recirculation system. Domestic hot and cold water will supply the tepid water system through a central mixing valve. Water will be distributed with an 80°F supply temperature setpoint, and will have a recirculation pump to maintain system temperature. A diverter valve will periodically discharge water to the non-potable water system storage tank. The diverter valve will be controlled by the BAS and will have Owner-adjustable scheduling controls.

A schematic of the domestic water system is shown on Drawing P2.

EQUIPMENT AND MATERIALS

- Steam Semi-Instantaneous Domestic Water Heaters: Two (2) shell and tube type, each with the capacity to heat approximately 150 gpm of water from 50°F to 140oF using 10 psi steam.
- Circulation Pumps:
    - Domestic Hot Water - one 1/4 horsepower, similar to Grundfos Alpha.
    - Tepid water – one ¼ horsepower 120-volt 1 phase.
- Thermostatic Mixing Valves:
    - Domestic Hot Water – 25 gpm at 5 psig pressure drop with 1 gpm minimum flow.
    - Tepid water – mixing valve for emergency fixtures with fail to cold water supply function, 100 gpm at 20 psig pressure drop with 3 gpm minimum flow
- Piping: ASTM B-88 hard-drawn type L copper with soldered fittings. Piping 2-1/2” & larger may be ASTM A312, ASTM A999 schedule 40 stainless steel with mechanical or press fittings.

LABORATORY COLD WATER

Huestis Hall will be supplied with laboratory cold water through new domestic cold-water piping. Redundant backflow preventers will be provided to isolate laboratory water from domestic and city water and allow continuous operation of the facility. New piping will be provided throughout the building to serve laboratory fixtures and equipment.

The new laboratory cold-water system will be intertied with the existing Zebrafish Laboratory cold-water system to provide redundancy for the Zebrafish system.

A schematic of the laboratory cold water system is shown on Drawing P3.

MATERIALS

- Piping: ASTM B-88 hard-drawn type L copper with soldered fittings. Piping 2-1/2” and larger may be ASTM A312, ASTM A999 schedule 40 stainless steel with mechanical or press fittings.

LABORATORY HOT WATER

Laboratory hot water will be provided to both Huestis Hall and the Zebrafish Laboratory by a set of redundant semi-instantaneous steam domestic water heaters. Water will be supplied at a temperature of 140°F. New piping will be provided throughout the building to serve laboratory fixtures and equipment.

A schematic of the laboratory hot water system is shown on Drawing P3.

EQUIPMENT AND MATERIALS

- Steam Semi-Instantaneous Domestic Water Heaters: Two (2) shell and tube type, each with the capacity to heat approximately 150 gpm of water from 50°F to 140oF using 10 psi steam.
- Circulation Pumps: Two ¼ horsepower pumps, similar to Grundfos Alpha.
- Thermostatic Mixing Valve: 150 gpm at 5 psig pressure drop with 3 gpm minimum flow.
- Piping: ASTM B-88 hard-drawn type L copper with soldered fittings. Piping 2-1/2" and larger may be ASTM A312, ASTM A999 schedule 40 stainless steel with mechanical or press fittings.

REVERSE OSMOSIS WATER

New Reverse Osmosis (RO) storage tanks will be located in the new mechanical penthouse. RO water will be gravity-fed to laboratory spaces throughout the building. Connected equipment will include RO faucets at laboratory sinks, water polishers in selected laboratories, and clean steam generators as discussed in the mechanical section.

A schematic of the RO water system is shown on Drawing 2/P6.

EQUIPMENT AND MATERIALS

- Storage: Two (2) 400-gallon high-density polyethylene tanks for reverse osmosis service
- Piping: Schedule 80 PVC with solvent-welded fittings

SANITARY WASTE AND VENT

A new sanitary waste and vent system piping will be provided to serve non-laboratory spaces throughout the building, and will connect to the existing site service in the current location. The sanitary waste and vent system will be of conventional design with atmospheric vents extending above the finished roof. The system will include pumped waste from sewage ejectors and elevator sumps, which will connect to the building gravity waste piping. The building waste system will gravity-drain into the utility sanitary sewer system. Adequate cleanouts will be provided to permit necessary maintenance.

SEWAGE EJECTORS AND SUMP PUMPS

The existing sewage ejector receiver basin in the basement will be refurbished, and new duplex sewage ejectors with a removal system will be provided to serve the Huestis basement and Zebrafish restrooms.

A new elevator sump pump will be provided, sized to current Code requirements.

A schematic of the sanitary waste and vent system is shown on Drawing P4 with approximate equipment capacities.

EQUIPMENT AND MATERIALS

- Sewage Ejector Pumps: Duplex sewage ejector pumps with estimated capacity of 150 gpm at 30 feet of water head and a motor size of 3 horsepower each.
- Elevator Sump Pump: Simplex sump pump with ½ horsepower motor, 50 gpm at 15 feet of head.
- Thermostatic Mixing Valve: 150 gpm at 5 psig pressure drop with 3 gpm minimum flow.
- Piping:
  - Sanitary Waste: Service weight no-hub cast iron soil pipe with standard couplings.
  - Sanitary Vent: Service weight no-hub cast iron soil pipe with standard couplings. Two-inch and smaller may be schedule 40 galvanized steel with threaded couplings at contractor's option.
  - Pumped Waste: Schedule 40 galvanized steel with threaded couplings.

ACID WASTE AND VENT

A new acid waste and vent system piping will be provided to serve laboratory spaces throughout the building. The acid vent system will be of conventional design with atmospheric vents extending above the finished roof. The building acid waste system will gravity drain to an acid neutralization tank. Neutralized waste will be discharged to the site sanitary waste piping, with a sampling port exterior to the building. Adequate cleanouts will be provided to permit necessary maintenance.

The existing Zebrafish Laboratory acid waste ejector pump will remain in service and be connected to the new neutralization tank. Zebrafish Laboratory acid vent piping will connect to the new Huestis acid vent system.

A schematic of the acid waste and vent system is shown on Drawing P4.

EQUIPMENT AND MATERIALS

- Neutralization Tank: Polypropylene or polyethylene tank, installed flush with floor, 300-gallon capacity
- Piping: IPEX Labline polypropylene acid waste piping with mechanical couplings

STORM WATER

Storm drainage will be conventional design connecting new roof drains into combined storm drain and overflow piping that will gravity drain to the utility storm drain system. Piping will be concealed to the extent possible and will be routed through the mechanical chases to the basement where it will connect to the site storm water piping at the existing location.

The existing basement storm water receiver basin will be refurbished, and new duplex sump pumps with a removal system will be provided to serve Huestis basement and the Zebrafish Laboratory. The pumps will be connected to the emergency power supply. We recommend performing this work during the summer when the groundwater level is likely to be at its lowest level.

EQUIPMENT AND MATERIALS

- Stormwater Pumps: Duplex sump pumps with an estimated capacity of 150 gpm at 30 feet of water head and a motor size of 3 horsepower each.
- Piping:
  - Storm Drain: Service weight no-hub cast iron soil pipe with standard couplings, and 1-inch thick fiberglass insulation in occupied spaces
  - Pumped Storm Drain: Schedule 40 galvanized steel with threaded couplings

COMPRESSED AIR

Compressed air will be delivered from the campus distribution system to laboratory bench outlets and equipment. New connections to the campus system with the appropriate isolation valves will be provided as necessary to allow direct connection of Zebrafish and Lokey Laboratories to the campus system independently of Huestis.

A new local compressed air tank, pressure reducing station, air filtration, and air dryers will be provided to condition the compressed air source to meet program requirements.

A temporary air compressor will be required to maintain service for both the Zebrafish and Lokey Laboratories until they can be reconnected to the campus compressed air service.

A schematic of the compressed air system is shown on Drawing 2/P5.

EQUIPMENT AND MATERIALS

- Compressed Air Receiver Tank: 100-gallon steel tank
- Air Dryer: Refrigerated air dryer with 325 SCFM flow capacity
- Piping: ASTM B-88 hard-drawn type L copper with soldered fittings

NATURAL GAS

Natural gas will be delivered from the campus distribution system to laboratory bench outlets. Each laboratory will have an emergency gas shutoff station. A new pressure-reducing station will be provided to meet program requirements.

A schematic of the natural gas system is shown on drawing 1/P5.

MATERIALS

- Piping: ASTM A-53 black steel piping with threaded couplings and valves. Joints in piping larger than 2-inch diameter shall be welded.

VACUUM

Vacuum service will be provided from a new system, located in the basement mechanical room, to bench outlets in each laboratory space. A new vacuum compressor, sized for the full building load, will serve as the lead unit. The existing vacuum compressor will be relocated to the basement and will serve as a backup compressor.

A schematic of the vacuum system is shown on Drawing 1/P6.

EQUIPMENT AND MATERIALS

- Vacuum Compressor: 200 AFCM capacity
- Vacuum Receiver Tank: 300-gallon steel tank
- Piping: ASTM B-88 hard-drawn type L copper with brazed joints

3h. PROPOSED IMPROVEMENTS - ELECTRICAL AND I.T. BY SYSTEMS WEST ENGINEERS, INC

POWER

STANDARDS AND GUIDELINES

Electrical power systems will conform to the most recent version of the following industry standards and guidelines:

- IEEE STD. 241-74: Electric Systems for Commercial Buildings
- NFPA 70 National Electrical Code
- International Building Code (IBC)
- International Fire Code (IFC)
- Underwriters Laboratories (UL)

BUILDING ELECTRICAL SERVICE

A new service will be provided for Huestis to provide redundancy. The new service will be derived from feeder 4. There are spare load breaks located in the transformer vault in the basement of Huestis. A new 1500KVA pad-mount transformer will be installed in the basement to feed a new 4000A board to serve Huestis.

NORMAL POWER

The existing 4000A main distribution board will be retrofitted to add one (1) 4000A circuit breaker with a kirk key.

The new 4000A distribution board will consist of one (1) 4000A main breaker, six (6) 800A breakers, and one (1) 4000A tie breaker with a kirk key. A new 4000A feeder will be provided to connect the new distribution board to the existing through the 4000A kirk-keyed breakers. The new distribution board will be installed in the basement close to the new 1500KVA transformer.

All new panelboards on the first through third floors will be fed from the new 4000A distribution board. Each electrical room on the first through third floors will be provided with two (2) 800A sub-distribtuion boards. Both sub-distribution boards willbe fed off the 800A breakers in new main distribution board. One sub-distribtuion board will serve all panelboards in the labs located on east side of building and the second sub-distribution board will serve the labs on the west side. This will also be done on the second and third floors.

EMERGENCY/STANDBY POWER

The existing standby main distribution system will used which includes all 277/480V and 120/208V switchboards located in the basement. All emergency power to new life safety and standby panelboards will originate from the existing switchboards 2L1 and 2S1. The proposed improvements are shown in the attached Standby One Line Diagram.

POWER DISTRIBUTION AND BRANCH CIRCUITING

Power distribution in the facility will be at 480Y/277V and 208Y/120V and will be distributed in the following manner:

- 480V, 3-phase, motor loads of 1/2 horsepower and larger located in basement
- 208V, single or 3-phase for user equipment and HVAC equipment not available at 480V
- 120V, single phase for receptacle outlets, motors smaller than 1/2 horsepower and interior lighting

The existing panelboard enclosures will be re-used and relocated to each laboratory space. Existing bus and circuit breakers will be replaced for each existing panelboard. Panelboards will be provided as required to satisfy the branch circuit demands of the facility. Panelboards and feeder capacities will be sized as required to accommodate the connected demand loads. A minimum of 20-25% spare capacity will be provided in all panelboards to allow for future modifications. Spare circuit breakers will be provided for added equipment, either during construction or after the facility is occupied. Panelboards will use bolt-on circuit breakers with copper bussing, and will be located in electrical rooms, mechanical spaces, or secure areas where only authorized personnel have access. All panelboards will be provided with door-in-door enclosures.

All lab-specific panels will be located at each laboratory area. Other panels will be installed in the electrical rooms located at each floor. Each electrical room on the first through third floors will contain one common standby panel, one 120/208V distribution board. Individually-mounted motor starters will be used. Larger fans and pumps will have variable frequency drives. Disconnect switches will be provided on all equipment unless integral with the equipment. Motor starters and disconnects will typically be located within the line of sight of each piece of equipment.

Wiring devices, including but not limited to switches and receptacles, will be specification grade 20 amp minimum rated. All wiring devices will be labeled with a clear tape identifying the panel and circuit number serving the device. General use receptacles will be provided throughout the facility, and special purpose receptacles will be provided for equipment as required. Ground fault circuit interrupter (GFCI) receptacles will be provided at locations where receptacles are placed within six feet of wall or floor-mounted sinks, hose bibbs, and above countertops containing sinks. Weatherproof GFCI receptacles with in-use covers will be provided on the exterior of the facility near each exit door and as required.

LIGHTING AND LIGHTING CONTROL

STANDARDS AND GUIDELINES

The design will conform to the most recent version of the following industry standards and design guidelines:

- Oregon Energy Efficiency Specialty Code - 2010
- ASHRAE/IES Standard 90.1
- NFPA 101 – Life Safety Code

Lighting levels will be designed in accordance with the Illuminating Engineers Society of North America (IESNA) and the Oregon Energy Efficiency Code. An attempt will be made to standardize the lamp types used in fixtures throughout the project in order to reduce the number of lamp types needed for replacement.

SYSTEMS DESCRIPTIONS

Lighting levels will be designed in accordance with the Illuminating Engineers Society of North America (IESNA) and the Oregon Energy Efficiency Code. An attempt will be made to standardize the lamp types used in fixtures throughout the project in order to reduce the number of lamp types needed for replacement.

INTERIOR LIGHTING

Lighting design will consider ease of maintenance, energy efficiency, and suitability for the environments. High-efficiency LED lighting will be employed. A variety of fixture types will be used to distribute light in a controlled way that will be efficient, flexible, and will compliment the architecture in their respective spaces. To provide a custom look, fixtures built into architectural elements will be considered.

Classrooms and laboratories will use linear direct/indirect luminaires to provide a better teaching and learning environment. Luminaires will be mounted 12 – 24 inches below ceiling level with ceiling heights at or about 8' AFF. Luminaires will be located to allow for center room projector units. Classrooms and laboratories will use dimming control and be capable of a dimming range of 1% to 90% with variable switching options available allowing for flexibility in lighting levels. Where dimming control is requested in spaces other than classrooms, the dimming range shall be 10% to 90% with variable switching options.

All luminance sources shall be specified with a color rendering index (CRI) of 81 or higher and a correlated color temperature (CCT) of 4000-4100K, for a clean daylight look and feel.

Lighting in all areas shall achieve a max-to-min contrast ratio of 3:1 or better unless otherwise noted. Preliminary target lighting levels indicated below are averages and based on area types.

- Offices 30-35 fc
- Open Areas 30-35 fc
- Classrooms/Labs 30-40 fc
- Conference/Meeting 40-50 fc
- Social Commons 15-25 fc
- Circulation 10-20 fc
- Stairs 10-20 fc
- Storage/Custodial 10-20 fc
- Restrooms 15-20 fc
- Telecom Rooms 45-50 fc (min.)
- Elec./Mech. Rooms 20-30 fc
- Exterior Entries 3-5 fc

EMERGENCY LIGHTING
Emergency egress lighting will consist of standard fixtures with UL924 relay devices that automatically illuminate upon loss of normal power. Egress lighting will be served from life safety panelboards. Lights will be located to provide a one foot-candle average illuminance along the path of egress. Light fixtures in critical areas, such as electrical rooms, will also be provided with backup power from emergency system panelboards.

Emergency exit signs will be green LED type, served from emergency system panelboards, and will be located to provide clear direction to all exits and as required to comply with all applicable codes.

AUTOMATIC LIGHTING CONTROL
Lighting controls that meet the requirements of the Oregon Energy Efficiency Specialty Code will be provided.

Occupancy or vacancy sensors will be installed to control lighting in spaces that include, but are not limited to, offices, restrooms, conference rooms, classrooms/learning spaces, lounges, storage rooms and any other areas where appropriate. Either ceiling-mounted or wall-mounted occupancy sensors will be installed depending on the physical size and specific geometry of the room being controlled.

In open areas, book stacks and restrooms occupancy sensors will operate in an automatic on/automatic off mode. This method of control will be used in lieu of a complex system, in an effort to keep maintenance of the control system to a minimum.

In private offices and meeting rooms, motion sensors will be installed to function as vacancy sensors. Systems will automatically shut off lights when a space is unoccupied and require manual input to turn on lighting in the space. The approach will increase the available energy savings associated with the interior lighting system.

Select lighting will be automatically and continuously dimmed according to the amount of natural daylight present in the space. Typical spaces will be where adequate glazing is available.

COMMUNICATIONS
STANDARDS AND GUIDELINES
Communication systems will conform to the most recent version of the following industry standards and guidelines:
- EIA/TIA Standard 568 and 569

VOICE/DATA
A minimum of two (2) 4-inch conduit pathways will be provided from the tunnel system and routed to the MDF room on the first floor. The University will provide and install all incoming fiber and copper services using these pathways. Additional pathways will be provided from the MDF room to the IDF room. These rooms will be stacked in the building and four (4) 4-inch sleeves will be provided between each floor of the MDF and IDF rooms. Data outlets located on the first and second floors will be served from equipment located within the first floor MDF room. Data outlets located on the third floor and the penthouse will be served from equipment located within the third floor IDF room.

The IDF room will be sized at 8'x10' minimum, and be centrally located in an effort to limit horizontal cable runs to a maximum of 295 feet. These rooms will house active network electronics, patch panels, and other Owner-provided data network equipment. MDF/IDF rooms will act as the transition point between the horizontal and backbone communications cabling for each floor.

IDF rooms will be environmentally controlled and will be locked to prevent unauthorized access. Grounding bus bars will be provided in each of the telecom rooms.
Cable trays will be provided throughout the facility on each floor for communication cable routing. The tray be 18-inches wode and 6-inches high.

Rough-in for telecom outlets will be provided to support four-port telecommunication outlets and wireless access points. This will consist of a 1-inch conduit routed from each telecom outlet to a space above an accessible ceiling or to the cable tray location. Areas where 10-gigabit connections are required will have 1-1/4" conduits routed from their respective outlets to accessible areas or cable trays.

A communications pathway riser diagram is attached for reference on quantity, sizes and locations of expected raceways.

Items currently not included in the scope of work are as follows:

- Telephone System: It is presumed that the University will provide all telephone hardware, wiring, and electronics, such as handsets. Telephone pathways (conduit and cable tray), junction boxes, and backboards will be included as part of this project.
- Data System: Data network wiring and electronics such as Ethernet switches, services, wire LAN access points, uninterruptable power supplies, and other electronic equipment are not included. It is presumed that the University will provide this equipment and all wiring. Data pathways (conduit and cable tray), junction boxes, and backboards will be included as part of the project.
- DAS (Distributed Antenna System): It is presumed the University will provide DAS electronics, copper and fiber optic cabling, and antennas. Pathways (conduit and cable tray) and power for equipment will be included as part of this project.

FIRE ALARM

STANDARDS AND GUIDELINES

Electronic safety and security systems will conform to the most recent version of the following industry standards and guidelines:

- NFPA 72: National Fire Alarm Code
- NFPA 101: Life-Safety Code
- Uniform Fire Code
- Oregon Structural Specialty Code

FIRE DETECTION AND ALARM

A new fire alarm panel will be provided in the basement. The panel will be connected to the existing campus fire alarm signal loop to provide notification at UOPD headquarters. Additional addressable power supplies will be provided where additional capacity is required and will be located in the electrical rooms.

Alarms will be reported at the fire alarm annunciator panel located at the main entry vestibule. A manual pull station will be provided adjacent to the fire alarm annunciator panel. Manual pull stations will be double-action of the non-coded type with a key reset switch.

Smoke detectors will be provided where required by Code and by the Fire Marshal. Photoelectric-type duct smoke detectors with auxiliary relays will be installed in mechanical air ducts in accordance with International Mechanical Code (IMC) and will shut down air handling units upon alarm. Heat detectors will be provided as required by Code. Flow and tamper switches with supervisory interface modules will be provided for building sprinkler systems.

Fire alarm notification devices consisting of horn and/or strobe units will be provided in public spaces and all required spaces other than private offices. Horn locations will be established to provide sufficient sound levels to alert occupants.

3i. PROPOSED IMPROVEMENTS - FIRE SUPPRESSION BY SYSTEMS WEST ENGINEERS, INC

Access to the main fire sprinkler riser at the northwest corner of the basement is a major issue with the existing Huestis fire sprinkler system. Currently, access is significantly blocked by piping that serves the Lokey Laboratory. While it is possible to get to the riser, access is difficult and does not meet NFPA requirements. There does not appear to be a practical way to improve access, and relocation of the riser would be required to address the problem.

The relocated riser would be installed at the south end of the Huestis basement, adjacent to the existing Zebrafish Laboratory water service entrance. We assume that the water service size and service pressure along 13th Avenue at the south end of Huestis is adequate to provide fire flow.

The existing fire department connection would be reconnected to the new riser. The existing standpipes, zone stations, and main piping would be reused to the extent possible, while all runout piping and sprinkler heads outside of the Zebrafish and Lokey Laboratory zones would be replaced with new.

Schedule 40 and schedule 10 black steel piping with mechanical couplings and threaded fittings would be used throughout. Overhangs that are four feet and larger will be protected by dry heads connected to the wet pipe system.

POTENTIAL NEW FIRE RISER LOCATION

3j. PROPOSED IMPROVEMENTS - MEP CONSTRUCTION PHASING BY SYSTEMS WEST ENGINNERS, INC

The existing Zebrafish and Lokey Laboratories must remain operational during the construction period. While most existing mechanical, electrical, and plumbing systems are independent for each, there is some overlap. To address the overlap, modifications to isolate systems, construction of some temporary services, and a specific construction sequence will be required. The following approach is intended to demonstrate feasibility. A more direct approach could likely be developed as part of actual design.

PHASE 1 - ISOLATION EXISTING BUILDING AIR SUPPLY AND EXHAUST SYSTEMS

All first, second, and third floor HVAC systems are isolated from the Zebrafish and Lokey Laboratories. However, the north portion of the basement is served by Huestis supply and general exhaust systems, and two (2) hoods in the Zebrafish Laboratory are connected to the existing Huestis laboratory exhaust system.

To provide supply air to the north basement, the northernmost air handling unit will remain operational. Ductwork serving the south risers and the first through third floors above the north basement will be disconnected. Areas in the north basement served by other fans will be connected to the northernmost air handling unit. The unit will remain in place and continue operating until the Huestis systems are brought online.

General exhaust from the north basement will remain connected to an existing general exhaust fan on the roof which will need to remain operational until the Huestis systems are online. The exhaust fan can remain in the new penthouse during construction since the exhaust is not associated with laboratories or other non-recirculating services.

Potentially, the two (2) fume hoods could be temporarily connected to the existing Lokey Laboratory main laboratory exhaust riser which is routed through the north portion of the basement and up the north stair tower. Alternately, a temporary laboratory exhaust fan could be installed on the roof outside of the penthouse area and connected to the existing exhaust risers located in one of the south core chases. The connection to the Lokey system or the temporary fan will remain in place until the new Huestis systems are operational. At that time, they will be connected to the main Huestis laboratory exhaust systems.

To keep the rooftop fans operational, one of the electrical panels in the existing penthouse that contains the RO water system will need to be kept in service until new power is installed in the area. The panel is fed directly from the basement, and additional work is not required.

PHASE 2 - ISOLATION HYDRONIC AND PLUMBING SYSTEMS

After completion of Phase 1 work, all air-side systems will be separate from the upper floors, and the central and southernmost air handling units could be demolished and the space may be used to install of temporary services needed to isolate the remaining building systems. Remaining services to be isolated include:

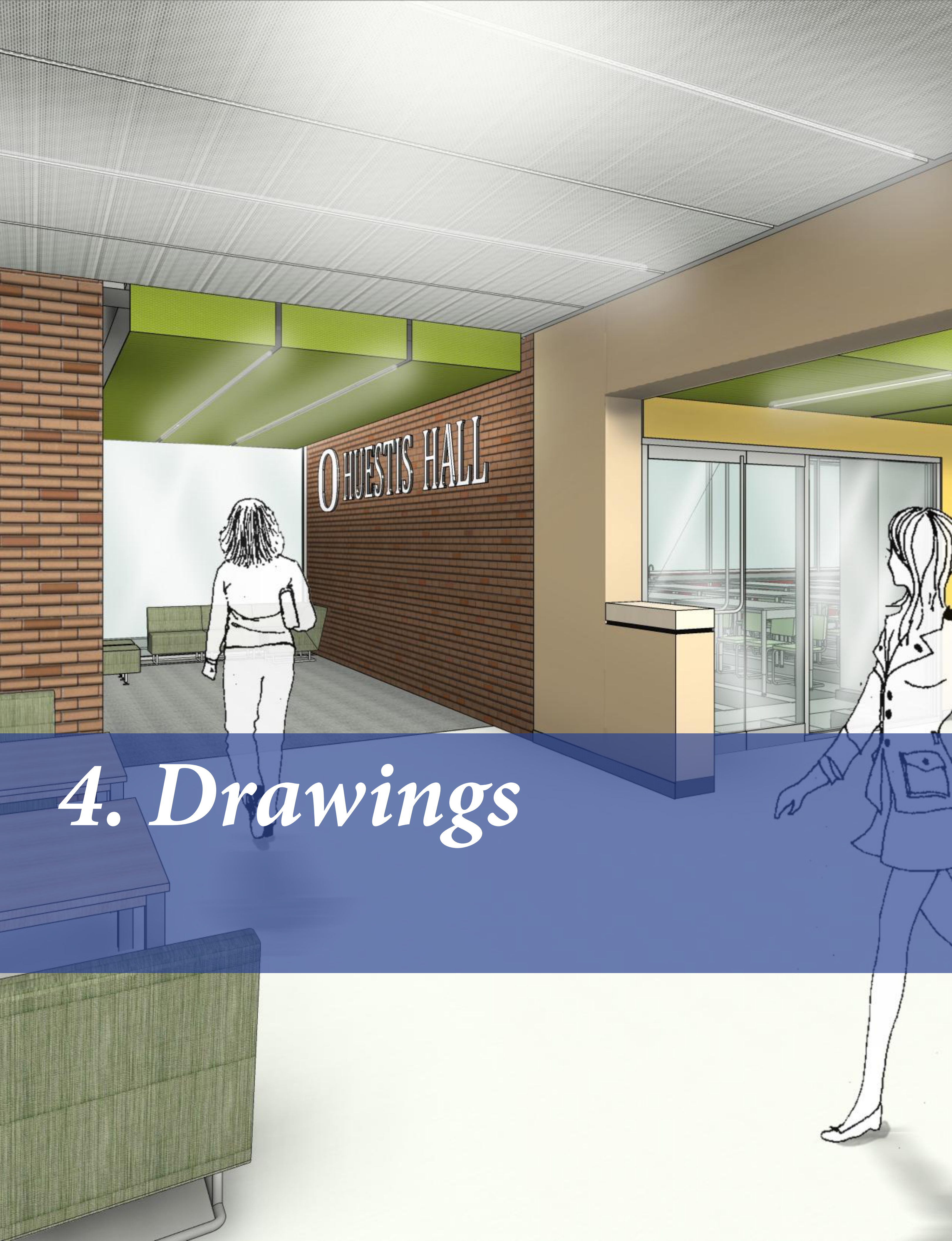
- Zebrafish Heating and Chilled Water Systems: The Zebrafish Laboratory heating and chilled water systems are inter-tied with the Huestis systems in an area located directly south of the existing supply air handling units. New hydronic systems will replace existing systems, and it does not appear practical to construct the new systems in this space while keeping the Zebrafish Laboratory operational. To address the issue, temporary chilled water and heating water services for the Zebrafish Laboratory could be installed in the space vacated by the air handling units. Potentially, converters and pumps that currently serve Huestis could be repurposed for the temporary service. After the temporary service is operational, all existing Huestis and the current Zebrafish Laboratory hydronic systems can be demolished allowing installation of new services.
- Domestic Cold Water: The Zebrafish Laboratory domestic cold water is fed from the Huestis service. A temporary connection to an existing separate Zebrafish Laboratory water service will be required. Backflow preventers will be required on the laboratory and domestic water lines.
- Domestic and Laboratory Hot Water: The Zebrafish domestic hot water and laboratory hot water heaters will be replaced. To provide temporary service, electric domestic hot water heaters will be installed in the temporary services area.
- Compressed Air: Currently, the Zebrafish and Lokey Laboratories are served from the Huestis system. It does not appear practical to keep the Huestis system operational during construction, and installation of a temporary compressor connected directly to the Lokey and Zebrafish Laboratory air dryers will be required. Again, the unit will be installed in the temporary services area.

PHASE 3 - BASEMENT WORK

After completion of Phase 2 work, the Zebrafish and Lokey Laboratories will be isolated from Huestis and all construction work could be completed except for construction of the new autoclave and fish quarantine areas in the basement. These areas cannot be constructed until the Huestis HVAC systems are operational.

After the systems are operational, the existing north supply fan and the associated motor control center will be demolished, and the existing RO water storage tanks and pumps will be relocated to the same area as the new hydronic systems. Removal of this equipment will allow work in the basement to be completed including reconnection of temporary services to new building systems.

4. Drawings



HUESTIS HALL FEASIBILITY STUDY
IMPROVEMENT DRAWINGS

DRAWING INDEX:

G1	COVER SHEET
A1	BASEMENT CONCEPTUALPLAN
A2	FIRST FLOOR CONCEPTUAL PLAN
A3	SECOND FLOOR CONCEPTUAL PLAN
A4	THIRD FLOOR CONCEPTUAL PLAN
M1	BASEMENT MECHANICAL PLAN
M2	LEVEL 1 MECHANICAL PLAN
M3	LEVEL 2 MECHANICAL PLAN
M4	LEVEL 3 MECHANICAL PLAN
M5	ROOF MECHANICAL PLAN
M6	TYPICAL LABORATORY LAYOUT
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M8	HYDRONIC DIAGRAM
M9	HVAC DIAGRAM
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P9	LABORATORY WATER SYSTEM DIAGRAM
P10	SANITARY & ACID WASTE SYSTEM DIAGRAM
P11	NATURAL GAS AND COMPRESSED AIR SYSTEM DIAGRAMS
P12	VACUMME AND RO SYSTEM DIAGRAMS
E1	GENERAL NOTES, DRAWING SYMBOLS, AND ABBREVIATIONS
E2	TYPICAL LABORATORY LIGHTING LAYOUT
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E4	ONE-LINE DIAGRAM - DEMOLITION
E5	STANDBY POWER ONE-LINE DIAGRAM - DEMOLITION
E6	POWER ONE-LINE DIAGRAM (PART 1)
E7	POWER ONE-LINE DIAGRAM (PART 2)
E8	STANDBY POWER ONE-LINE DIAGRAM
E9	FIRE ALARM SYSTEM RISER DIAGRAM
E10	COMMUNICATIONS PATHWAY RISER DIAGRAM

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UO HUESTIS HALL
FEASIBILITY STUDY

SHEET NUMBER
G1

BASEMENT CONCEPTUAL PLAN

1/16" = 1'-0"

DEPARTMENT LEGEND:

- BUILDING SUPPORT
- BUILDING SUPPORT (NO WORK)
- CIRCULATION
- CORRIDOR
- ELECTRICAL ROOM
- ELEVATOR
- ELEVATOR MACHINE ROOM
- EXISTING ALL-USE RESTROOM
- IDF ROOM
- LOKEY LABORATORY (NO WORK)
- MECHANICAL
- MEDIA KITCHEN
- STAIR TOWER
- UTILITY SHAFT
- ZEBRAFISH EXPANSION AREA
- ZEBRAFISH LABORATORY (NO WORK)
- ZEBRAFISH RENOVATION AREA

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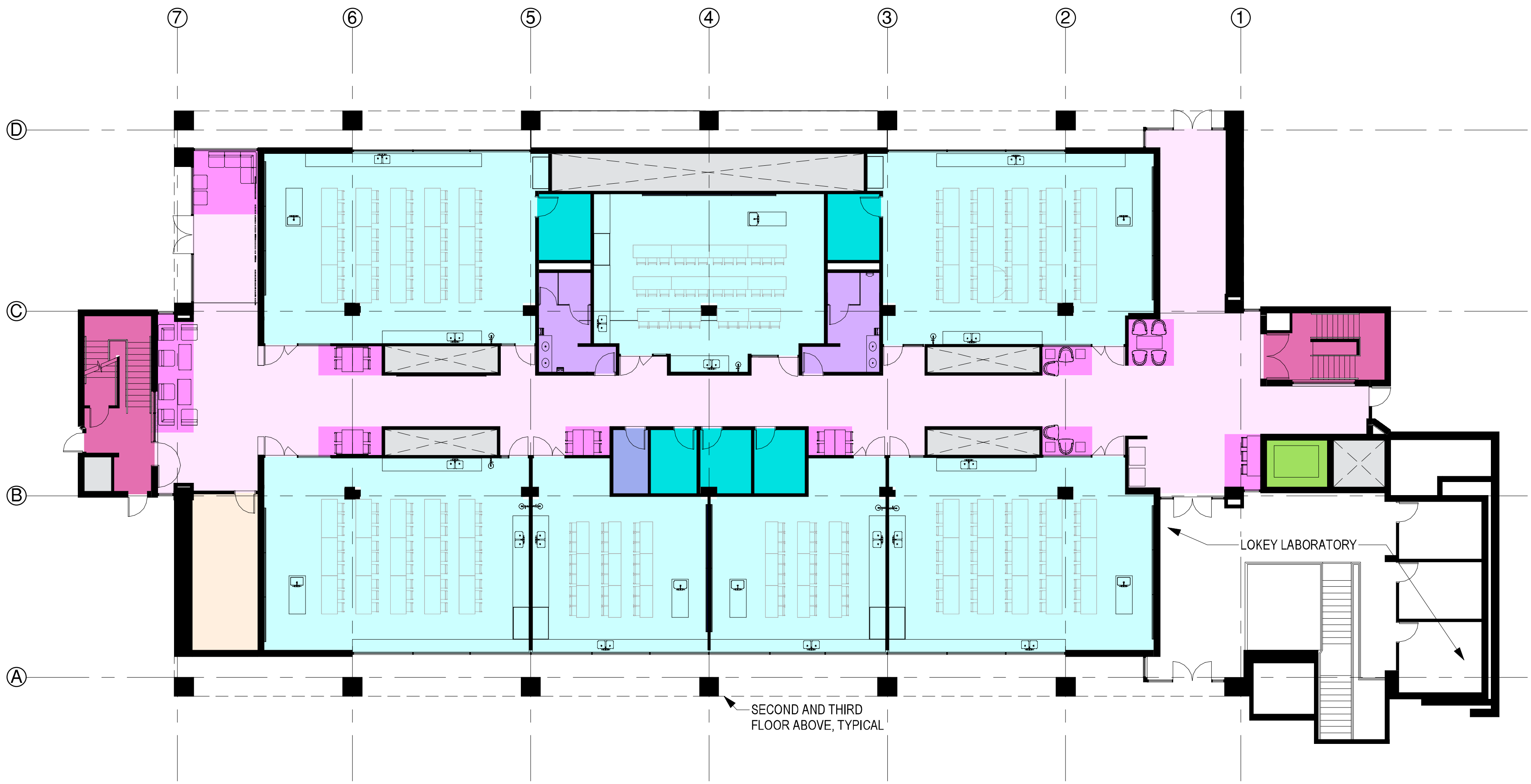
FEASIBILITY STUDY

SHEET NUMBER
A1



NORTH

FIRST FLOOR CONCEPTUAL PLAN

1/16" = 1'-0"

DEPARTMENT LEGEND:

- BREAK-OUT SPACE
- CORRIDOR
- ELECTRICAL ROOM
- ELEVATOR
- OFFICE
- RESEARCH CLASSROOM
- RESTROOMS
- STAIR TOWER
- STORAGE
- UTILITY SHAFT

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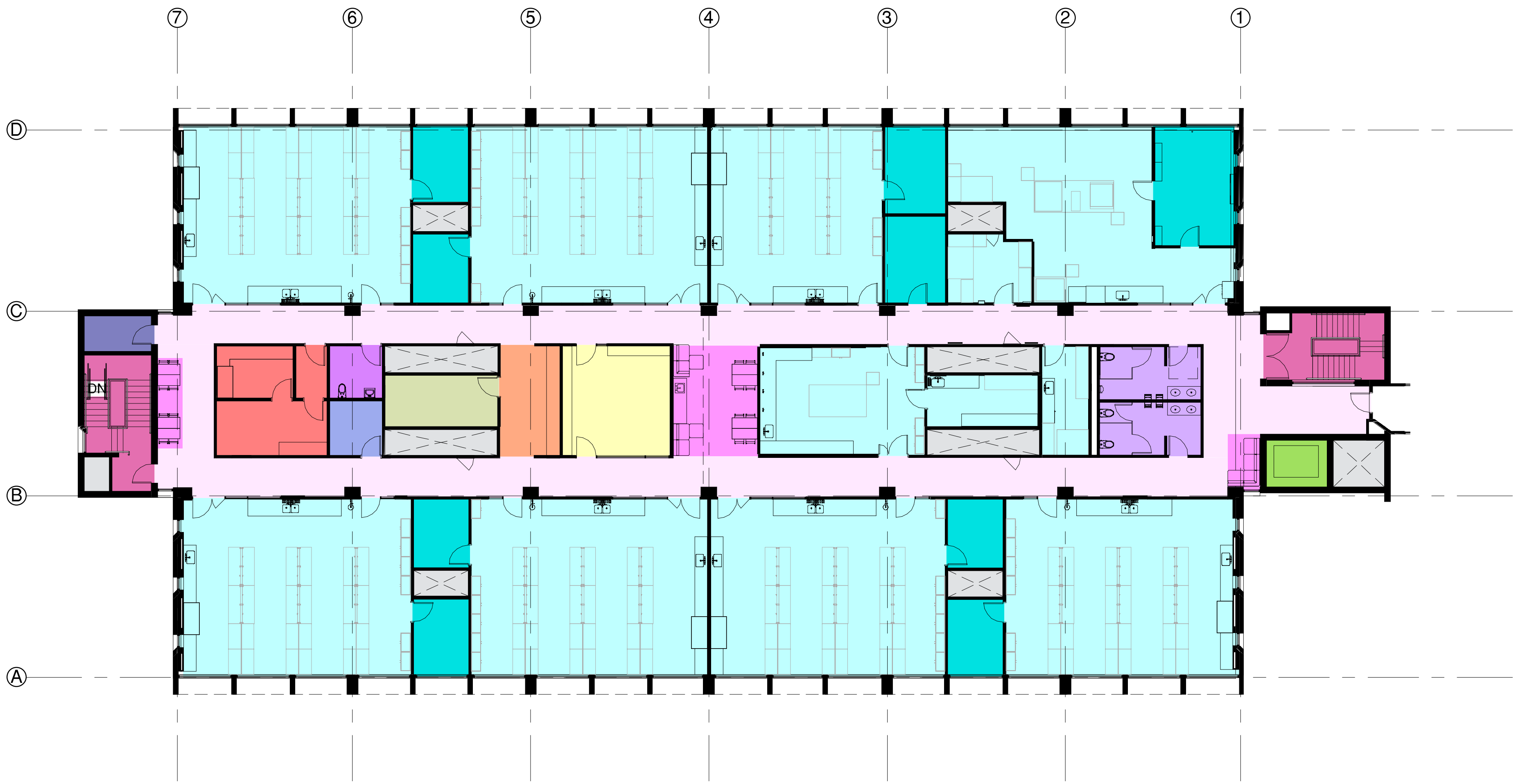
FEASIBILITY STUDY

SHEET NUMBER
A2



SECOND FLOOR CONCEPTUAL PLAN

1/16" = 1'-0"

DEPARTMENT LEGEND:

ALL-USE RESTROOM	ELECTRICAL ROOM	PRINT/MAIL ROOM
BREAK-OUT SPACE	ELEVATOR	RESEARCH LABORATORY
CONFERENCE ROOM	HOUSING FACILITY	RESTROOMS
CORRIDOR	IDF ROOM	STAIR TOWER
CUSTODIAL	OFFICE	UTILITY SHAFT

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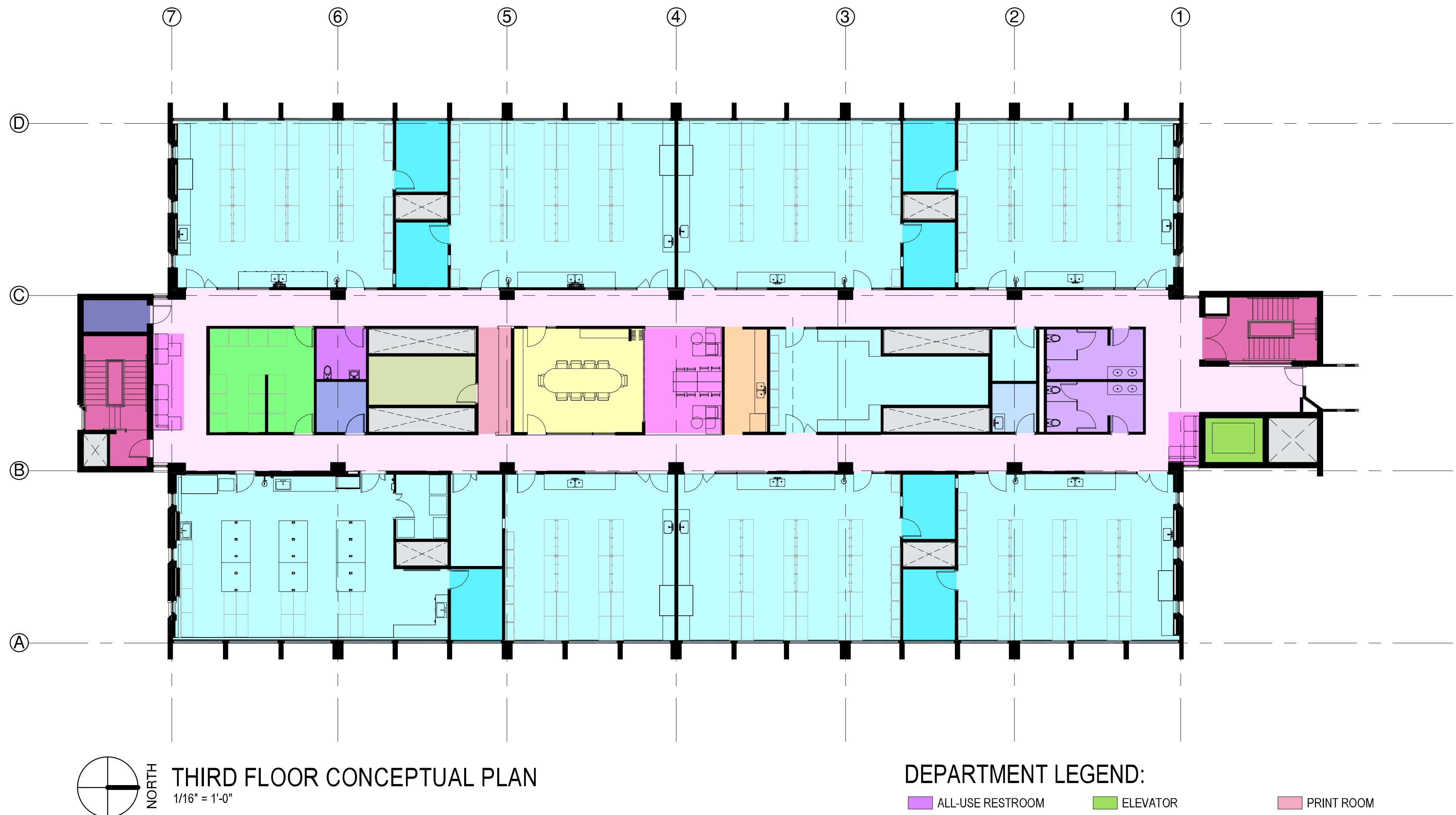
FEASIBILITY STUDY

SHEET NUMBER
A3



THIRD FLOOR CONCEPTUAL PLAN

1/16" = 1'-0"

DEPARTMENT LEGEND:

- ALL-USE RESTROOM
- BREAK-OUT SPACE
- CONFERENCE ROOM
- CORRIDOR
- CUSTODIAL
- ELECTRICAL ROOM
- ELEVATOR
- FREEZER FARM
- IDF ROOM
- KITCHENETTE
- LACATION
- OFFICE / FLEX SPACE
- PRINT ROOM
- RESEARCH LABORATORY
- RESTROOMS
- STAIR TOWER
- UTILITY SHAFT

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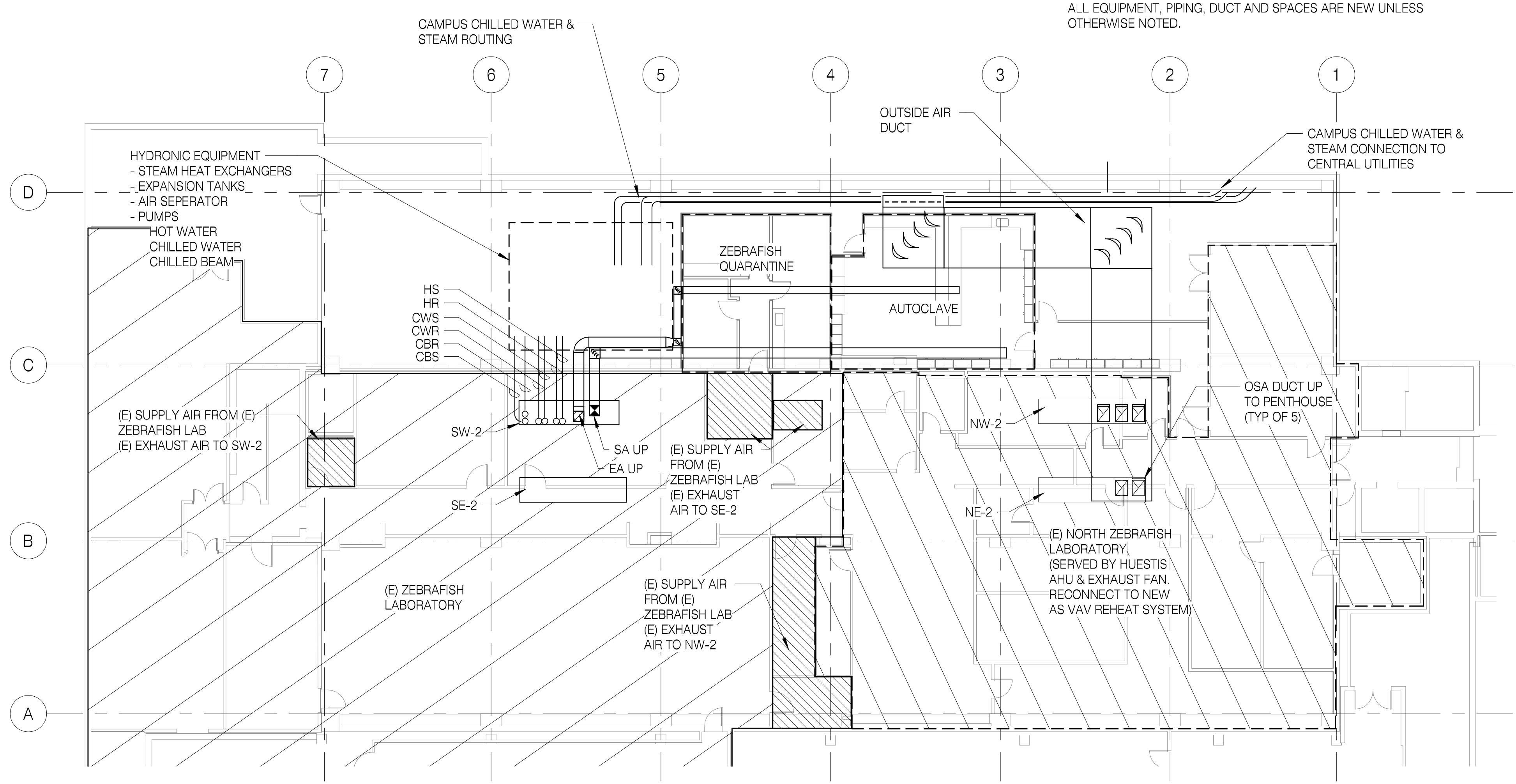
FEASIBILITY STUDY

SHEET NUMBER
A4

SHEET NOTES:

ALL EQUIPMENT, PIPING, DUCT AND SPACES ARE NEW UNLESS OTHERWISE NOTED.



BASEMENT MECHANICAL PLAN

1/16" = 1'-0"

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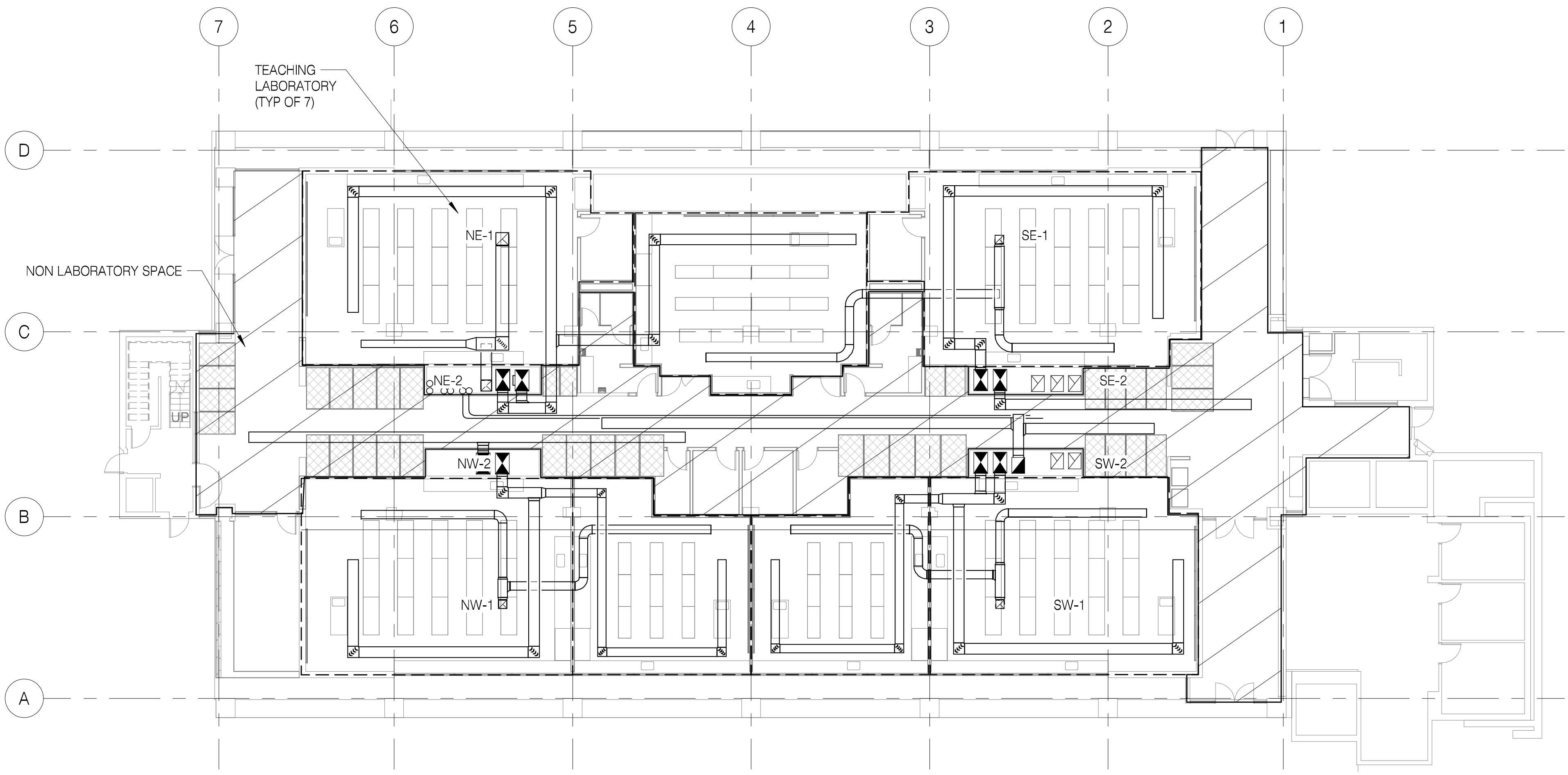
FEASIBILITY STUDY

SHEET NUMBER
M1



LEVEL 1 MECHANICAL PLAN

1/16" = 1'-0"

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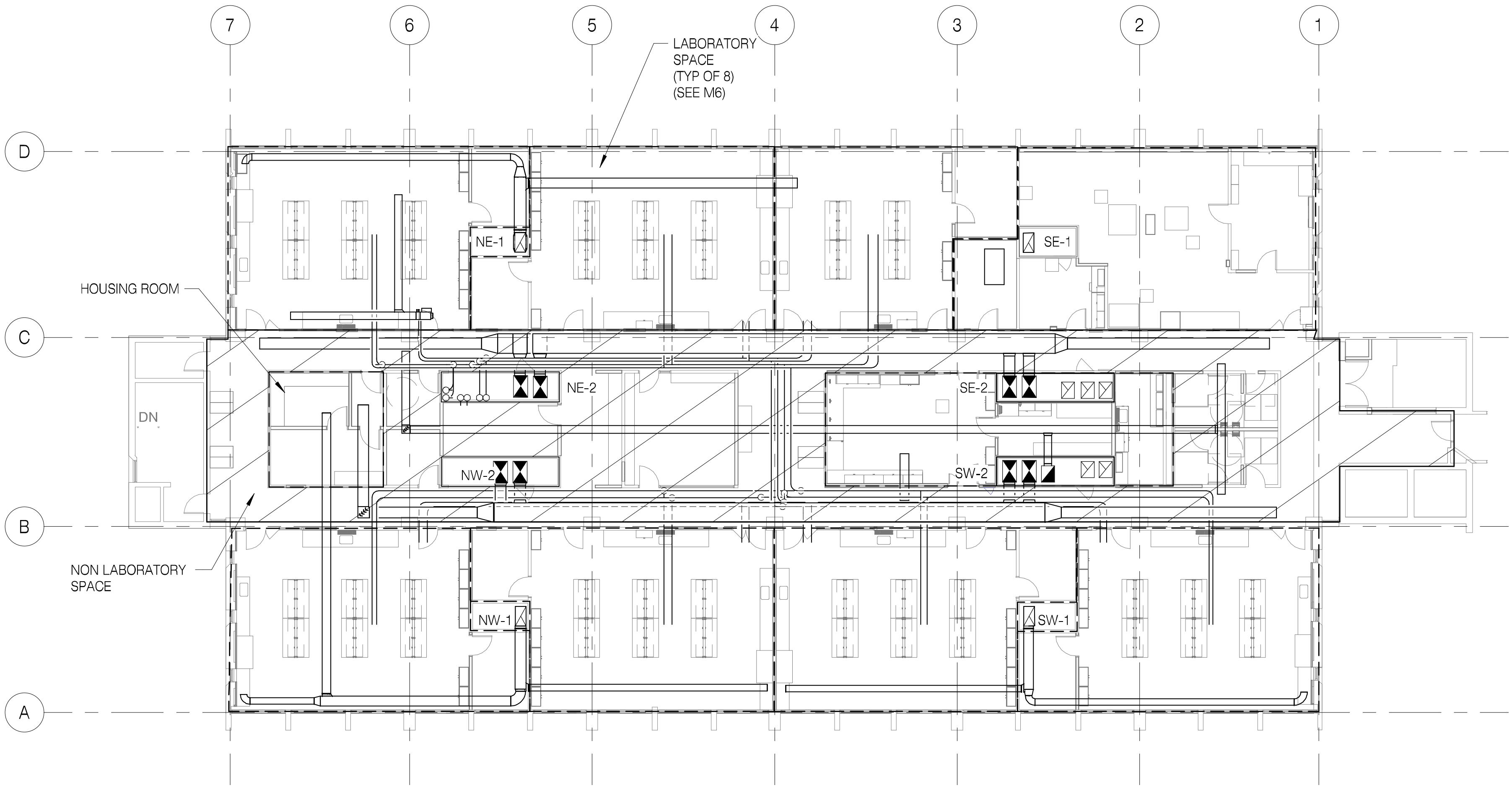
SHEET NUMBER
M2



LEVEL 2 MECHANICAL PLAN

1/16" = 1'-0"

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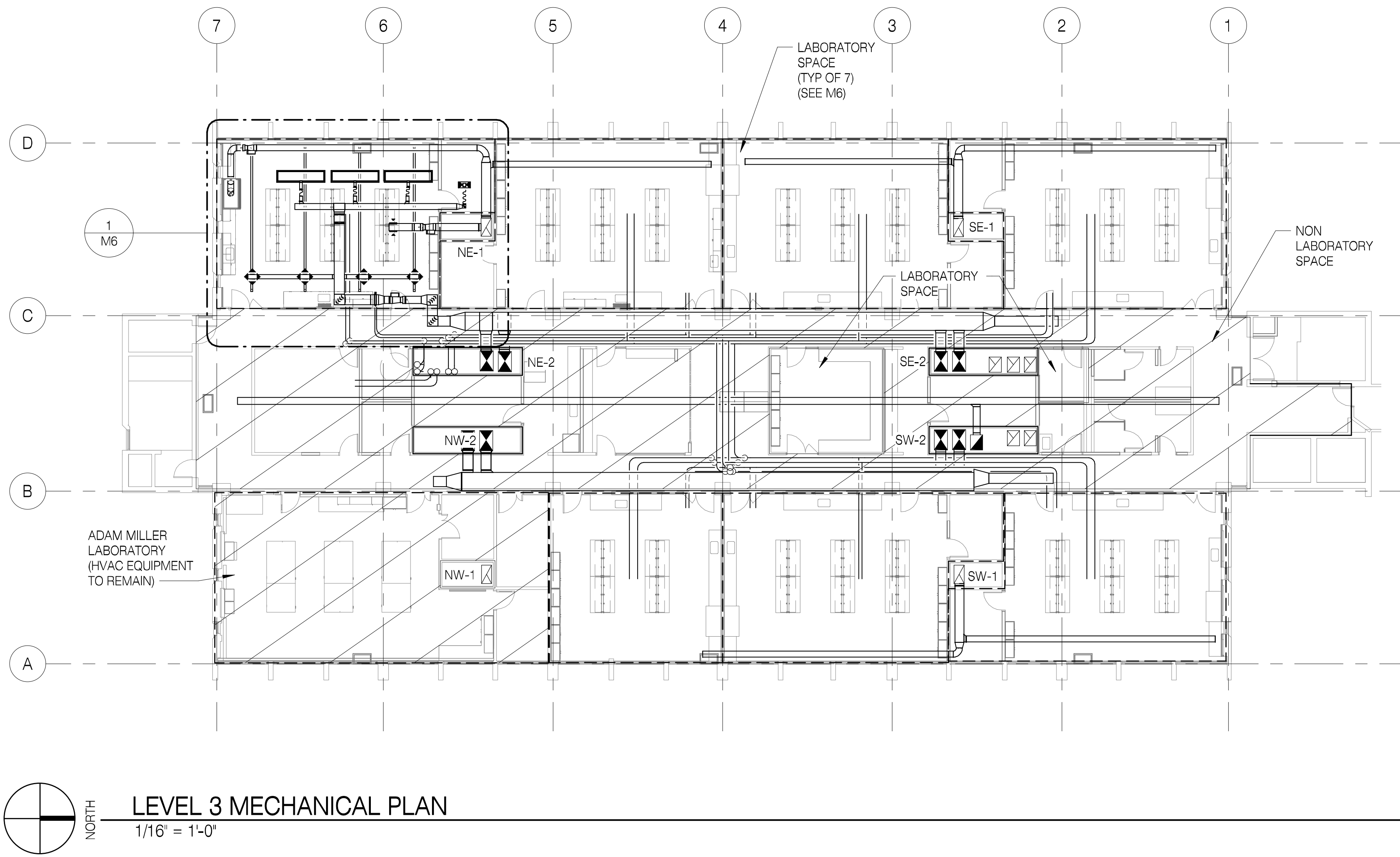
SHEET NUMBER
M3



LEVEL 3 MECHANICAL PLAN

1/16" = 1'-0"

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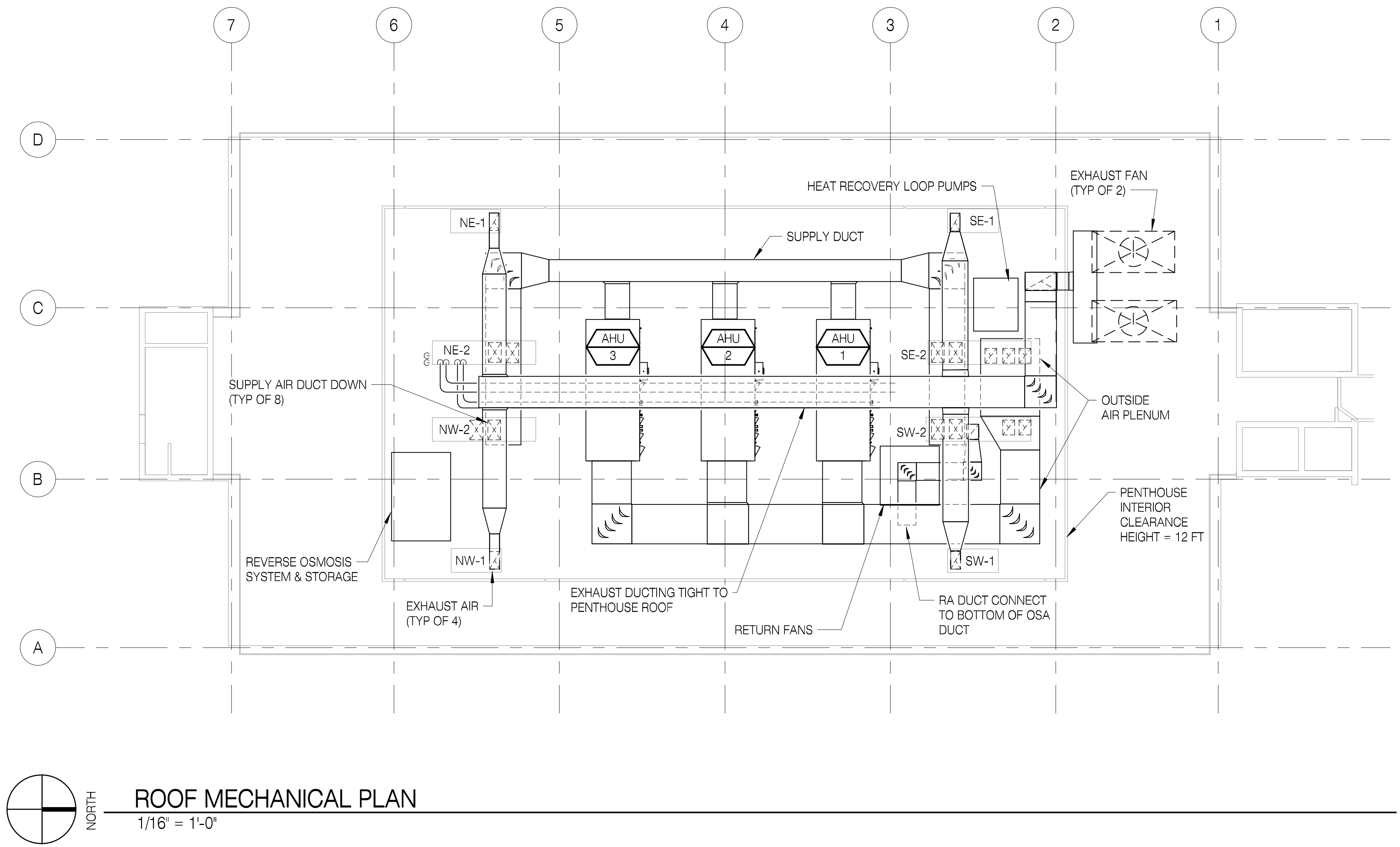
SHEET NUMBER
M4



ROOF MECHANICAL PLAN

1/16" = 1'-0"

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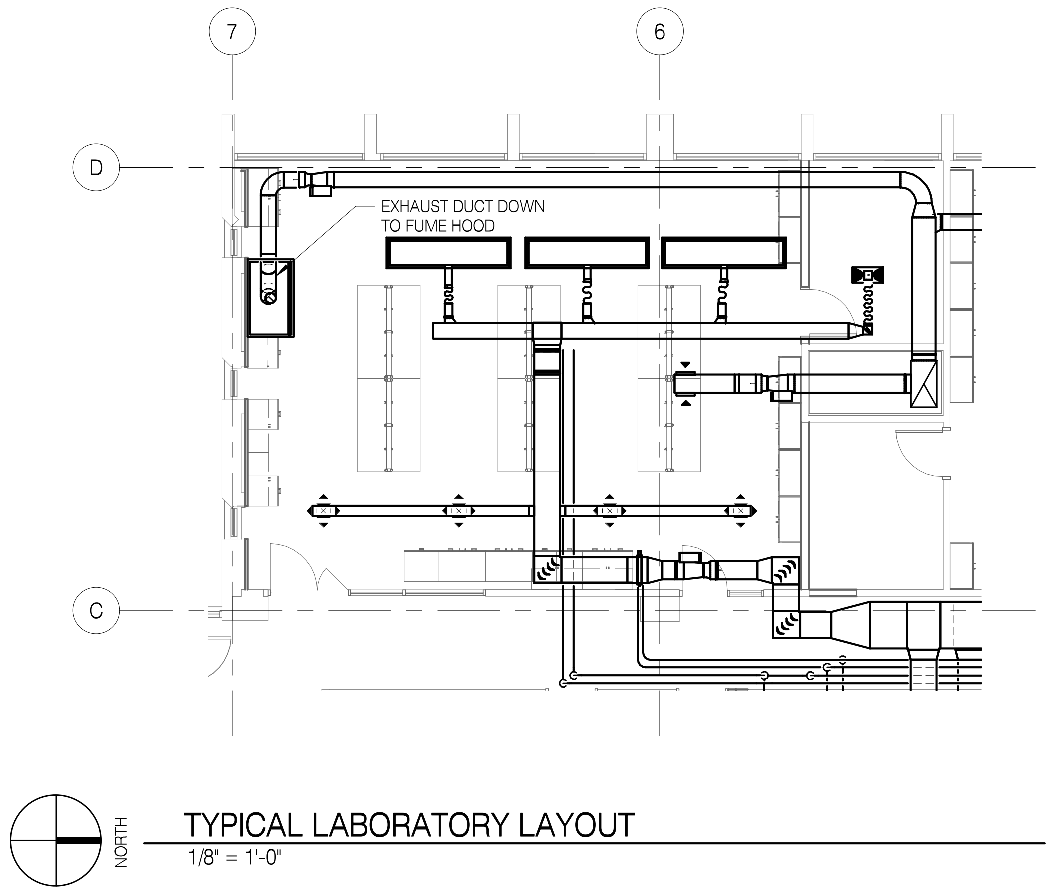
SHEET NUMBER
M5



TYPICAL LABORATORY LAYOUT

1/8" = 1'-0"

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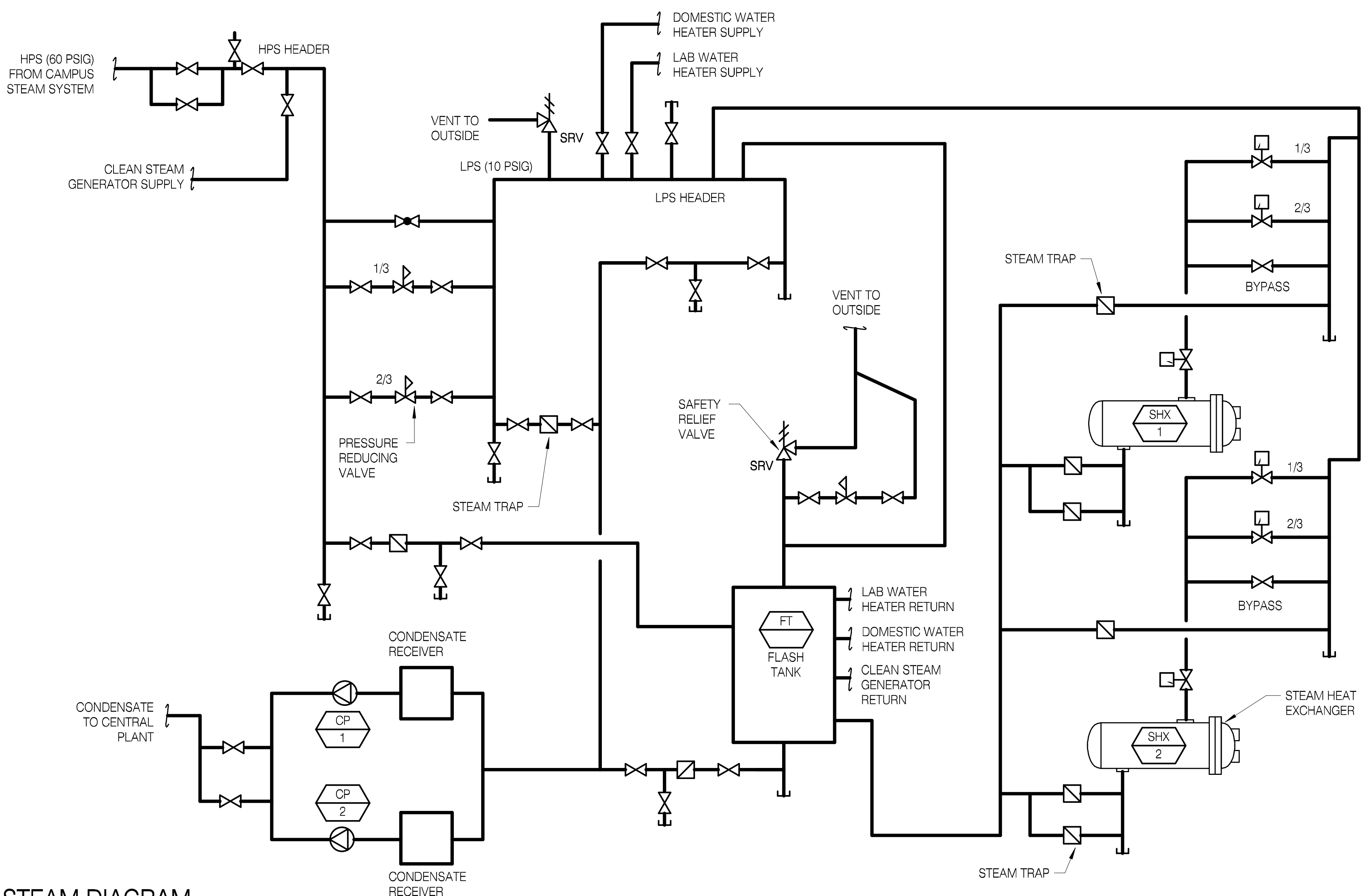
SHEET NUMBER
M6



STEAM DIAGRAM

NOT TO SCALE

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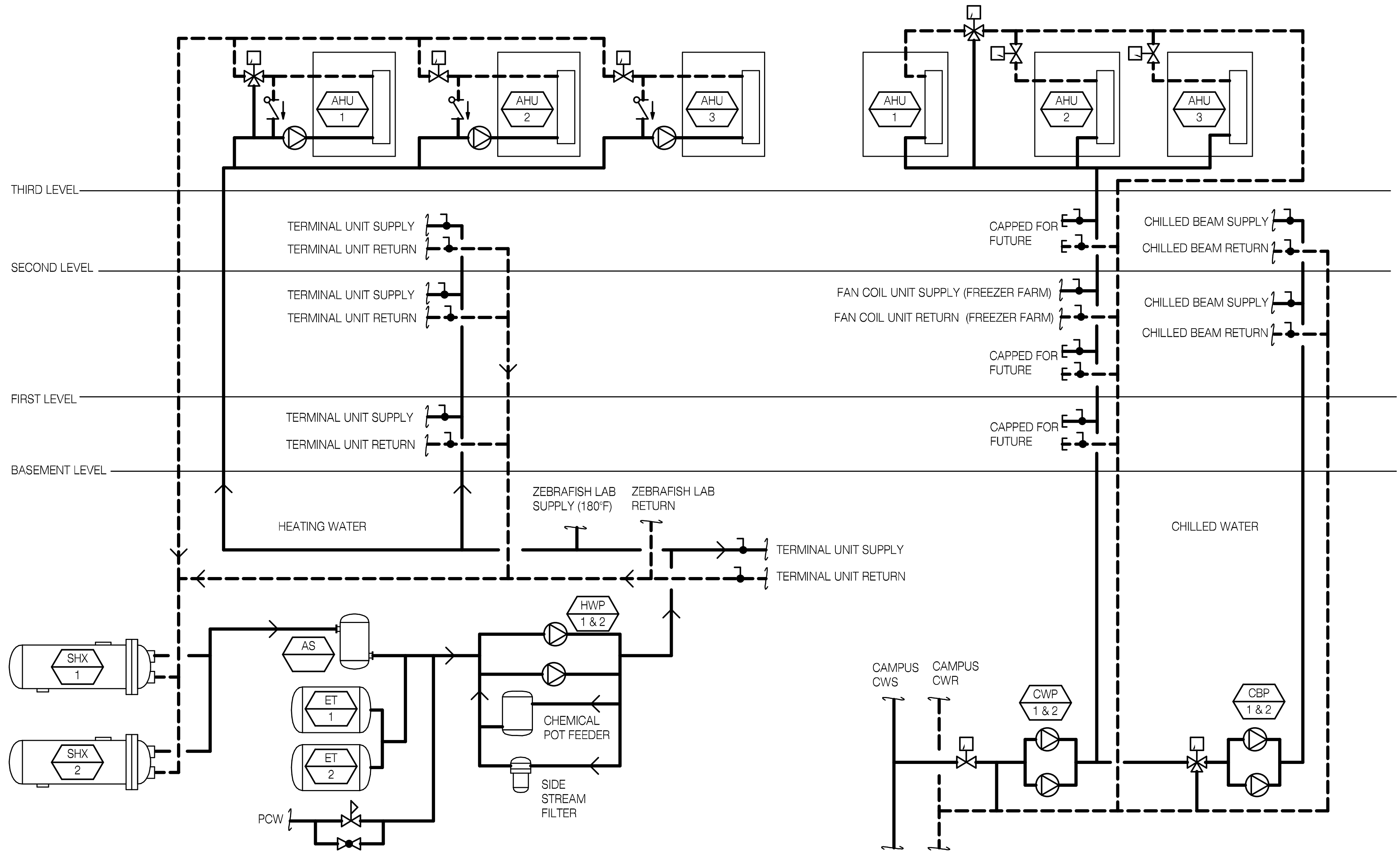
FEASIBILITY STUDY

SHEET NUMBER
M7



HYDRONIC DIAGRAM

NOT TO SCALE

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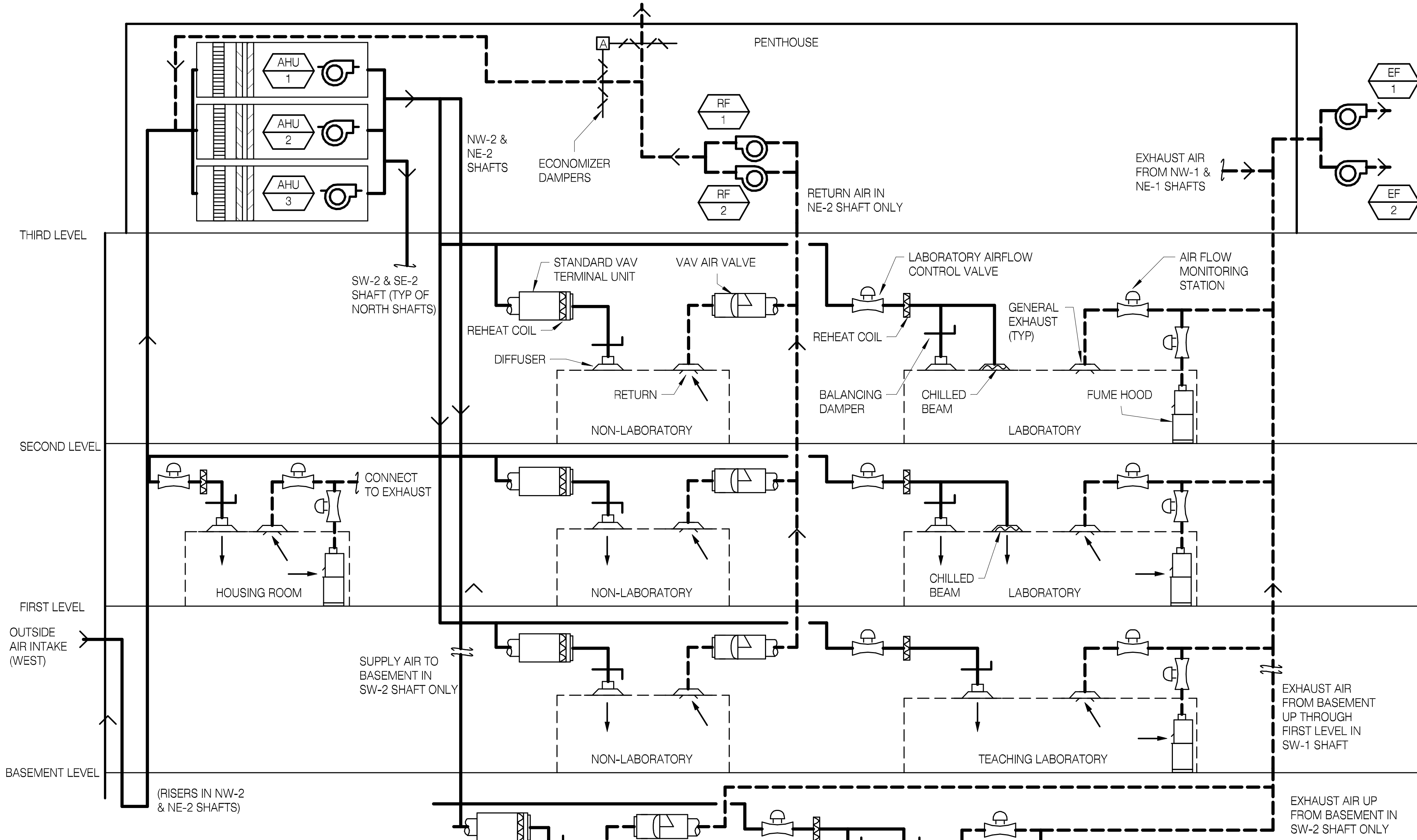
FEASIBILITY STUDY

SHEET NUMBER
M8



HVAC DIAGRAM

NOT TO SCALE

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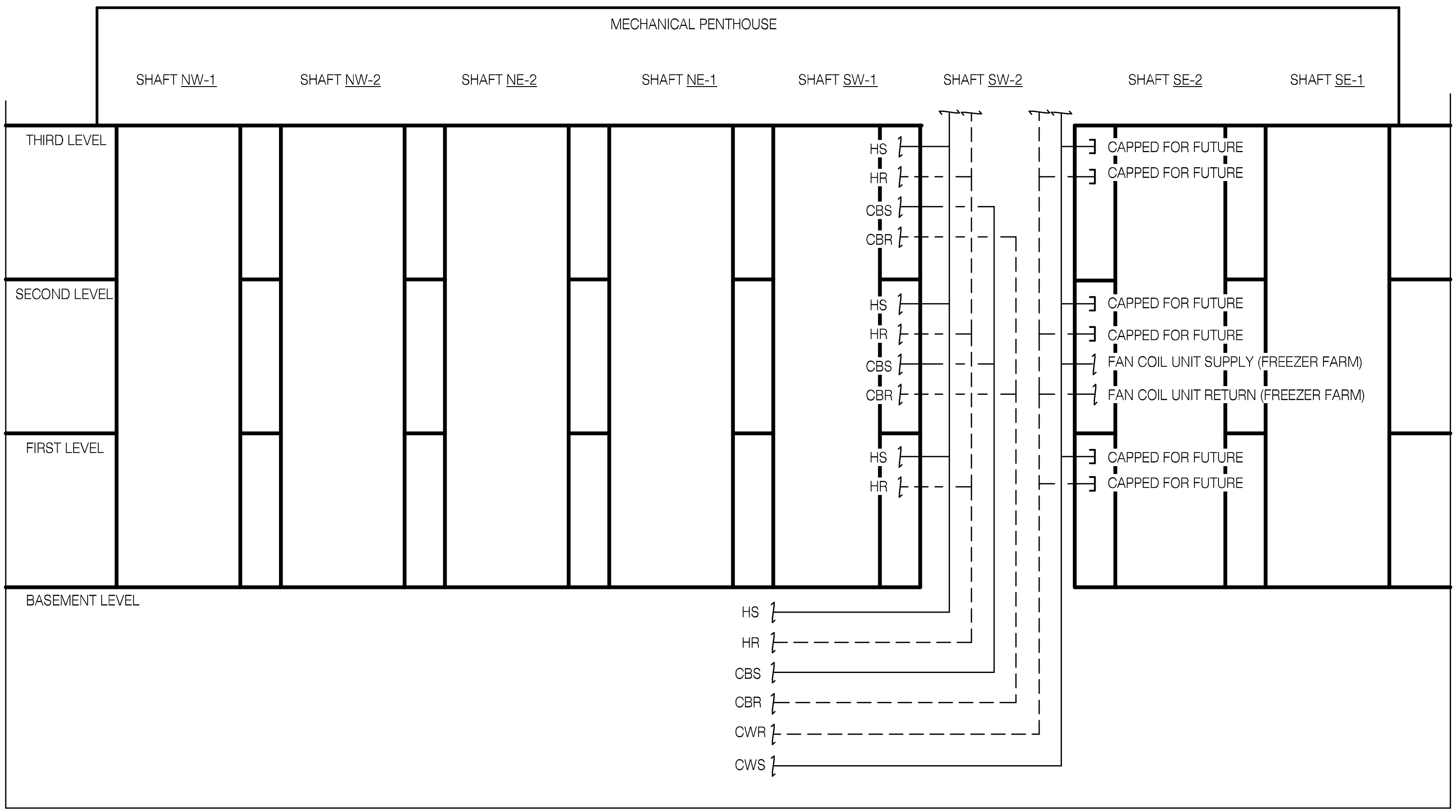
FEASIBILITY STUDY

SHEET NUMBER
M9



HYDRONIC RISER DIAGRAM

NOT TO SCALE

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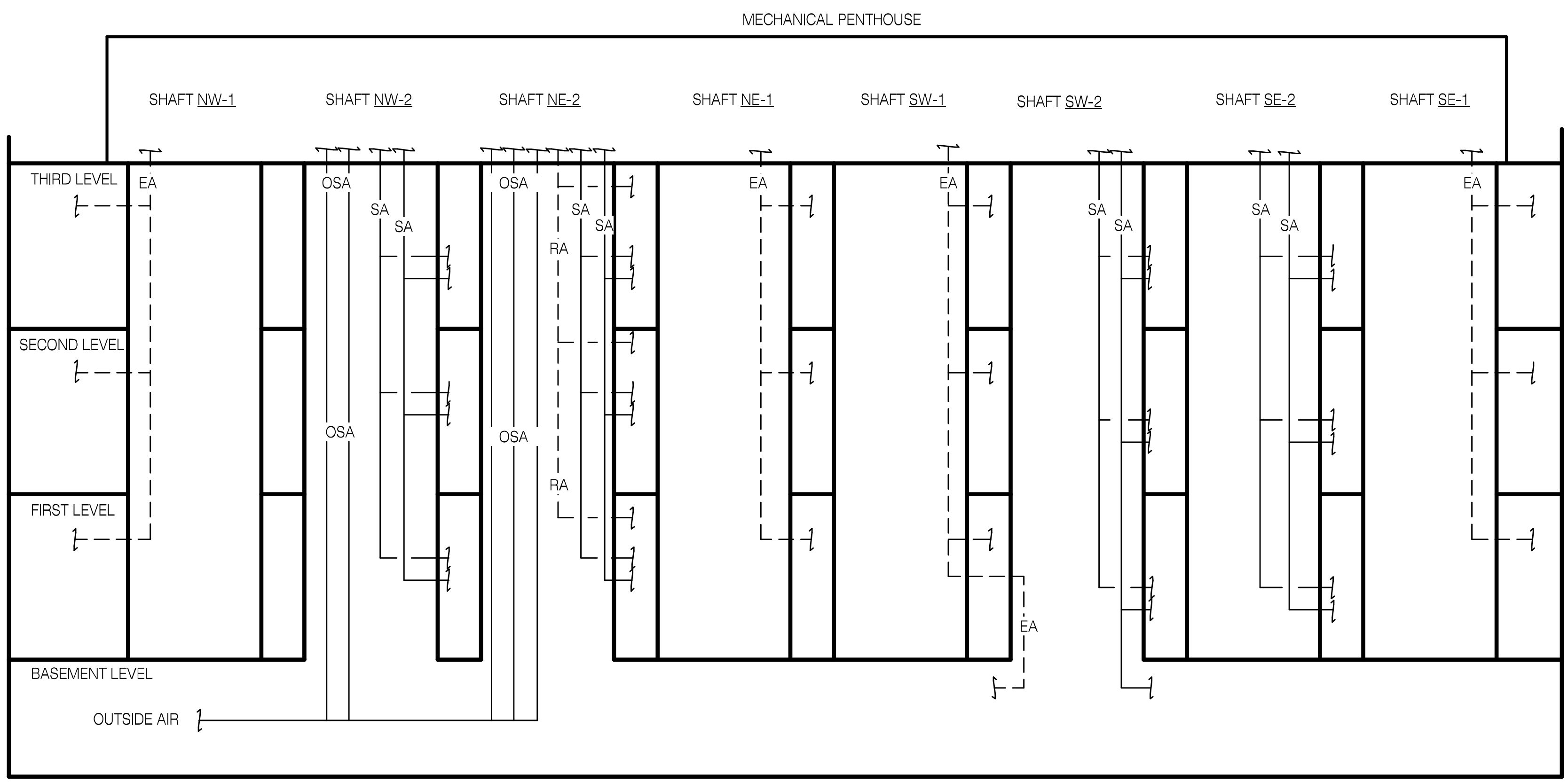
FEASIBILITY STUDY

SHEET NUMBER
M10



HVAC DUCT RISER DIAGRAM

NOT TO SCALE

SYSTEMS WEST ENGINEERS, INC.

UO HUESTIS HALL
FEASIBILITY STUDY

SHEET NUMBER
M11

PLUMBING LEGEND

PIPING

FIRE PROTECTION PIPING:

SYMBOL	ABBREV.	DESCRIPTION
F	F	FIRE SPRINKLER SUPPLY

PLUMBING & LABORATORY PIPING:

SYMBOL	ABBREV.	DESCRIPTION
·	CW	POTABLE COLD WATER
· ·	HWS	POTABLE HOT WATER
· · ·	HWR	POTABLE HOT WATER RETURN
TPS	TPS	POTABLE TEPID WATER SUPPLY
TPR	TPR	POTABLE TEPID WATER RETURN
NP	NP	NON-POTABLE COLD WATER
	W	SANITARY WASTE
AW	AW	ACID WASTE
PW	PW	PUMPED WASTE
	V	VENT
AV	AV	ACID VENT
D	D	DRAIN
SD	SD	STORM DRAIN
OD	OD	OVERFLOW DRAIN
PSW	PSW	PUMPED STORM WATER
GAS	GAS	NATURAL GAS
AIR	AIR	COMPRESSED AIR
LCW	LCW	LAB COLD WATER
LHW	LHW	LAB HOT WATER
LHWR	LHWR	LAB HOT WATER RETURN
RO	RO	REVERSE OSMOSIS WATER
VAC	VAC	LABORATORY VACUUM

SYMBOL	ABBREV.	DESCRIPTION
		PIPING UP
		PIPING DOWN
S = .01		SLOPE OF PIPE IN DECIMALS OF FEET
		CAPPED PIPE
		PIPE REDUCING FITTING: CONCENTRIC, ECCENTRIC
		DIRECTION OF FLOW
		UNION
		PUMP
	BV	BALL VALVE
	BFV	BUTTERFLY VALVE
	CHV	CHECK VALVE
	GV	GATE VALVE
		ECCENTRIC PLUG VALVE
	PRV	PRESSURE REGULATING VALVE
		WYE STRAINER
		PRESSURE GAUGE
M		METER, SELF-CONTAINED
	FD	FLOOR DRAIN
RP		REDUCED PRESSURE BACKFLOW PREVENTER

GENERAL

SYMBOL	ABBREVIATION	DESCRIPTION
(E)		EXISTING
ϕ OR dia		DIAMETER
		NEW TO EXISTING POINT OF CONNECTION
2		NOTE REFERENCE MARKER
2 / M-121; 2 / M-501	PLAN / DETAIL NUMBER / SHEET NUMBER	PLAN OR DETAIL REFERENCE MARKER
EF / 2	EQUIPMENT TYPE / EQUIPMENT NUMBER	EQUIPMENT MARKER
208		ROOM NUMBER
		EXISTING SHOWN LIGHT
		NEW WORK SHOWN BOLD
		EXISTING TO BE REMOVED

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AFS	AUTOMATIC FIRE SPRINKLER
AL	ALUMINUM
ALT	ALTERNATE
BAS	BUILDING AUTOMATION SYSTEM
BHP	BRAKE HORSEPOWER
BOP	BOTTOM OF PIPE
BTUH	BRITISH THERMAL UNITS PER HOUR
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
CONT	CONTINUATION
Dba	DECIBELS ACOUSTIC
DN	DOWN
EFF	EFFICIENCY
EWT	ENTERING WATER TEMPERATURE
FLA	FULL LOAD AMPS
FT	FEET
FT WC	FEET WATER COLUMN
FUT	FUTURE
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GYP BD	GYPSUM WALL BOARD
HP	HORSEPOWER
HZ	HERTZ (CYCLES PER SECOND)
IE	INVERT ELEVATION
IN	INCHES
IN WC	INCHES WATER COLUMN
IW	INDIRECT WASTE
LBS	POUNDS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTUs per HOUR
MCA	MINIMUM CIRCUIT AMPS
MFGR	MANUFACTURER
MIN	MINIMUM
MOP	MAX. OVERCURRENT PROTECTION
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NPSH	NET POSITIVE SUCTION HEAD
OFCI	OWNER FURNISHED/ CONTRACTOR INSTALLED
PD	PRESSURE DROP
PH	PHASE
PSIG	POUNDS per SQUARE INCH GAUGE
REQ'D	REQUIRED
RPM	REVOLUTIONS per MINUTE
SS	STAINLESS STEEL
STL	STEEL
TYP	TYPICAL
VFD	VARIABLE FREQUENCY DRIVE
WC	WATER COLUMN
WG	WATER GAUGE

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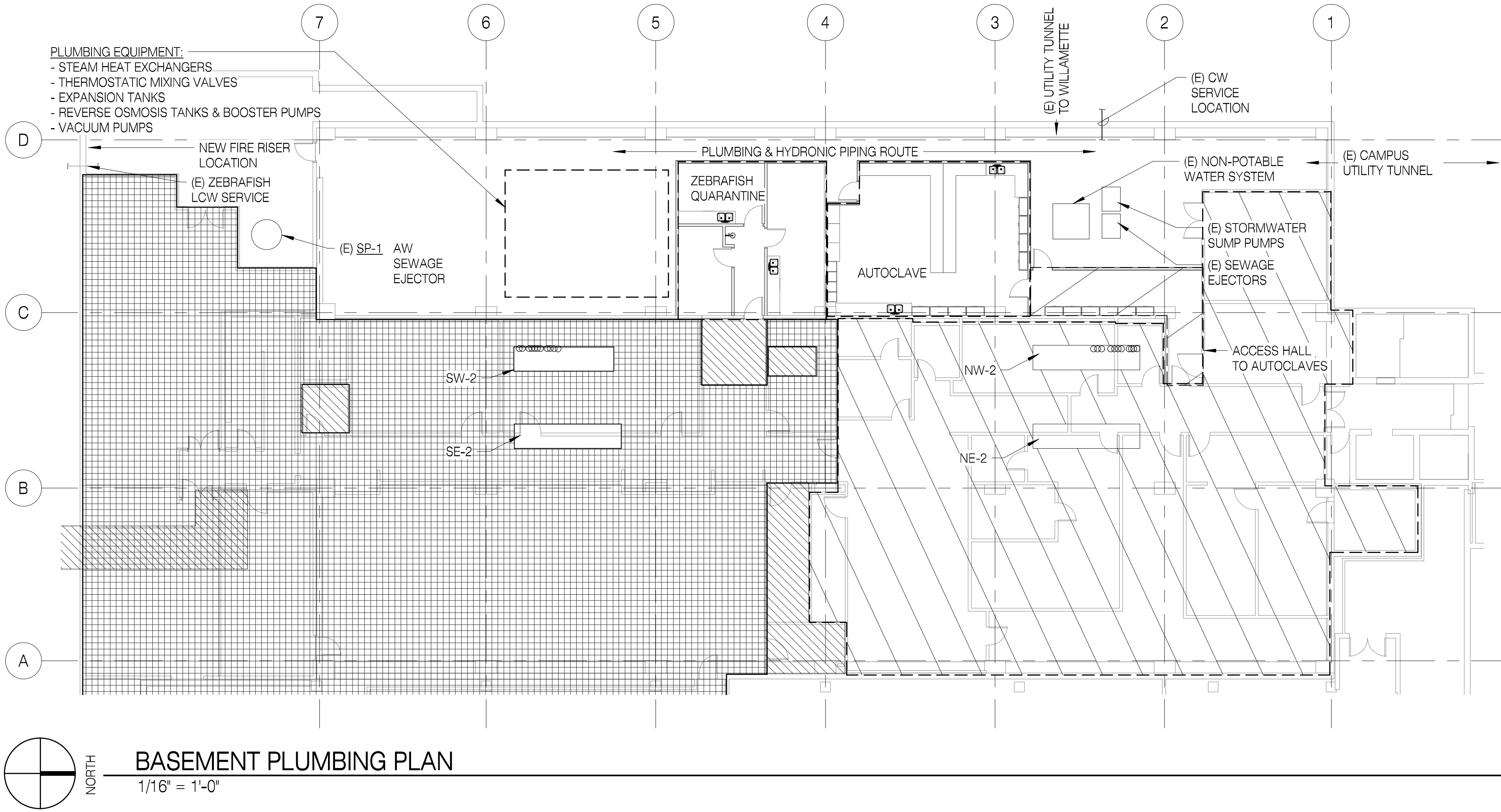
UO HUESTIS HALL
FEASIBILITY STUDY

SHEET NUMBER
P1

SHEET NOTES:

1. ALL EQUIPMENT & PIPING ARE NEW UNLESS OTHERWISE NOTED.
2. ZEBRAFISH QUARANTINE & AUTOCLAVE ROOM WILL EACH BE EQUIPPED WITH 1 COMBINATION EMERGENCY SHOWER/RECESSED EYEWASH, 2 DROP-IN EPOXY SINKS WITH LABORATORY WATER & ROW FAUCETS, FLOOR DRAIN, & 2 SETS OF AIR, GAS, & VAC BENCH MOUNT DUPLEX TURRET LAB OUTLETS.



BASEMENT PLUMBING PLAN

1/16" = 1'-0"

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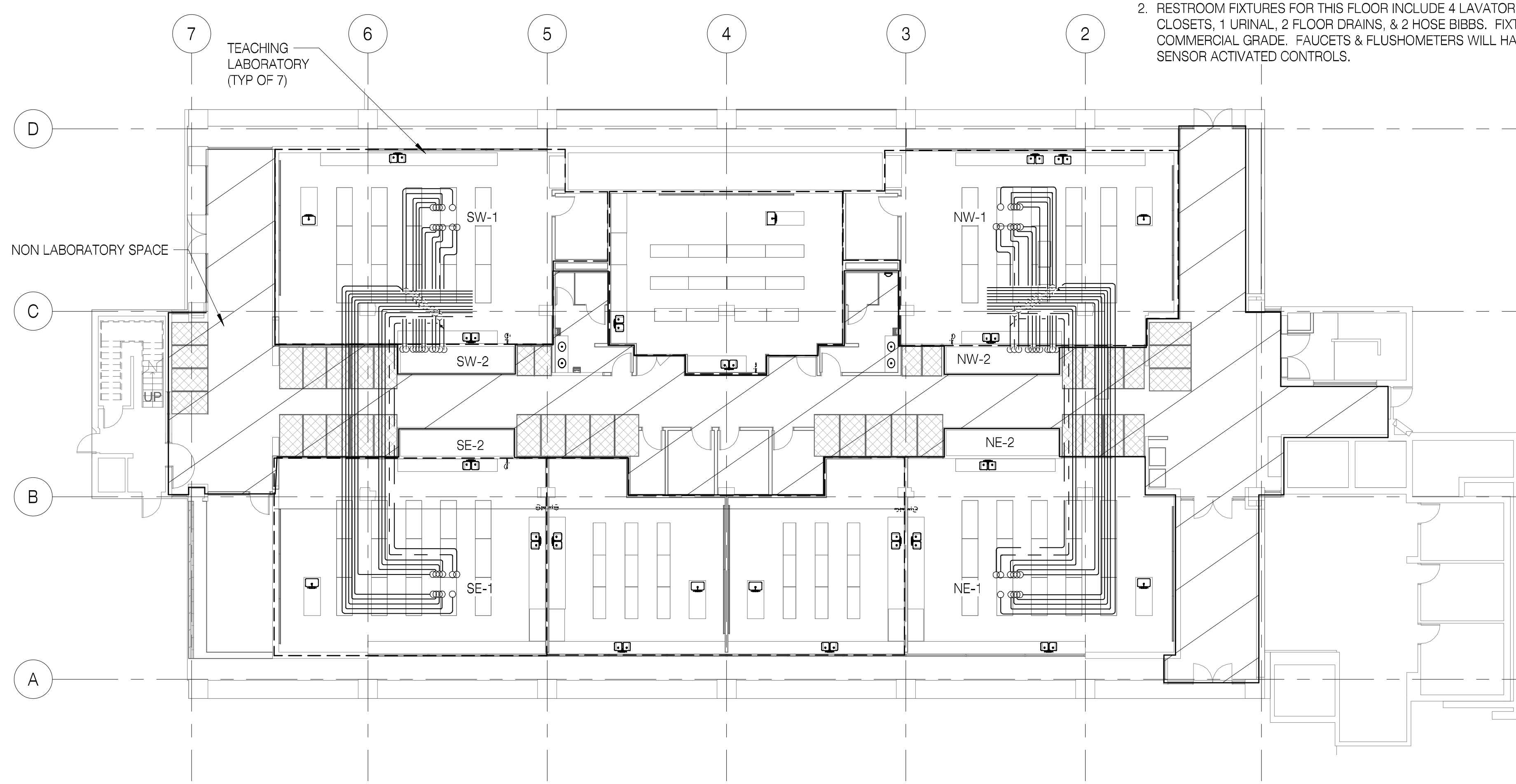
SHEET NUMBER
P2

SHEET NOTES:

1. TEACHING LABORATORIES WILL EACH BE EQUIPPED WITH 1 COMBINATION EMERGENCY SHOWER/RECESSED EYEWASH, DROP-IN EPOXY SINKS (QUANTITY SHOWN) WITH LABORATORY WATER & ROW FAUCETS, FLOOR DRAIN, & 4 SETS OF AIR, GAS, & VAC BENCH MOUNT DUPLEX TURRET LAB OUTLETS.
2. RESTROOM FIXTURES FOR THIS FLOOR INCLUDE 4 LAVATORIES, 3 WATER CLOSETS, 1 URINAL, 2 FLOOR DRAINS, & 2 HOSE BIBBS. FIXTURES SHALL BE COMMERCIAL GRADE. FAUCETS & FLUSHOMETERS WILL HAVE HARDWIRED SENSOR ACTIVATED CONTROLS.



LEVEL 1 PLUMBING PLAN

1/16" = 1'-0"

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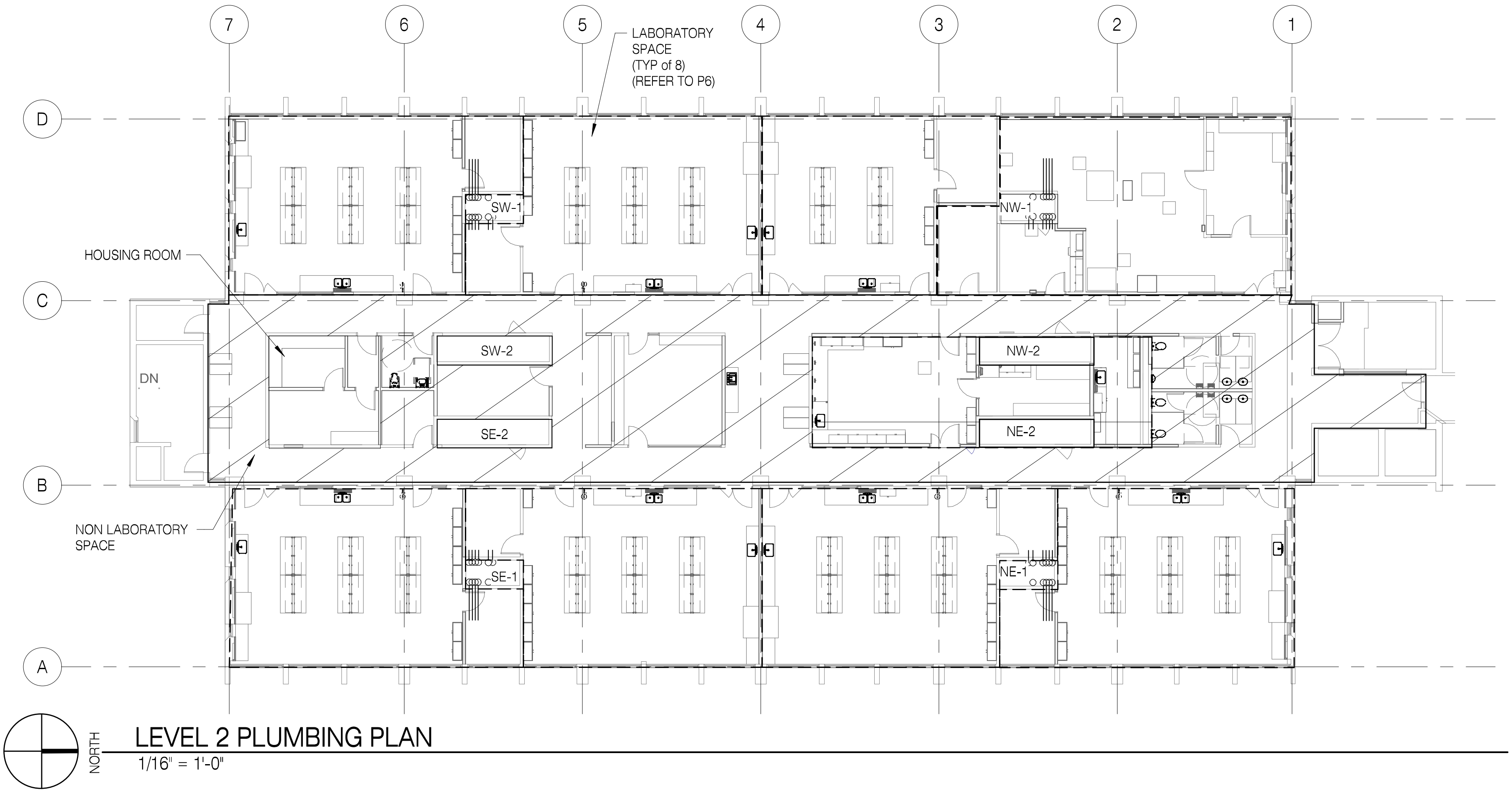
SHEET NUMBER
P3

SHEET NOTES:

1. REFER TO P6 ENLARGED PLAN FOR TYPICAL LABORATORY FIXTURE QUANTITIES, & THE REPORT NARRATIVE FOR MATERIALS.
2. RESTROOM FIXTURES FOR THIS FLOOR INCLUDE 5 LAVATORIES, 4 WATER CLOSETS, 1 URINAL, 3 FLOOR DRAINS, & 3 HOSE BIBBS. FIXTURES SHALL BE COMMERCIAL GRADE. FAUCETS & FLUSHOMETERS WILL HAVE HARDWIRED SENSOR ACTIVATED CONTROLS.



LEVEL 2 PLUMBING PLAN

1/16" = 1'-0"

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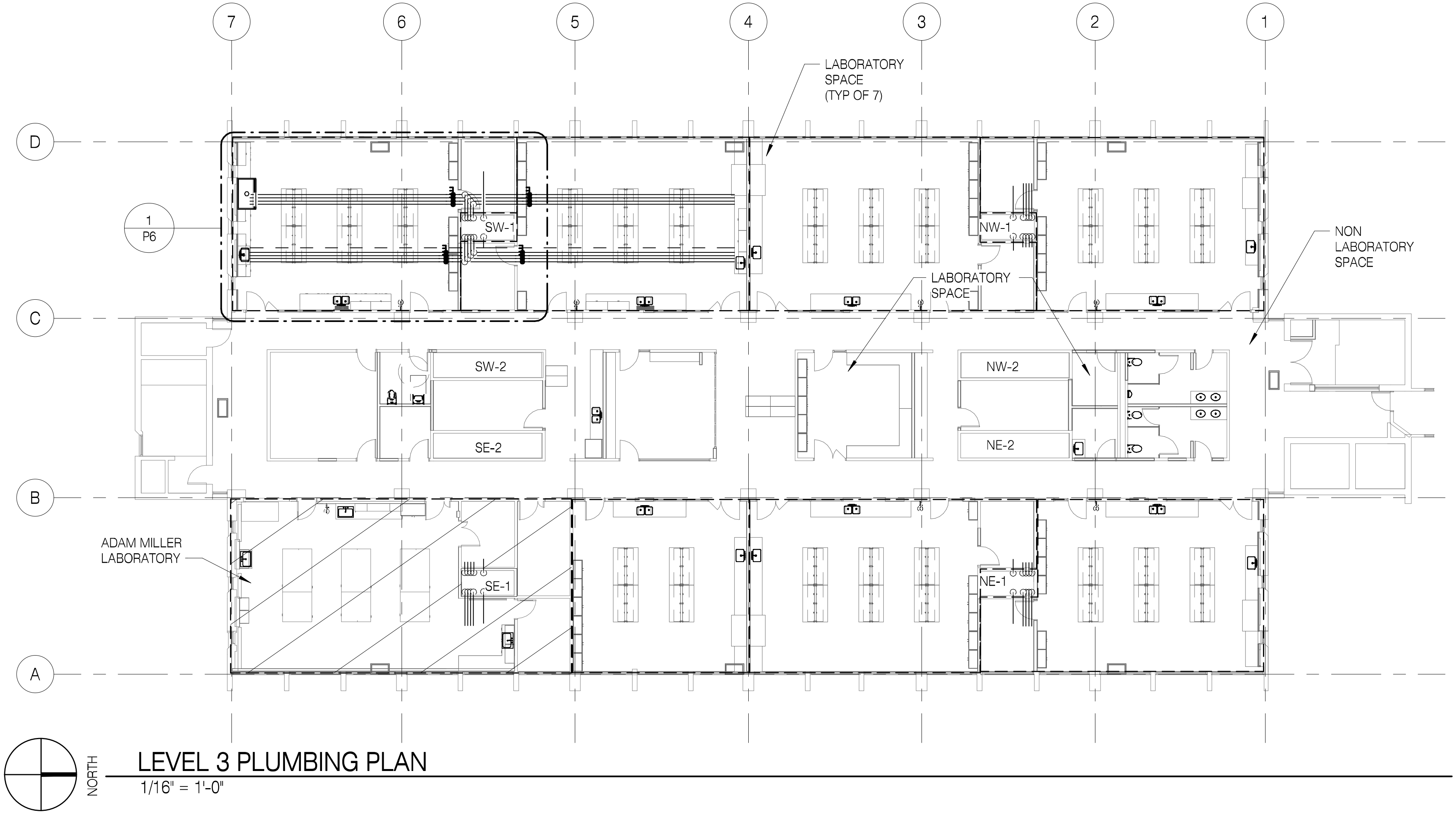
SHEET NUMBER
P4

SHEET NOTES:

1. REFER TO P6 ENLARGED PLAN FOR TYPICAL LABORATORY FIXTURE QUANTITIES, & THE REPORT NARRATIVE FOR MATERIALS.
2. RESTROOM FIXTURES FOR THIS FLOOR INCLUDE 5 LAVATORIES, 4 WATER CLOSETS, 1 URINAL, 3 FLOOR DRAINS, & 3 HOSE BIBBS. FIXTURES SHALL BE COMMERCIAL GRADE. FAUCETS & FLUSHOMETERS WILL HAVE HARDWIRED SENSOR ACTIVATED CONTROLS.



LEVEL 3 PLUMBING PLAN

1/16" = 1'-0"

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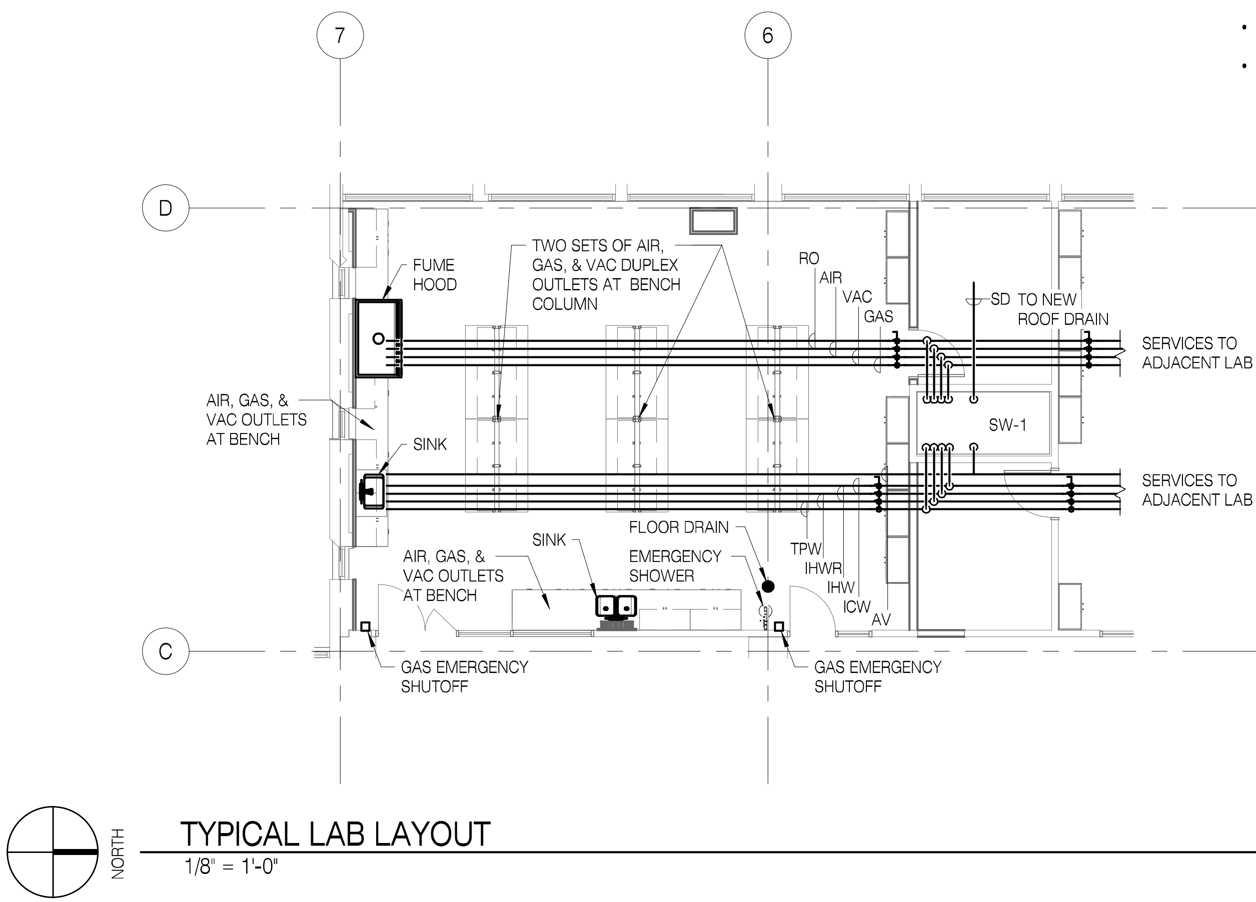
SHEET NUMBER
P5

SHEET NOTES:

1. TYPICAL LABORATORIES WILL EACH BE EQUIPPED WITH:
   - 1 COMBINATION EMERGENCY SHOWER/RECESSED EYEWASH
   - 1 FLOOR DRAIN
   - 2 DROP-IN EPOXY SINKS WITH LABORATORY WATER & RO FAUCETS
   - 1 ROUGH-IN RO CONNECTION AT A LABORATORY BENCH FOR FUTURE CONNECTION TO OFOI DI WATER POLISHER
   - 6 SETS OF AIR, GAS, & VAC DUPLEX TURRET LAB OUTLETS MOUNTED ON LAB BENCH COLUMNS
   - 2 SETS OF AIR, GAS, & VAC SIMPLEX TURRET LAB OUTLETS AT PERIMETER BENCHES
   - 1 FUME HOOD WITH LCW CUP SINK & SIMPLEX OUTLETS FOR GAS, AIR, & VAC
   - LABORATORY GAS EMERGENCY SHUTOFF SYSTEM WITH SHUTOFF BUTTONS AT EXIT DOORS TO HALLWAY.



TYPICAL LAB LAYOUT

1/8" = 1'-0"

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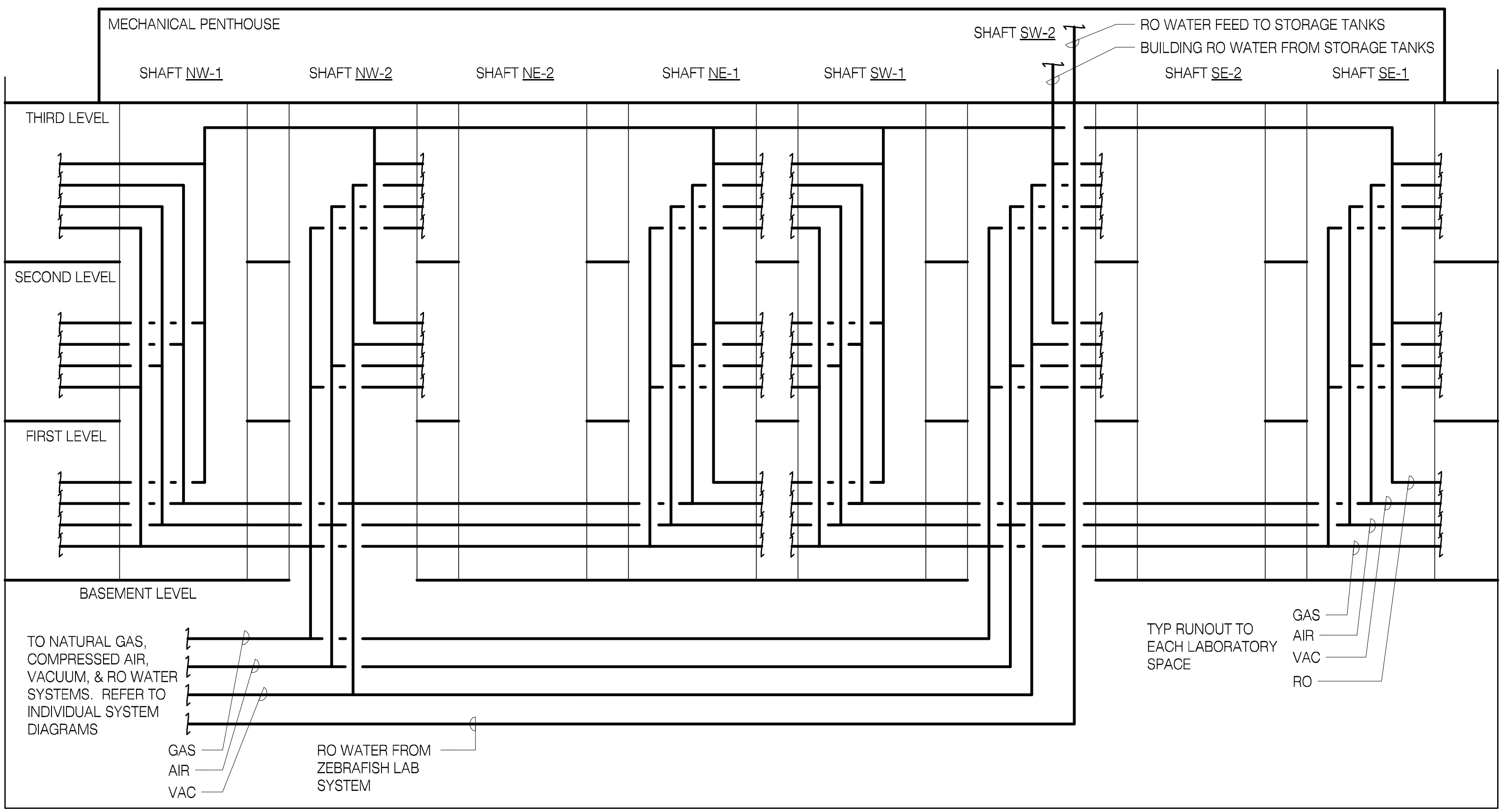
DIAGRAM NOTES:

1. THIS DIAGRAM IS SCHEMATIC IN NATURE & DOES NOT SHOW ACTUAL QUANTITY OF EQUIPMENT, FIXTURES, ETC.



LABORATORY RISER DIAGRAM - NATURAL GAS, COMPRESSED AIR, VACUUM, & RO WATER

NOT TO SCALE

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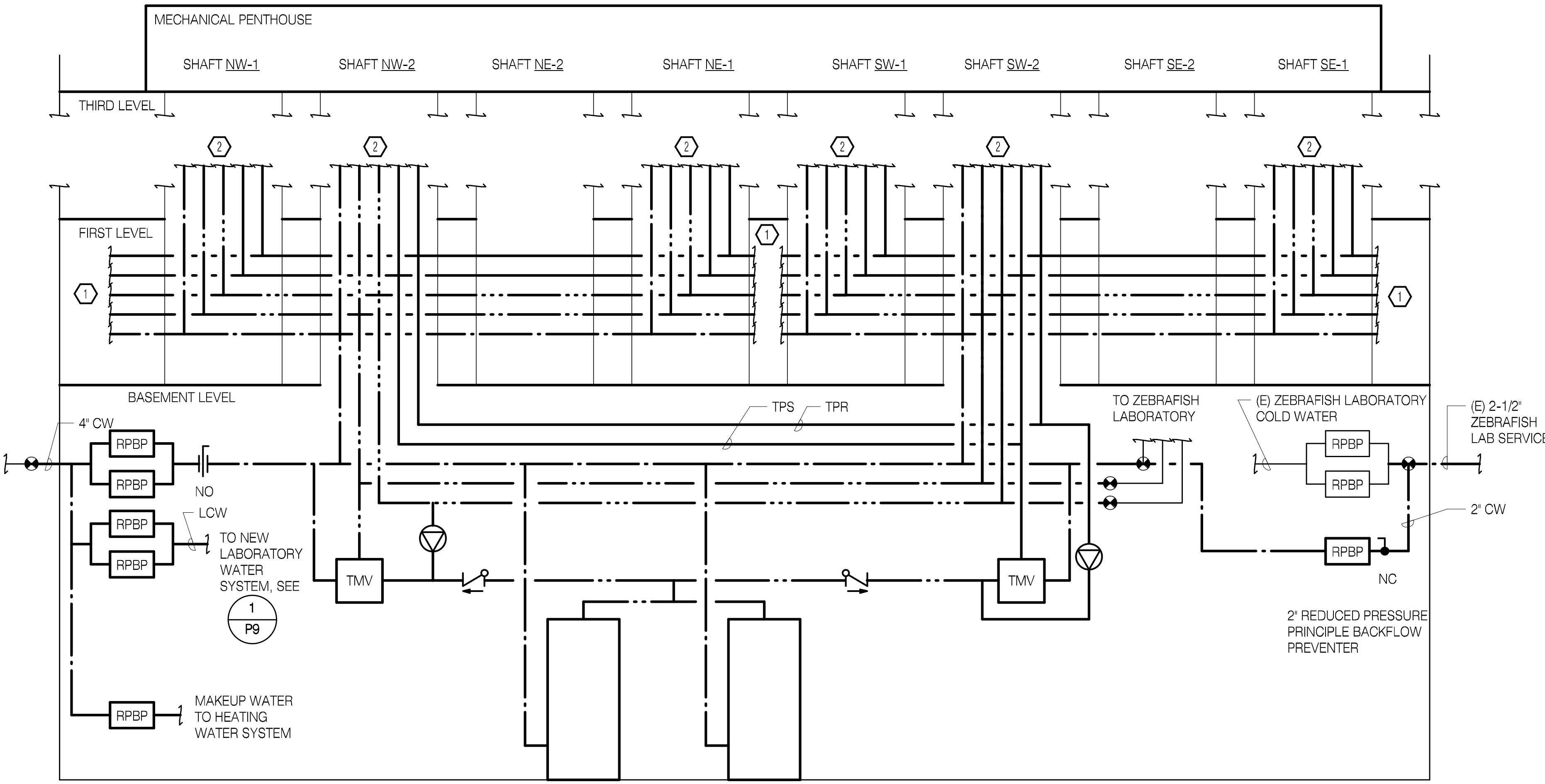
SHEET NUMBER
P7

D I A G R A M   N O T E S:

1. THIS DIAGRAM IS SCHEMATIC IN NATURE & DOES NOT SHOW ACTUAL QUANTITY OF EQUIPMENT, FIXTURES, ETC.

R E F E R E N C E   N O T E S:

1. CW, HW, HWR, TPS, & TPR BRANCH TO LABORATORIES. TYP OF FLOORS ABOVE. SHAFTS NW-2 & SW-2 WILL SERVE CORE LABORATORIES.
2. SERVICES CONTINUE IN SHAFT TO 2ND & 3RD FLOORS.



POTABLE WATER SYSTEM DIAGRAM

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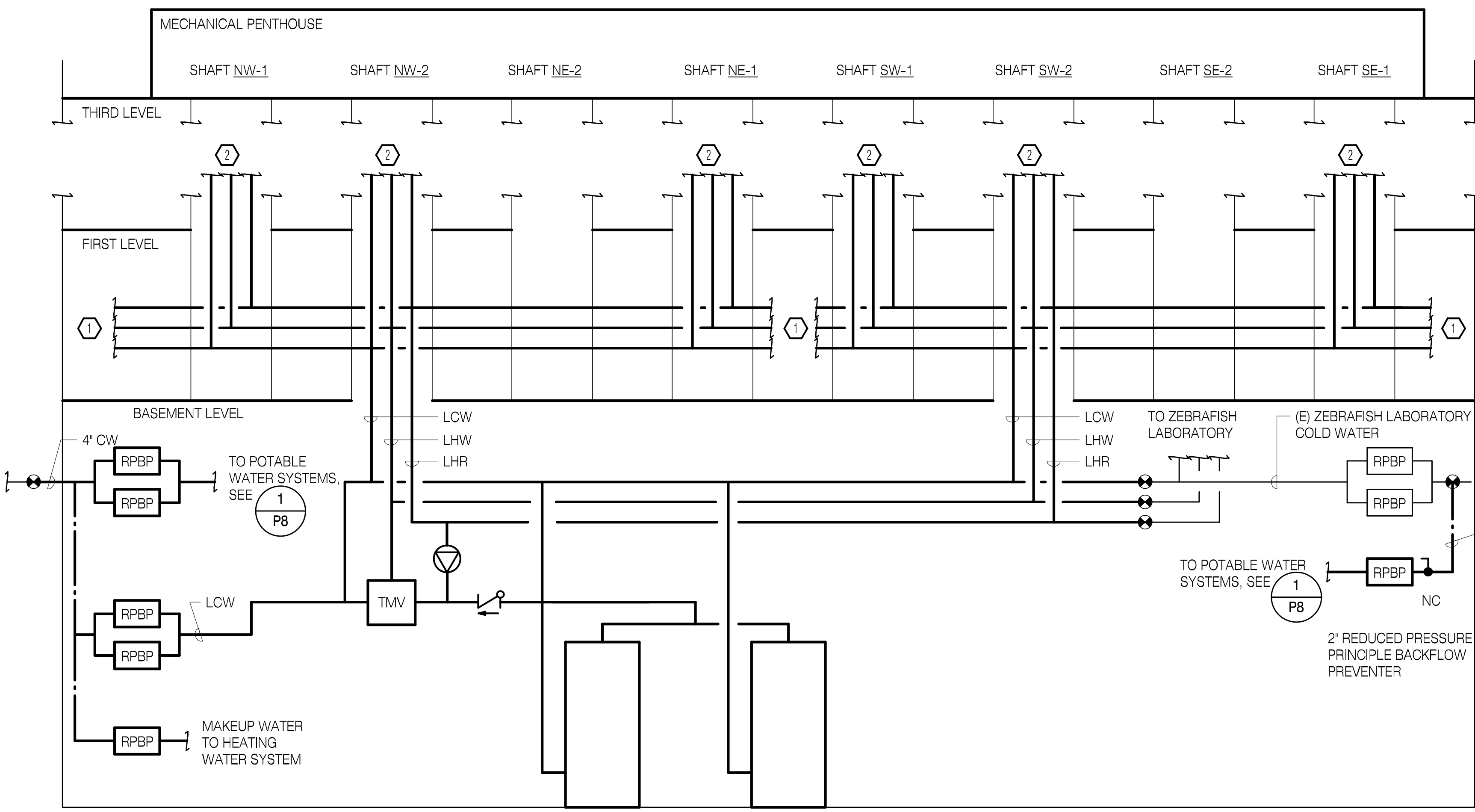
SHEET NUMBER
P8

DIAGRAM NOTES:

1. THIS DIAGRAM IS SCHEMATIC IN NATURE & DOES NOT SHOW ACTUAL QUANTITY OF EQUIPMENT, FIXTURES, ETC.

REFERENCE NOTES:

1. LCW, LHW, LHR BRANCH TO LABORATORIES. TYP OF FLOORS ABOVE.
2. SERVICES CONTINUE IN SHAFT TO 2ND & 3RD FLOORS.



LABORATORY WATER SYSTEM DIAGRAM

NOT TO SCALE

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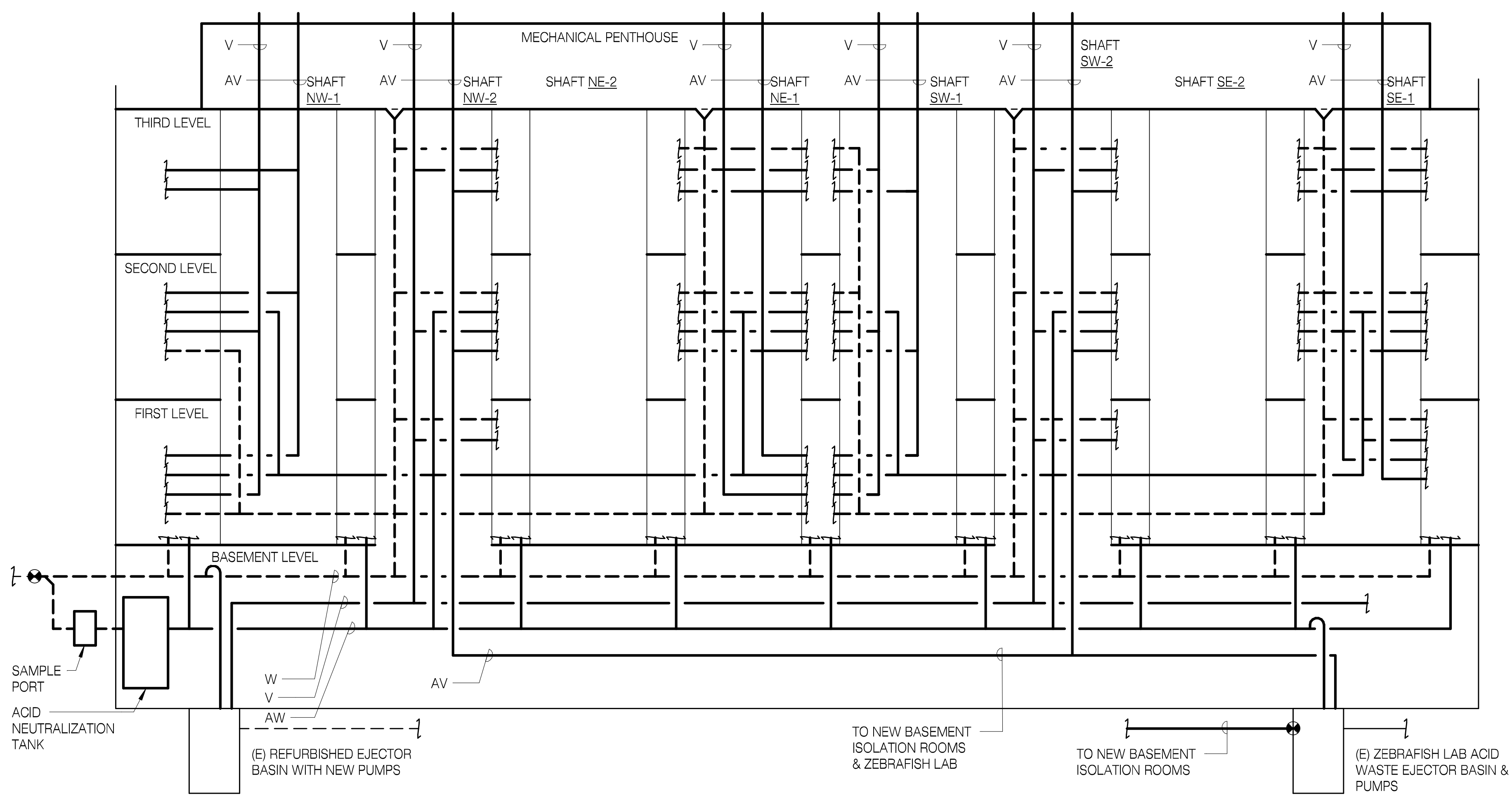
SHEET NUMBER
P9

DIAGRAM NOTES:

1. THIS DIAGRAM IS SCHEMATIC IN NATURE & DOES NOT SHOW ACTUAL QUANTITY OF EQUIPMENT, FIXTURES, ETC.



SANITARY & ACID WASTE SYSTEM DIAGRAM

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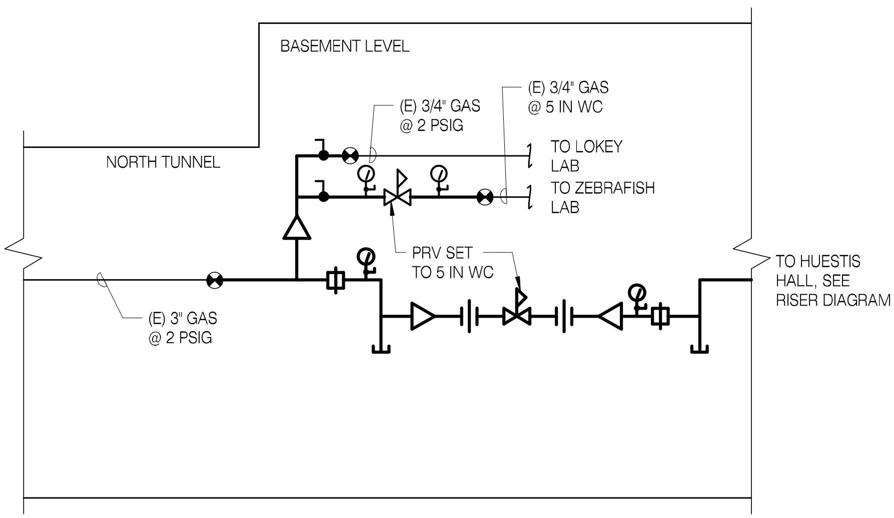
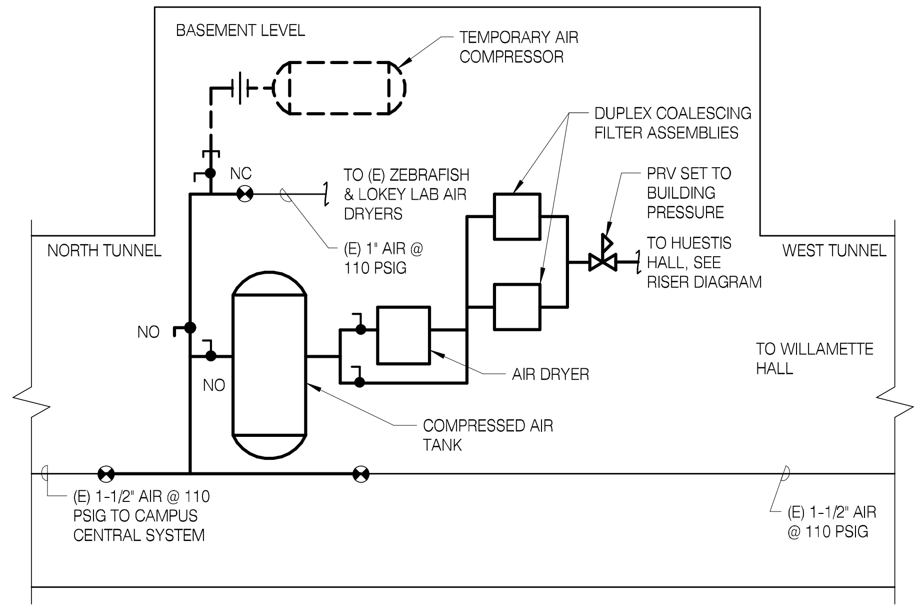
SHEET NUMBER
P10



1 NATURAL GAS SYSTEM DIAGRAM

NOT TO SCALE



2 COMPRESSED AIR SYSTEM DIAGRAM

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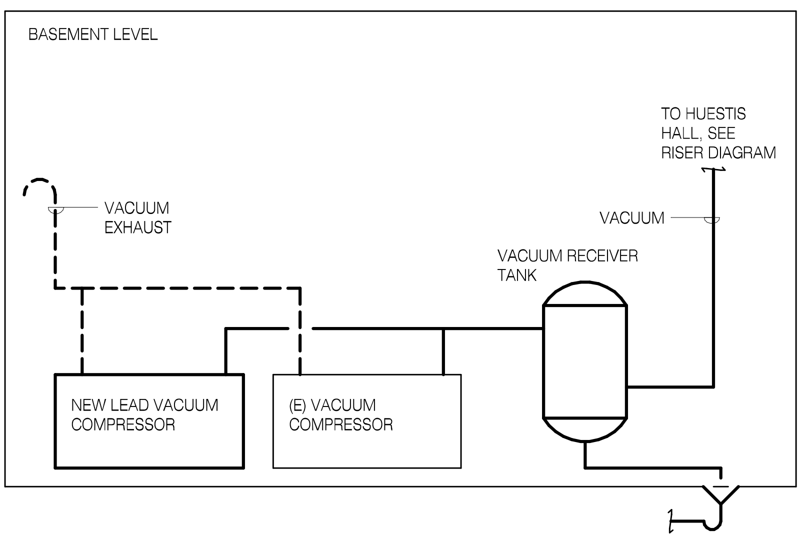
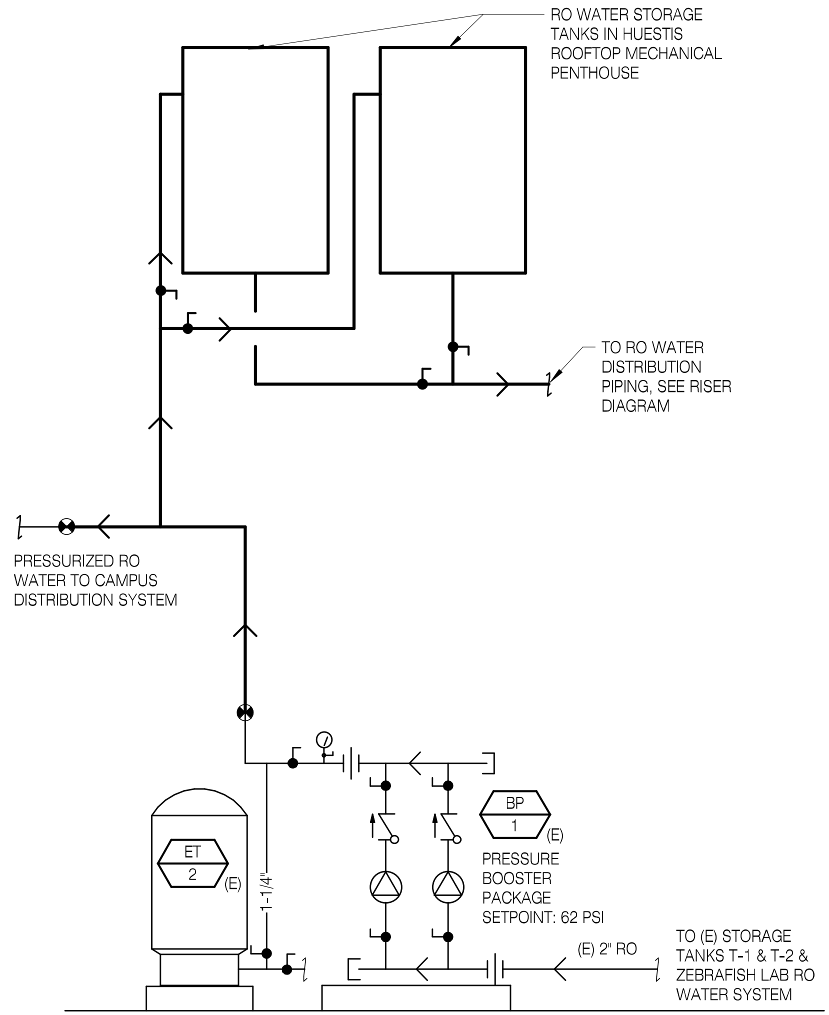
SHEET NUMBER
P11



1 VACUUM SYSTEM DIAGRAM

NOT TO SCALE



2 REVERSE OSMOSIS WATER SYSTEM

NOT TO SCALE

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P12

ELECTRICAL LEGEND

RACEWAYS & BOXES FOR ELECTRICAL SYSTEMS

STUB

LIGHTING CONTROL EQUIPMENT

DIGITAL WALL MOUNTED LIGHTING SWITCH, ON/OFF

PANELBOARDS

SURFACE BRANCH PANELBOARD (120/208V)

ELECTRICAL CABINETS & ENCLOSURES

ELECTRICAL EQUIPMENT AS INDICATED ON DRAWINGS

WIRING DEVICES

WALL SWITCH. "a"= CIRCUITS CONTROLLED, "K"= KEY SWITCH, "P"= W/PILOT LIGHT, "2"= DOUBLE POLE, "3"= THREE-WAY, "M"= AUTOMATIC WALL SWITCH, "D"= DIMMING SWITCH, "TS"= DIGITAL TIMER SWITCH

+44" a — DUPLEX RECEPTACLE MOUNTED ABOVE STANDARD HEIGHT. HEIGHT INDICATED IN INCHES. WHERE NO HEIGHT INDICATED, MOUNT ABOVE COUNTERTOP.

EQUIPMENT CONNECTION

OVER-CURRENT PROTECTIVE DEVICES

FUSE

CIRCUIT BREAKER

GROUND FAULT INTERRUPT CIRCUIT BREAKER

SWITCH

FUSED SWITCH

ELECTRICITY METERING

UTILITY METER

STANDBY GENERATION SYSTEM

GENERATOR

AUTOMATIC TRANSFER SWITCH

LIGHTING FIXTURES

SUSPENDED LUMINAIRE IN 4', 8' & 12' LENGTHS, MOUNTED END-TO-END WHERE SHOWN

LOW-VOLTAGE DISTRIBUTION

TRANSFORMER

CURRENT TRANSFORMER

ELECTRICAL EQUIPMENT AS INDICATED DRAWINGS

DATA COMMUNICATIONS

2V/2D — COMBINATION PHONE/DATA PORT SHOWING QUANTITY OF EACH TYPE: V=VOICE (PHONE)/D=DATA

FIRE DETECTION & ALARM

FIRE ALARM SYSTEM MANUAL PULL STATION

FIRE ALARM SYSTEM BELL

FIRE ALARM SYSTEM HORN: V= VOICE, WP= WEATHERPROOF

FIRE ALARM SYSTEM HORN/STROBE LIGHT - MOUNT @ 80" A.F.F.

FIRE ALARM STROBE

FIRE ALARM FLOW SWITCH

FIRE ALARM TAMPER SWITCH

FIRE ALARM SYSTEM SMOKE DETECTOR: D = DUCT DETECTOR, R = RELAY BASE

COMBINATION FIXED TEMPERATURE AND RATE OF RISE DETECTOR.

MANUAL DISCHARGE STATION

GENERAL

EQUIPMENT IDENTIFIER (EXHAUST FAN 1 SHOWN)

SHEET REFERENCE NOTE

PLAN OR DETAIL NUMBER
SHEET NUMBER

EXISTING WORK SHOWN LIGHT

NEW WORK SHOWN BOLD

EXISTING TO BE REMOVED

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
BLDG	BUILDING
C	CONDUIT
cd	CANDELA
CKT	CIRCUIT
DIM	0-10V DIMMING
DSP	DIGITAL SIGNAL PROCESSOR
(E)	EXISTING
ELEC	ELECTRICAL
EMERG	EMERGENCY
FAM	FIRE ALARM MASTER
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
HVAC	HEATING, VENTILATING & AIR CONDITIONING
IDF	INTERMEDIATE DISTRIBUTION FRAME
L.V.	LOW VOLTAGE
MDF	MAIN DISTRIBUTION FRAME
MECH	MECHANICAL
(N)	NEW
PNL	PANEL
PRS	PROGRAM RAPID START
SWBD	SWITCHBOARD
TTB	TELEPHONE TERMINAL BOARD
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
TYP	TYPICAL
WG	WIREGUARD
WP	WEATHERPROOF

GENERAL NOTES

1. THE FACILITY WILL REMAIN IN OPERATION DURING CONSTRUCTION.
2. COORDINATE ALL SHUTDOWNS AND CONSTRUCTION ACTIVITY WITH FACILITIES STAFF.
3. SIZE AND LOCATION OF ALL EXISTING ELECTRICAL EQUIPMENT IS APPROXIMATE. CONTRACTOR SHALL SITE VERIFY THE EXACT LOCATION OF EXISTING AND CONSTRUCT ALL WORK FROM FIELD DIMENSIONS.
4. CONTRACTOR SHALL MAKE ADJUSTMENTS NECESSARY TO ACCOMMODATE MINOR DEVIATIONS AT NO COST TO OWNER.
5. LIGHT WORK INDICATES EXISTING ELECTRICAL CIRCUITRY AND OTHER ELECTRICAL EQUIPMENT. DASHED LINE WORK INDICATES ELECTRICAL DEVICES AND EQUIPMENT TO BE REMOVED.
6. WHERE EXISTING EQUIPMENT IS REMOVED AND NOT REPLACED IN THE SAME LOCATION, PATCH AND PAINT SURFACES TO MATCH ORIGINAL CONDITION.
7. REMOVE ALL ABANDONED RACEWAY AND WIRING.
8. RECONNECT ALL CIRCUITRY TO REMAINING DEVICES AND EQUIPMENT.

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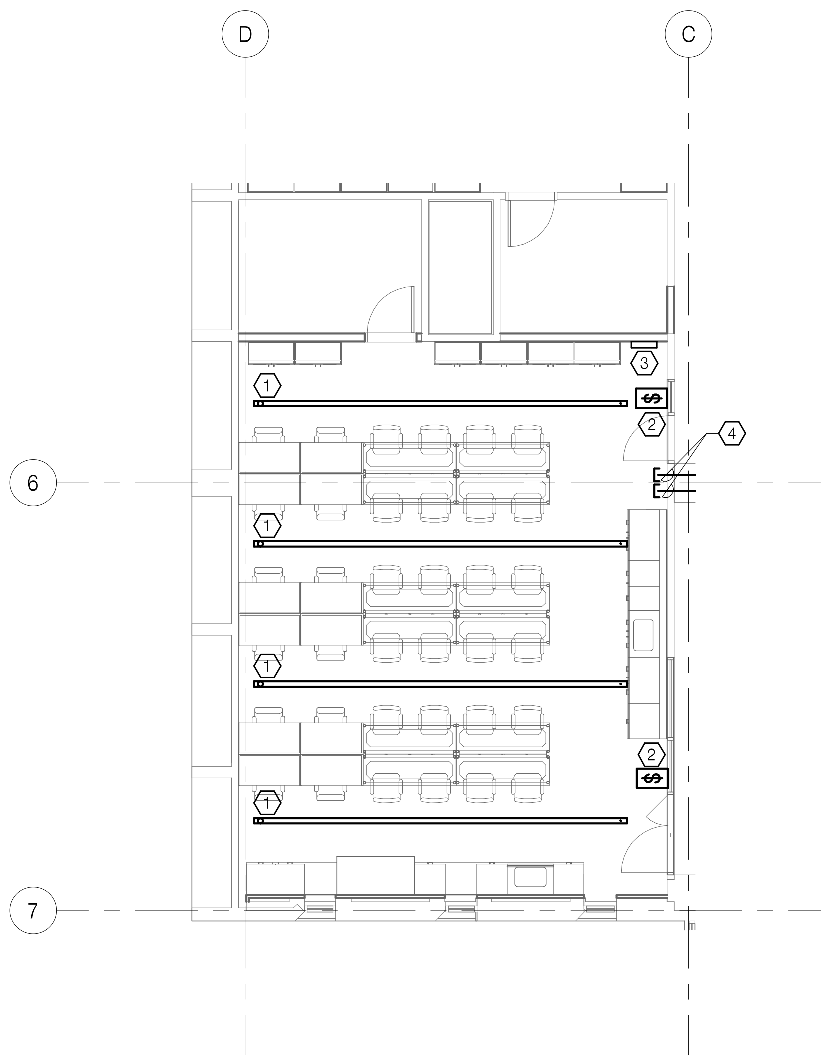
SHEET NUMBER
E1



TYPICAL LABORATORY LIGHTING LAYOUT

1/8" = 1'-0"

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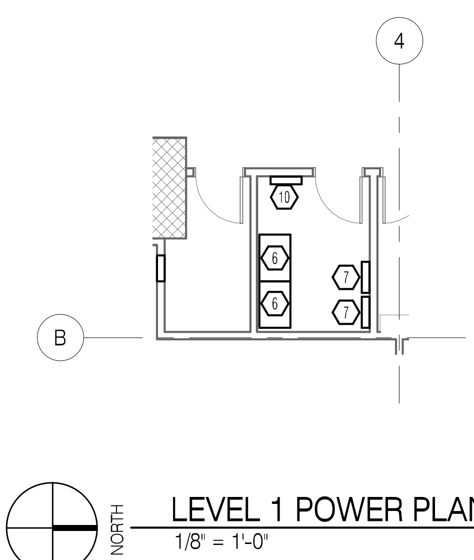
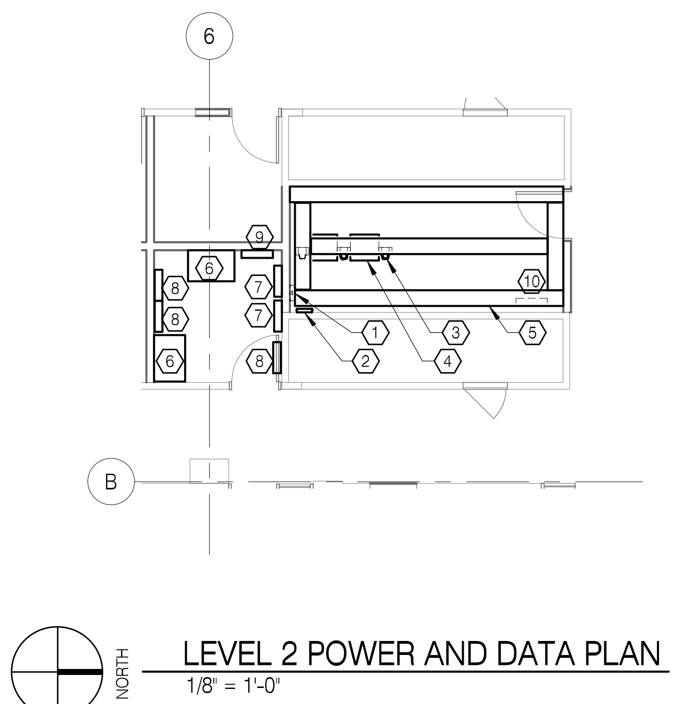
REFERENCE NOTES:

1. 12" LADDER RACK MOUNTED VERTICALLY
2. TELECOMMUNICATIONS GROUNDING BAR
3. WIRE MANAGEMENT
4. 2 FT RACK
5. 12" LADDER RACK, TYP
6. SUBDISTRIBUTION BOARD.
7. STANDBY PANEL.
8. UPS PANEL.
9. LIFE SAFETY PANEL.
10. FIRE ALARM EXTENDER PANEL



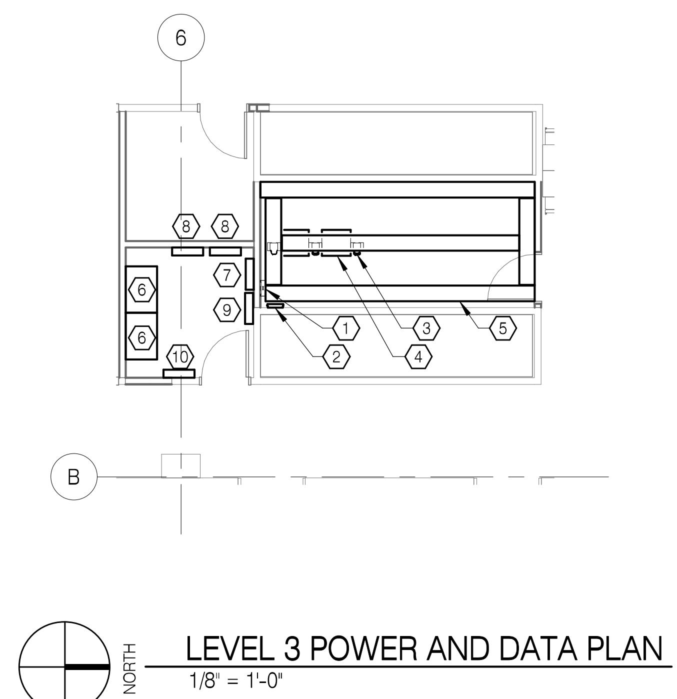
LEVEL 1 POWER PLAN

1/8" = 1'-0"



LEVEL 2 POWER AND DATA PLAN

1/8" = 1'-0"



LEVEL 3 POWER AND DATA PLAN

1/8" = 1'-0"

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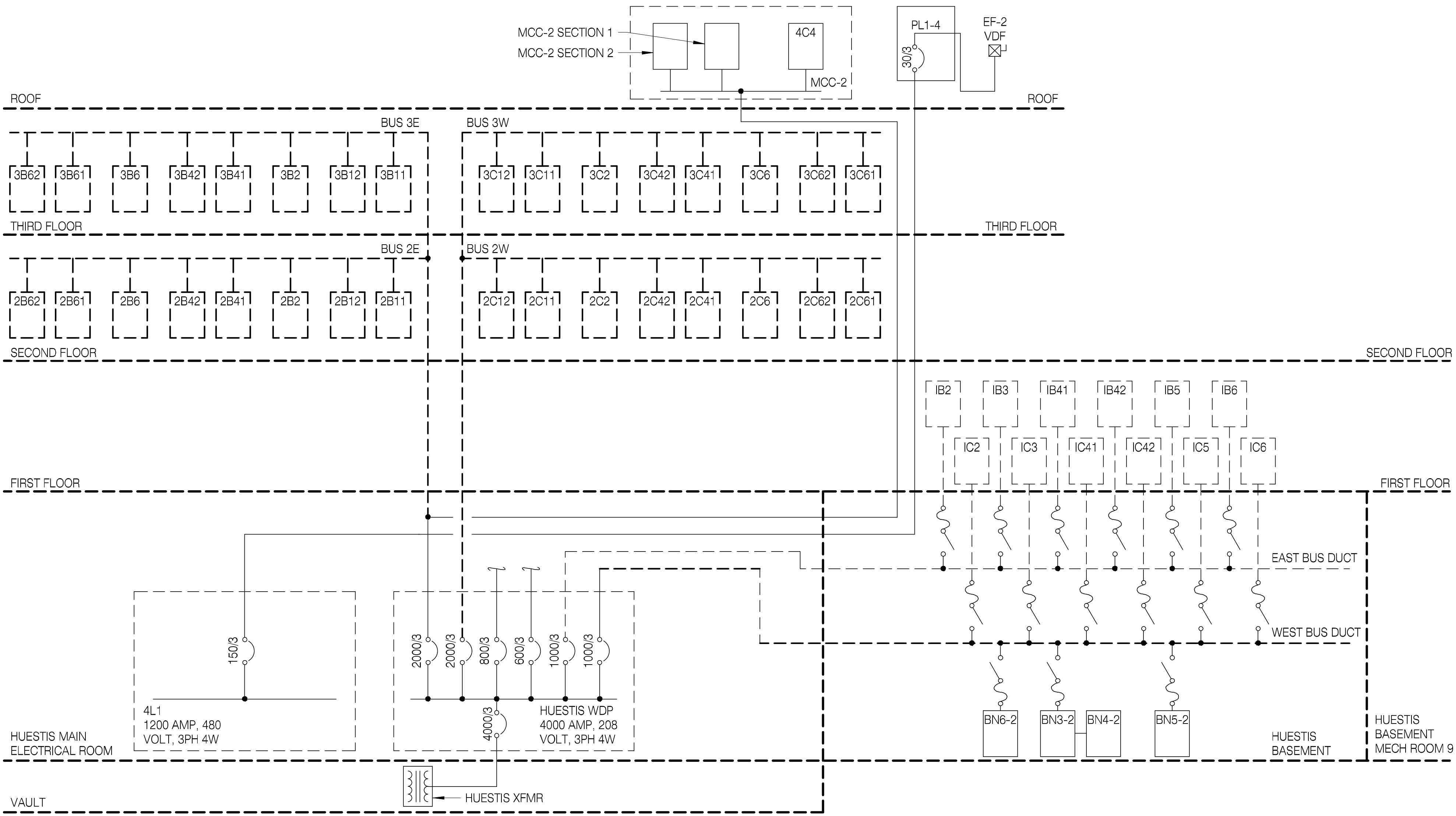
SHEET NUMBER
E3



NORMAL POWER ONE-LINE DIAGRAM - DEMOLITION

1/8" = 1'-0"

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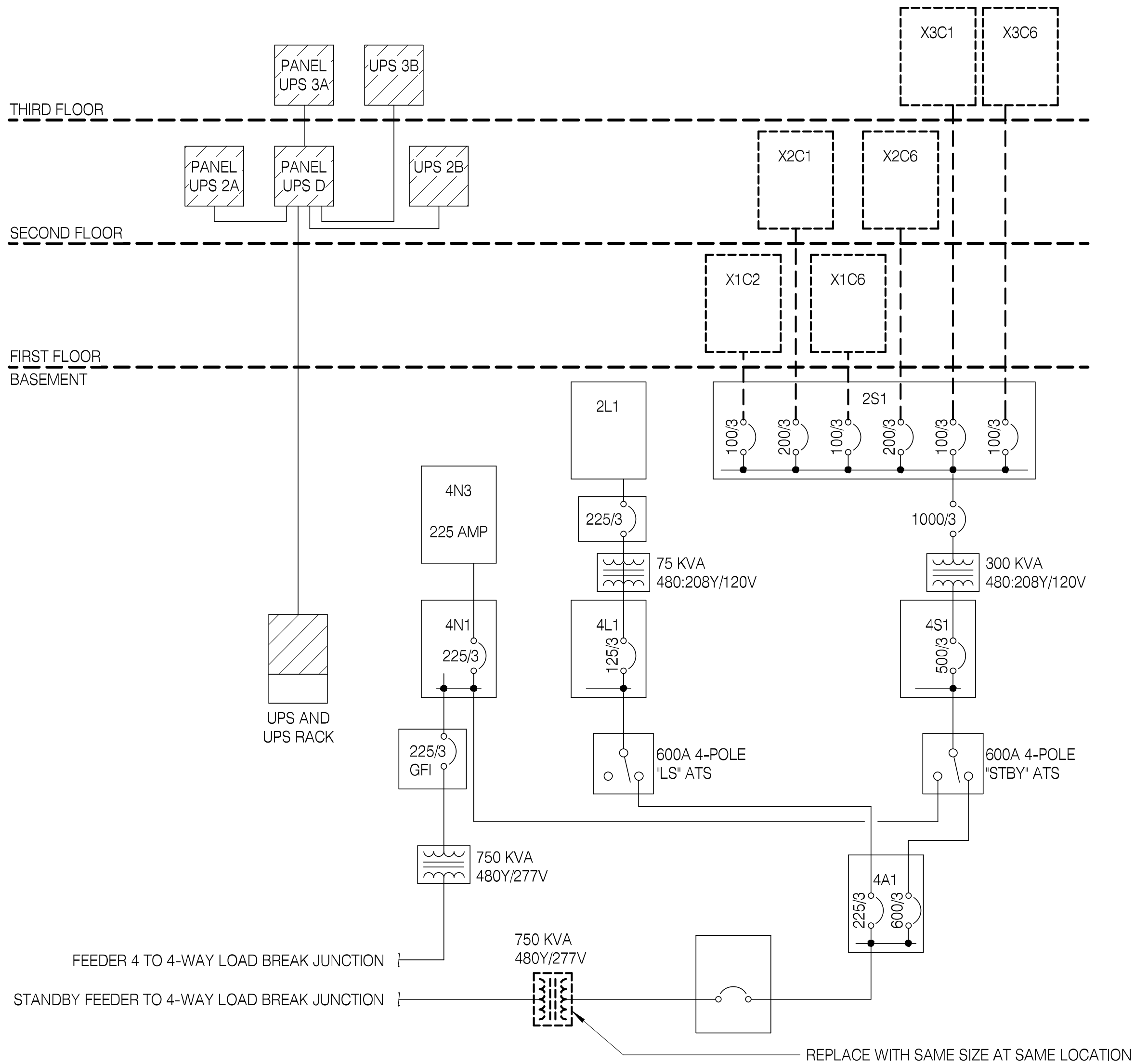
SHEET NUMBER
E4



STANDBY POWER ONE-LINE DIAGRAM - DEMOLITION

NOT TO SCALE

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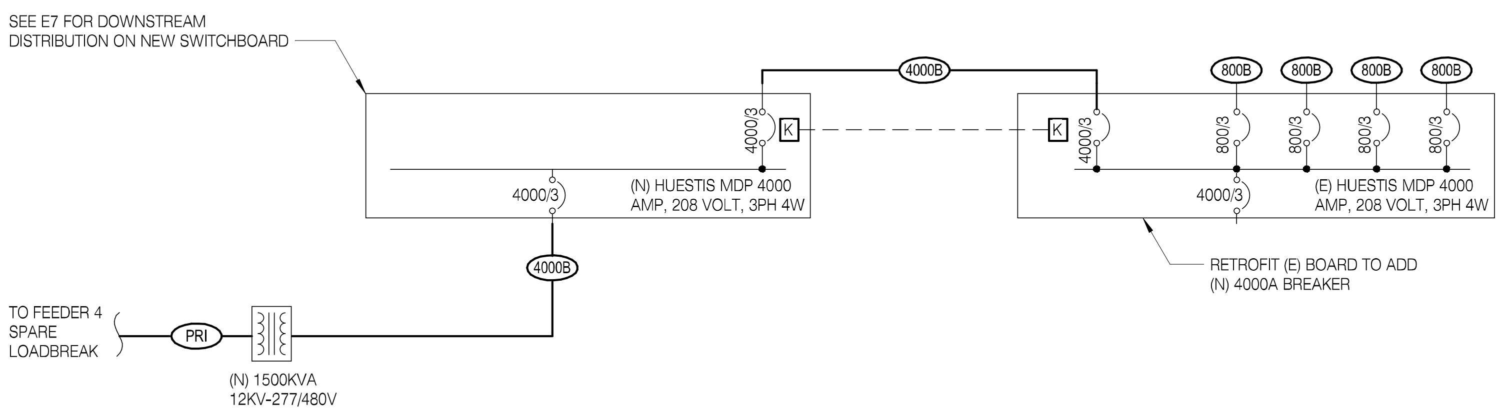
SHEET NUMBER
E5



FEEDER SCHEDULE

DESIG.	DESCRIPTION	COMMENTS
200B	4 #3/O CU , 1 #6 GND. IN 2 1/2" C.	
400B	2 SETS OF (4 #3/O CU , 1 #2 GND. IN 2 1/2" C.)	
800B	3 SETS OF (4 #300 CU , 1 #2/O GND. IN 3 1/2" C.)	
4000B	11 SETS OF (4 #500 CU, 1 #500 GND IN 4" C)	
PRI	3 #2 MEDIUM VOLTAGE CLX CABLE WITH GND	

KEY:
T = 2 WIRE
A = 3 WIRE
B = 4 WIRE

NORMAL SERVICE ONE LINE DIAGRAM - NEW

1/8" = 1'-0"

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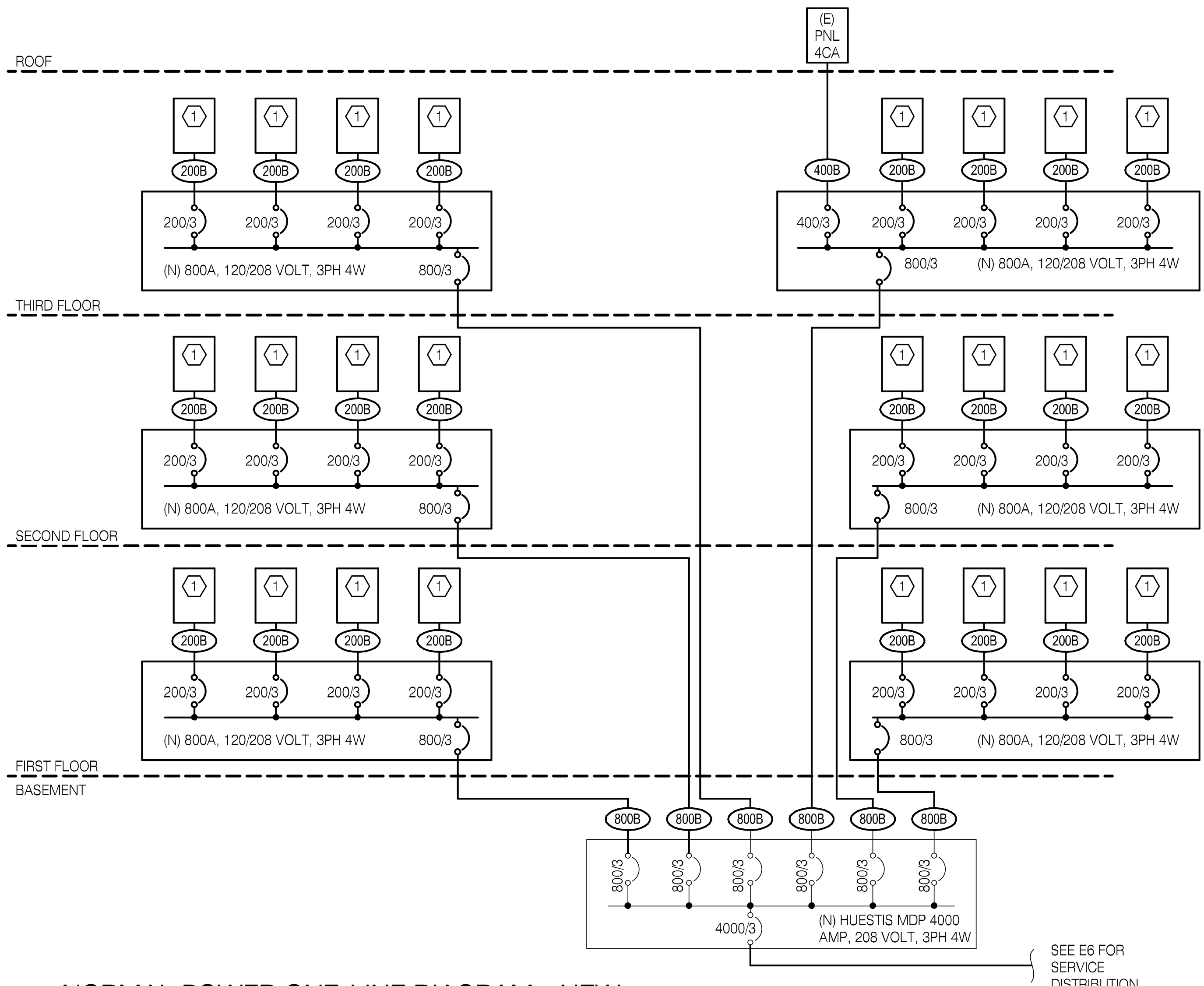
SHEET NUMBER
E6



NORMAL POWER ONE-LINE DIAGRAM - NEW

NOT TO SCALE

REFERENCE NOTES:

1 NEW 200A, 3PH, 4W, 42 CKT PANEL WITH MAIN BREAKER

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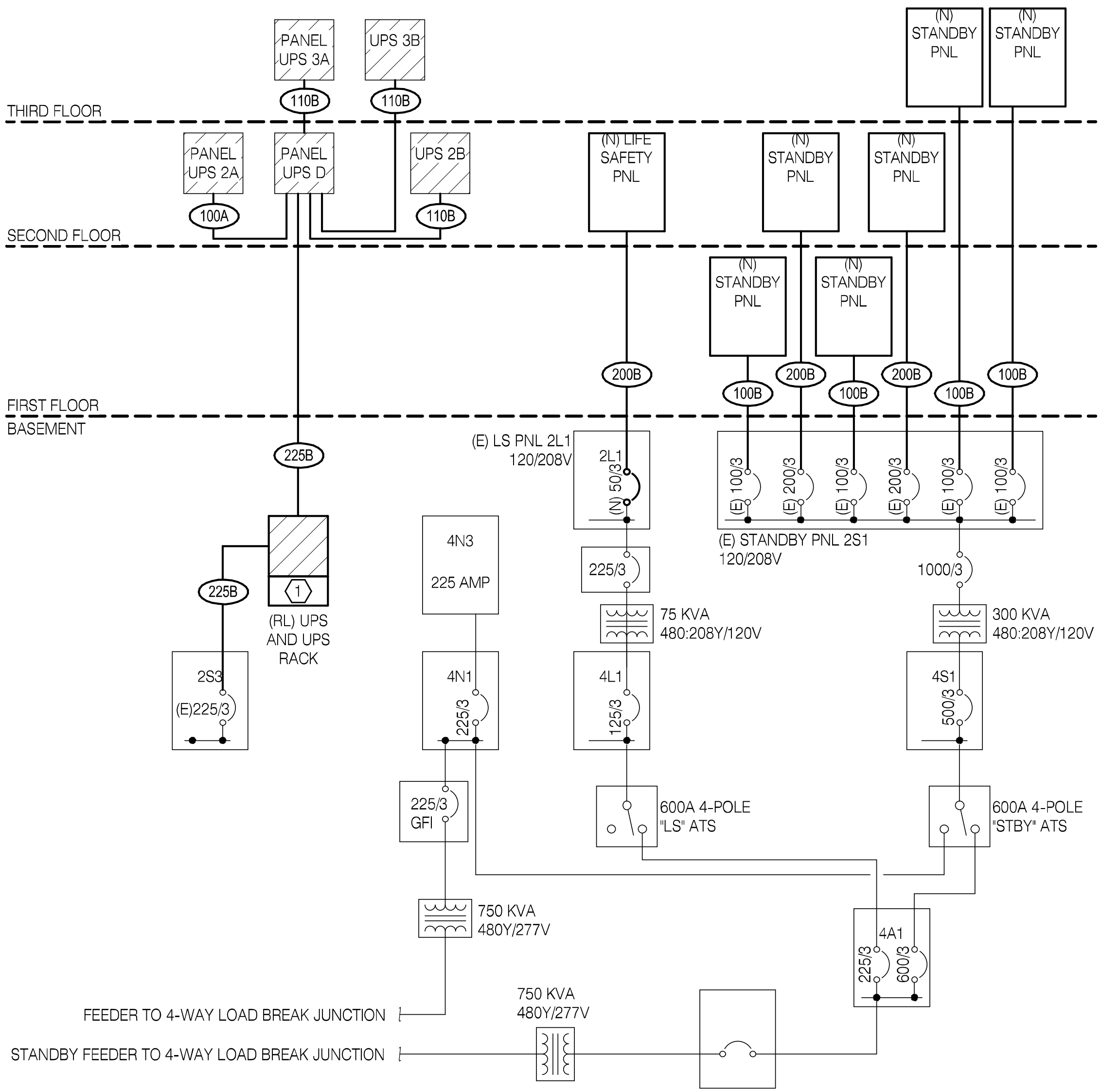
SHEET NUMBER
E7



STANDBY POWER ONE-LINE DIAGRAM - NEW

NOT TO SCALE

REFERENCE NOTES:

1. RELOCATE UPS AND RACK SIX FEET FROM EXISTING LOCATION. PROVIDE AND ALL NEW FEEDERS TO AND FROM UPS. SEE ELECTRICAL ROOM LAYOUT FOR LOCATION OF RELOCATED PANELS.

FEEDER SCHEDULE

DESIG.	DESCRIPTION	COMMENTS
100A	3 #3 CU., 1 #8 GND. IN 1 1/2" C.	
110B	4 #2 CU., 1 #6 GND. IN 1 1/2" C.	
225B	4 #4/0 CU, 1 #4 GND IN 2 1/2"C	

KEY:
T = 2 WIRE
A = 3 WIRE
B = 4 WIRE

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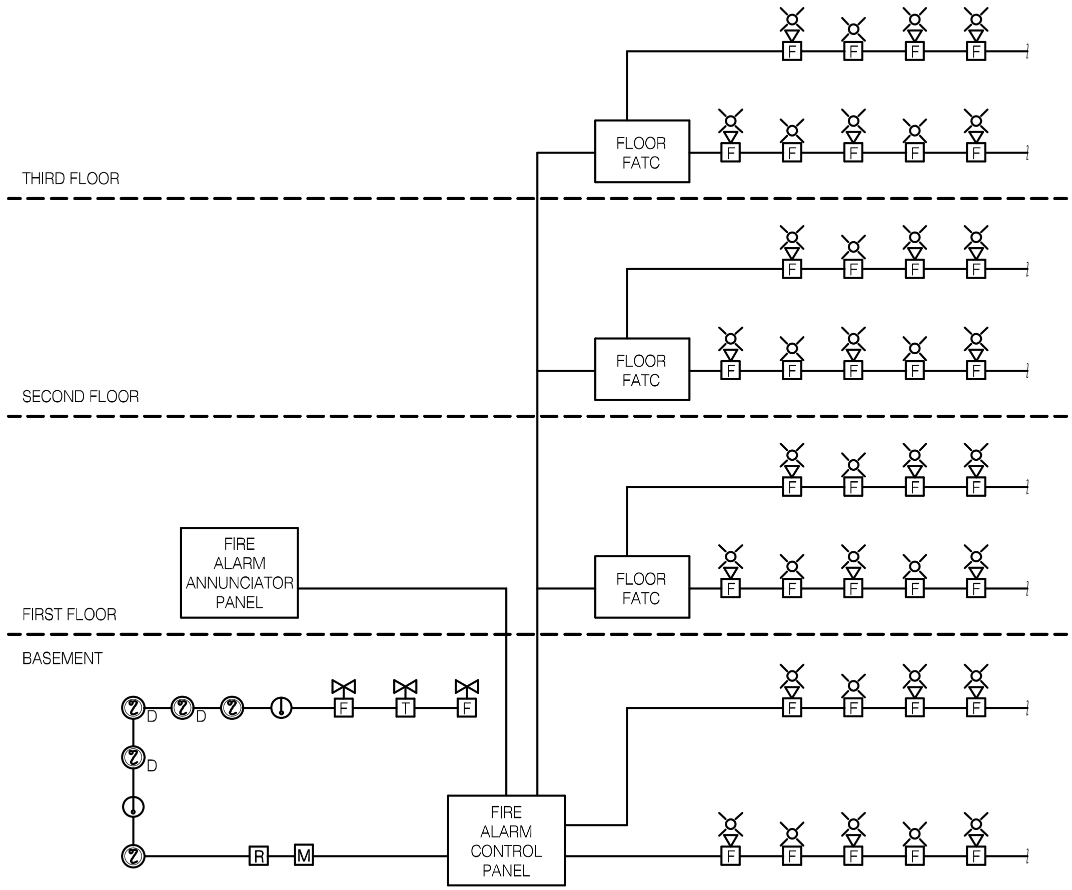
SHEET NUMBER
E8



FIRE ALARM SYSTEM RISER DIAGRAM

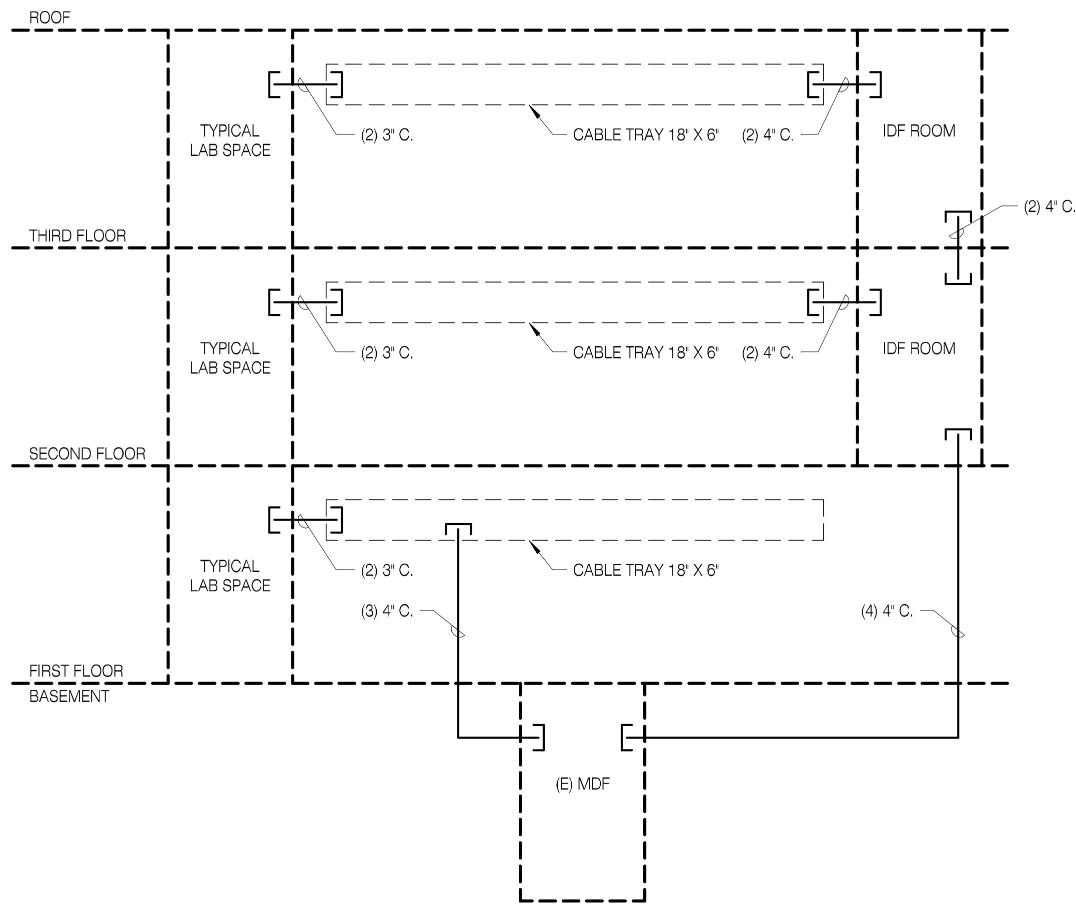
1/8" = 1'-0"

Robertson | Sherwood | Architects pc

SYSTEMS WEST ENGINEERS, INC
411 high street
eugene, oregon 97401-2427
541.342.7210
systemswestengineers.com

UO HUESTIS HALL
FEASIBILITY STUDY

SHEET NUMBER
E9



COMMUNICATIONS PATHWAY RISER DIAGRAM

1/8" = 1'-0"

Robertson | Sherwood | Architects pc

SYSTEMS WEST ENGINEERS, INC
411 high street
eugene, oregon 97401-2427
541.342.7210
systemswestengineers.com

UO HUESTIS HALL
FEASIBILITY STUDY

SHEET NUMBER
E10

5. Appendix

5a. HUESTIS HALL DETAILED COST ESTIMATE

Conceptual Estimate- DRAFT 1.0

GBC CONSTRUCTION
Building Relationships

Project:	**Huestis**	Estimate No.:	1.0
Location:	Eugene OR	Date:	15-Oct-17
Owner:	UO	Estimator:	Freeman
Architect:	RSA	GSF:	53,850

System		**Cost/GSF**	**Total**
Sitework		$ 9.00	$ 190,000
Foundations		$ 2.14	$ 115,500
Substructure		$ 0.09	$ 5,000
Superstructure		$ 30.91	$ 1,664,325
Exterior Closure		$ 26.41	$ 1,422,259
Roofing		$ 13.31	$ 716,674
Demolition		$ 8.99	$ 483,950
Interior Construction		$ 87.77	$ 4,726,373
Conveying Systems		$ 6.33	$ 341,000
HVAC		$ 89.28	$ 4,807,500
Plumbing		$ 31.01	$ 1,669,713
Fire Sprinkler		$ 4.00	$ 215,400
Electrical		$ 56.41	$ 3,037,594
IS Estimate		$ 12.00	$ 646,200
Site Logistics / Care & Control		$ 11.17	$ 601,245
Subtotal		$ 383.34	**$ 20,642,732**
General Conditions		$ 34.50	$ 1,857,846
Market Conditions	4.00%	$ 15.33	$ 825,709
Estimating Contingency	15.00%	$ 57.50	$ 3,096,410
Subtotal		$ 490.67	**$ 26,422,697**
Insurance/OH/Fee	6.20%	$ 23.77	$ 1,279,849
TOTAL CONSTRUCTION COSTS		**$ 514**	**$ 27,702,547**

Owner Costs (Excluded from Estimate)

1. Performance & Payment Bond
2. Building Permit & Plan Check fees
3. System Development & LID costs
4. Utility connection fees
5. Power company charges
6. Testing & inspection costs
7. Builders Risk Insurance & Deductibles
8. Architect & Engineer costs
9. Soils Report
10. Environmental Assessment Survey
11. Hazardous & toxic waste removal
12. Removal of soil contaminated by hazardous or toxic wastes

13 **Escalation to 2021 not included**
14 **Fume hoods**

GSF	
1sf	14,464
2nd	15,743
3rd	15,743
Basement	7,900
	53,850

GBC CONSTRUCTION
Building Relationships

Project:	**Huestis**	Estimate No.:	1.0
Location:	Eugene OR	Date:	15-Oct-17
Owner:	UO	Estimator:	Freeman
Architect	RSA		

Description	**Quantity**		**Unit Price**	**Price**	**Comments**
SITEWORK					
Site Concrete- repair	3,000	sf	$8.00	$24,000	
Landscape and irrigation	1	allow	$50,000.00	$50,000	
Bike parkling relocation	1	ea	$8,000.00	$8,000	
Bike racks	10	ea	$800.00	$8,000	
Bikel Lockers	2	ea	$2,500.00	$5,000	
Site Lighting allowance	1	allow	$75,000.00	$75,000	
Temp protection	1	allow	$20,000.00	$20,000	
Subtotal				**$190,000**	
FOUNDATIONS					
Structural Excavation Shear wall footings	60	cy	$250.00	$15,000	
Mob and haul logistics tight area	2	loc	$8,500.00	$17,000	
Patch and repair hardscape at footings	1,000	sf	$8.00	$8,000	
Temp protection	1,000	sf	$4.00	$4,000	
Below grade water proofing	2	loc	$6,500.00	$13,000	
Elevator sump mods	1	ea	$5,500.00	$5,500	
MEP below grade relocates	1	allow	$5,000.00	$5,000	
Footing and Foundations	40	cy	$1,200.00	$48,000	
Subtotal				**$115,500**	
SUBSTRUCTURE					
Slab on Grade					
Slab on grade repairs in basement	500	sf	$10.00	$5,000	
Subtotal				**$5,000**	
SUPERSTRUCTURE					
Shotcrete walls					
Selective demo	1	allow	$15,000.00	$15,000	
8'x7' sawcutt opening with steel	1	ea	$10,000.00	$10,000	
Rough existing concrete for shotcrete	5,166	sf	$4.50	$23,247	
Scaffold full height	5,166	sf	$14.00	$72,324	
Drill epoxy dowels	1,500	ea	$45.00	$67,500	
Rebar	30,996	lbs	$2.00	$61,992	
Hoisting	1	ea	$25,000.00	$25,000	
Shotecrete Walls	380	cy	$1,300.00	$493,350	
Shotecrete clean up temp protection	1	allow	$18,000.00	$18,000	
Shotecrete mock up panel	1	ea	$5,000.00	$5,000	
Sack and patch	5,166	sf	$4.00	$20,664	
Form outside bulk head for shotrecte	300	lf	$75.00	$22,500	
Caulking	600	lf	$5.00	$3,000	
Concrete Column	5	cy	$1,700.00	$8,500	
Carbon Fiber					
Columns exterior	7,560	sf	$28.00	$211,680	
Girder beams	1,000	sf	$28.00	$28,000	
Columns interior	4,200	sf	$28.00	$117,600	
Prep surfaces	11,760	sf	$4.00	$47,040	
Miscellaneous Iron	5,166	sf	$10.00	$51,660	
Roof penthouse					
Steel	1	allow	$75,000.00	$75,000	
Walls	5,684	sf	$15.00	$85,260	
Sheetmetal at walls	5,684	sf	$12.00	$68,208	
Hoisting	1	crane	$22,000.00	$22,000	
Logistics to roof	1	allow	$20,000.00	$20,000	
Man door	2	ea	$2,500.00	$5,000	
Curb for penthouse	7,480	sf	$4.00	$29,920	
Gutters and drains	7,480	sf	$4.00	$29,920	
Louvers	240	sf	$50.00	$12,000	
Caulking	7,480	sf	$2.00	$14,960	
Subtotal				**$1,664,325**	
EXTERIOR CLOSURE	**20,018**				
Replace existing window glazing	124	ea	$4,500.00	$558,000	5520 sf
Caulking at windows	124	ea	$300.00	$37,200	
Lifts/scaffold/hoisting	1	ls	$125,000.00	$125,000	
Elastomeric coating on all concrete	20,558	sf	$2.75	$56,535	
Patch and repair at ground level	1	allow	$50,000.00	$50,000	
Caulking	20,018	sf	$1.00	$20,018	
Brick repoint 15%	1,400	sf	$17.00	$23,802	
Helflix anchors	1,112	ea	$25.00	$27,800	
Brick new	3,000	sf	$35.00	$105,000	
Seal brick- existing	9,334	sf	$1.50	$14,001	
Power wash building	20,018	sf	$2.00	$40,036	
Unforeseen exterior elements	1	allow	$90,000.00	$90,000	
Patch and repair	1	allow	$75,000.00	$75,000	
Main Entrance- SW					
Demo east and west for new storefronts	1,871	sf	$5.00	$9,355	
New storefront entries	1,871	sf	$50.00	$93,550	
New entry doors	2	pr	$7,500.00	$15,000	
Steel HSS	2	locatio	$12,500.00	$25,000	
Main Entrance- NE					
Relocate doors	1	allow	$9,000.00	$9,000	
Relocate bike parking	1	unit	$12,500.00	$12,500	
Repair exterior soffit	5,066	sf	$7.00	$35,462	
Subtotal				**$1,422,259**	
ROOFING					

GBC CONSTRUCTION
Building Relationships

Project:	**Huestis**	Estimate No.:	1.0
Location:	Eugene OR	Date:	15-Oct-17
Owner:	UO	Estimator:	Freeman
Architect	RSA		

Description	**Quantity**		**Unit Price**	**Price**	**Comments**
Demo MEP	1	allow	$50,000.00	$50,000	
Roof demo	14,464	sf	$2.00	$28,928	
New TPO low roof	6,984	sf	$22.00	$153,648	
Penthouse roof	7,480	sf	$25.00	$187,000	
Rough Carpentry	14,464	sf	$3.00	$43,392	
Flashing & Sheet Metal	14,464	sf	$4.00	$57,856	
Hoisting	1	allow	$20,000.00	$20,000	
Roof rail system	519	lf	$150.00	$77,850	
Fall protection achors	16	ea	$3,500.00	$56,000	
RTU/ Fan Supports	7	ea	$6,000.00	$42,000	
Subtotal				**$716,674**	
INTERIOR CONSTRUCITON					
Demolition interior					
MEP safe off	3	floors	$15,000.00	$45,000	
Temp partions/ containment	1	floors	$25,000.00	$25,000	
Interior demolition	53,850	sf	$7.00	$376,950	
Trash chute	2	ea	$18,500.00	$37,000	
Subtotal				**$483,950**	
Basement	7,900	SF			
MEP work arounds/ shutdowns for occupied	1	allow	$35,000.00	$35,000	
Mechanical rooms finishes	6,350	sf	$20.00	$127,000	
Zebra room- finishes	650	sf	$95.00	$61,750	
Autoclave- finishes	900	sf	$95.00	$85,500	machines by Owner
Fume hood	1	ea			
Level 1	14,464				
General					
Floor prep	14,464	sf	$1.00	$14,464	
Concrete cutting	1	allow	$10,000.00	$10,000	
Elev Lobby upgrades	1	allow	$15,000.00	$15,000	
Final clean/protection	14,464	sf	$1.25	$18,080	
Rough carpentry	14,464	sf	$2.00	$28,928	
Walls					
Shaft wall	5,632	sf	$10.00	$56,320	
Dimising	7,629	sf	$8.00	$61,032	
Furring at permiter	13,271	sf	$5.00	$66,355	
Paint					
Paint walls	39,813	sf	$0.80	$31,850	
Paint door frames	54	ea	$125.00	$6,750	
Ceilings					
LMCP	5,197	sf	$15.00	$77,955	
Clouds	17	ea	$5,500.00	$93,500	
Hard lid at restrooms	358	sf	$10.00	$3,580	
ACT	479	sf	$7.00	$3,353	
Acoustical ceiling treatment at OTS	9,259	sf	$6.00	$55,554	
OTS	9,259	sf	$1.50	$13,889	
Doors and Hardware					
3x7- single	25	ea	$1,800.00	$45,000	
3x7 double	4	ea	$1,900.00	$7,600	
Relite	25	ea	$1,500.00	$37,500	
Fire doors	2	ea	$2,200.00	$4,400	
Casework					
Upper	255	lf	$350.00	$89,250	
Lower	281	lf	$300.00	$84,300	
Epoxy surface	600	sf	$35.00	$21,000	
Solid Surface	104	sf	$10.00	$1,040	
Stainless	0	lf	$303.00	$0	
Lab benches	none	lf	$304.00	$0	
Podium	7	ea	$5,500.00	$38,500	
Book shelf	0	lf	$275.00	$0	
Flooring					
LVT	5,197	sf	$6.00	$31,182	
Rubbersheet flooring	8,431	sf	$9.00	$75,879	
Sealed concrete	460	sf	$3.00	$1,380	
VCT- IDF	64	sf	$5.00	$320	
Carpet tile	479	sf	$5.00	$2,395	
WOM	2	loc	$7,500.00	$15,000	
Ceramic floors and walls	1,633	sf	$30.00	$48,990	
Specialties					
Bathrooms	2	ea	$2,500.00	$5,000	
Signage	1	allow	$3,500.00	$3,500	
Window coverings	1	ls	$30,000.00	$30,000	
Misc items	14,464	sf	$0.75	$10,848	
Level 2	15,743				
General					
Floor prep	15,743	sf	$1.00	$15,743	
Concrete cutting	1	allow	$10,000.00	$10,000	
Elev Lobby upgrades	1	allow	$15,000.00	$15,000	
Final clean/protection	15,743	sf	$1.25	$19,679	
Rough carpentry	15,743	sf	$2.00	$31,486	
Walls					
Shaft wall	4,576	sf	$10.00	$45,760	
Dimising	10,802	sf	$8.00	$86,416	
Furring at permiter	8,197	sf	$5.00	$40,985	
Paint					
Paint walls	24,591	sf	$0.80	$19,673	
Paint door frames	1,220	ea	$125.00	$152,500	

GBC CONSTRUCTION
Building Relationships

Project:	**Huestis**	Estimate No.:	1.0
Location:	Eugene OR	Date:	15-Oct-17
Owner:	UO	Estimator:	Freeman
Architect	RSA		

Description	Quantity		Unit Price	Price	Comments
Ceilings					
LMCP	1,805	sf	$15.00	$27,075	
Clouds	5	ea	$5,500.00	$27,500	
Hard lid at restrooms	357	sf	$10.00	$3,570	
ACT	1,890	sf	$7.00	$13,230	
Acoustical ceiling treatment at OTS	0	sf	$6.00	$0	
OTS	9,421	sf	$1.50	$14,132	
Doors and Hardware					
3x7- single	43	ea	$1,800.00	$77,400	
3x7 double	1	ea	$1,900.00	$1,900	
Relite	1,176	sf	$7.00	$8,232	
Fire doors	0	ea	$2,200.00	$0	
Casework					
Upper	538	lf	$350.00	$188,300	
Lower	538	lf	$300.00	$161,400	
Epoxy surface	3,008	sf	$35.00	$105,280	
Solid Surface	361	sf	$10.00	$3,610	
Stainless	0	lf	$303.00	$0	
Lab benches	479	lf	$300.00	$143,700	
Podium	0	ea	$5,500.00	$0	
Book shelf	0	lf	$275.00	$0	
Flooring					
LVT	4,767	sf	$6.00	$28,602	
Rubbersheet flooring	9,090	sf	$9.00	$81,810	
Sealed concrete	460	sf	$3.00	$1,380	
VCT- IDF	272	sf	$5.00	$1,360	
Carpet tile	1,381	sf	$5.00	$6,905	
WOM	0	loc	$7,500.00	$0	
Ceramic floors and walls	1,633	sf	$30.00	$49,000	
Sealed concrete	460	sf	$3.00	$1,380	
Specialties					
Bathrooms	3	ea	$2,500.00	$7,500	
Signage	1	allow	$3,500.00	$3,500	
Window coverings	1	ls	$30,000.00	$30,000	
Misc items	15,743	sf	$0.75	$11,807	
Level 3	15,743				
General					
Floor prep	15,743	sf	$1.00	$15,743	
Concrete cutting	1	allow	$10,000.00	$10,000	
Elev Lobby upgrades	1	allow	$15,000.00	$15,000	
Final clean/protection	15,743	sf	$1.25	$19,679	
Rough carpentry	15,743	sf	$1.50	$23,615	
Walls					
Shaft wall	4,576	sf	$10.00	$45,760	
Dimising	10,802	sf	$8.00	$86,416	
Furring at permiter	8,514	sf	$5.00	$42,570	
Paint walls	30,118	sf	$0.80	$24,094	
Paint					
Paint walls	60,236	sf	$0.80	$48,189	
Paint door frames	115	ea	$125.00	$14,375	
Ceilings					
LMCP	2,929	sf	$15.00	$43,935	
Clouds	6	ea	$5,500.00	$33,000	
Hard lid at restrooms	357	sf	$10.00	$3,570	
ACT	1,857	sf	$7.00	$12,999	
Acoustical ceiling treament at OTS	0	sf	$6.00	$0	
OTS	9,669	sf	$1.50	$14,504	
Doors and Hardware					
3x7- single	42	ea	$1,800.00	$75,600	
3x7 double	1	ea	$1,900.00	$1,900	
Relite	1,680	sf	$20.00	$33,600	
Fire doors	0	ea	$2,200.00	$0	
Casework					
Upper	796	lf	$350.00	$278,600	
Lower	796	lf	$300.00	$238,800	
Epoxy surface	3,388	sf	$35.00	$118,580	
Solid Surface	997	sf	$10.00	$9,970	
Stainless	0	lf	$303.00	$0	
Lab benches	479	lf	$300.00	$143,700	
Podiuim	0	ea	$5,500.00	$0	
Book shelf	0	lf	$275.00	$0	
Flooring					
LVT	4,453	sf	$6.00	$26,718	
Rubbersheet flooring	9,080	sf	$9.00	$81,720	
Sealed concrete	460	sf	$3.00	$1,380	
VCT- IDF	262	sf	$5.00	$1,310	
Carpet tile	896	sf	$5.00	$4,480	
WOM	0	loc	$7,500.00	$0	
Ceramic floors and walls	414	sf	$30.00	$12,420	
Sealed concrete	460	sf	$3.00	$1,380	
Specialties					
Bathrooms	3	ea	$2,500.00	$7,500	
Signage	1	allow	$3,500.00	$3,500	
Window coverings	1	ls	$15,000.00	$15,000	
Misc items	15,743	sf	$0.75	$11,807	

GBC CONSTRUCTION
Building Relationships

Project:	**Huestis**	Estimate No.:	1.0
Location:	Eugene OR	Date:	15-Oct-17
Owner:	UO	Estimator:	Freeman
Architect	RSA		

Description	Quantity		Unit Price	Price	Comments
Subtotal					
North Foyer					
Demo shaft wall for glazing	288	sf	$25.00	$7,200	
Fire rated glazing in stair	288	sf	$100.00	$28,800	
Caulking	1	ls	$3,500.00	$3,500	
Door with hold open	3	ea	$3,500.00	$10,500	
South Foyer					
Demo shaft wall for glazing	300	sf	$25.00	$7,500	
Fire rated glazing in stair	300	sf	$100.00	$30,000	
Caulking	1	ls	$3,500.00	$3,500	
Door with hold open	3	ea	$3,500.00	$10,500	
Stairs/ Misc					
Whiteboards	27	ea	$2,500.00	$67,500	
Fume hoods	24	ea	by UO	by UO	
Restroom partitions	16	stall	$1,100.00	$17,600	
Stair treads	2	shafts	$8,000.00	$16,000	
OFCI	1	allow	$15,000.00	$15,000	
TV	6	ea	$1,500.00	$9,000	
Appliances	8	ea	$700.00	$5,600	
Freezer	13	ea	by UO	by UO	
Main entrance graphics	1	allow	$5,000.00	$5,000	
Wayfinding				by UO	
New handrail	400	lf	$50.00	$20,000	
Guardrail	400	lf	$125.00	$50,000	
Demo old handrail	400	lf	$20.00	$8,000	
Patch and repair	2	shafts	$10,000.00	$20,000	
Signage	1	ls	$15,000.00	$15,000	
Subtotal				**$4,726,373**	
CONVEYING SYSTEMS					
Replace 1 existing elevators	4	stops	$79,000.00	$316,000	
Shaft modifications for new cars	1	shafts	$25,000.00	$25,000	
Subtotal				**$341,000**	
HVAC-					
Safe off temp services	53,850	sf	$2.00	$107,700	
Exhaust systems					
Restroom and other Exhaust systems	15	ea	$9,000.00	$135,000	
Fume Hood exhaust systems	23	ea	$15,000.00	$345,000	
Fume hood exhaust Recconect Zebra	2	ea	$7,500.00	$15,000	
Lab equipment exhaust none show	2	flrs	$25,000.00	$50,000	
Steam and Condensate return systems				$0	
CP pumps	2	ea	$12,500.00	$25,000	
Flash tank	1	ea	$10,000.00	$10,000	
Heat exchanger	2	ea	$12,500.00	$25,000	
Condensate receiver	2	ea	$5,000.00	$10,000	
Distribution piping	500	lf	$400.00	$200,000	
Hydronic systems				$0	
HW				$0	
Heat exchanger	2	ea	$12,500.00	$25,000	
AS tank	1	ea	$9,500.00	$9,500	
ET	2	ea	$5,500.00	$11,000	
HWP 1 and 2	2	ea	$10,550.00	$21,100	
CPF	1	ea	$6,000.00	$6,000	
Distribution piping	1,680	lf	$220.00	$369,600	
CW					
CWP 1 and 2	2	ea	$11,000.00	$22,000	
CB'p	2	ea	$7,500.00	$15,000	
CW manifold and valve	16	ea	$1,500.00	$24,000	
Distribution piping	2,800	lf	$48.00	$134,400	
Shafts					
Modify main supply hot and chilled	2	ea	$25,000.00	$50,000	
Shaft risers HWS/HWR; CWS;CWR;	1	shafts	$130,000.00	$130,000	
Duct risers in shaft	7	shafts	$55,000.00	$385,000	
Central Air Dist. Sys					
AHU's	22,000	CFM	$15.00	$330,000	
RTU curbs	3	ea	$7,000.00	$21,000	
VAV Terminal Units	40	ea	$1,000.00	$40,000	
Exhaust fans	2	ea	$10,000.00	$20,000	
Return fans	2	ea	$11,000.00	$22,000	
Heat recovery system	1	allow	$50,000.00	$50,000	
Hoisting	2	ea	$11,500.00	$23,000	
Supply and return duct work	53,850	sf	$10.00	$538,500	
Phoenix valves at research labs	36	ea	$5,000.00	$180,000	2 per hood
Chilled beams	150	ea	$1,371.00	$205,650	cant quantify
CHWS&R to chilled beams- mains	2,100	lf	$48.00	$100,800	
HSWSR to chilled beams	2,100	lf	$47.00	$98,700	
Pex run out to beams	150	ea	$1,150.00	$172,500	
Pipe insulation	1	allow	$100,000.00	$100,000	
DDC Controls	53,850	sf	$13.00	$700,050	
Coring and concrete cutting	1	allow	$15,000.00	$15,000	
BIM	1	ls	$65,000.00	$65,000	
Subtotal				**$4,807,500**	
FIRE SPRINKLERS					
Fire Sprinklers	53,850	sf	$4.00	$215,400	
Subtotal				**$215,400**	
PLUMBING					
Plumbing demo	53,850	sf	$0.75	$40,388	

GBC CONSTRUCTION
Building Relationships

Project:	**Huestis**	Estimate No.:	1.0
Location:	Eugene OR	Date:	15-Oct-17
Owner:	UO	Estimator:	Freeman
Architect	RSA		

Description	**Quantity**		**Unit Price**	**Price**	**Comments**
Plumbing fixtures					
WC	16	ea	$4,500.00	$72,000	
Lavs	77	ea	$4,000.00	$308,000	
Floor drains	30	ea	$2,500.00	$75,000	
Mop sinks	3	ea	$2,500.00	$7,500	
Eyewash	25	ea	$3,000.00	$75,000	
Air/gas/vac	86	loc	$2,500.00	$215,000	
Shower	25	ea	$3,200.00	$80,000	
Plumbing	53,850	sf	$4.00	$215,400	
Roof drains	11	ea	$5,000.00	$55,000	
Acid wast and vent	63	loc	$1,500.00	$94,500	
300 gal holding tank	1	ea	$15,000.00	$15,000	
Domestic Water					
Pump	2	ea	$5,500.00	$11,000	
Water heater 150 gpm	2	ea	$10,000.00	$20,000	
Mixing valves	1	ea	$2,500.00	$2,500	
Lab Hot water					
Water heater 150 gpm	2	ea	$11,200.00	$22,400	
Pump	2	ea	$5,500.00	$11,000	
Storm water					
Pump sump	1	ea	$8,500.00	$8,500	
Compressed air					
Compressors	2	ea	$4,500.00	$9,000	
Air dryer	1	ea	$6,200.00	$6,200	
Vacuum					
Compressors	1	ea	$10,000.00	$10,000	
Receiver tank	1	ea	$15,000.00	$15,000	
Reverse Osmosis					
400 gal	2	ea	$12,000.00	$24,000	
Hoisting	1	ea	$7,500.00	$7,500	
Dist piping for RO;Air;Gas;Vac	53,850	sf	$4.50	$242,325	
Expansion tank	1	ea	$10,000.00	$10,000	
Elevator sump pump	1	ea	$8,500.00	$8,500	
Sewer ejector pump	1	ea	$9,000.00	$9,000	
Subtotal				**$1,669,713**	
ELECTRICAL	53,850	sf			
Commissioning	1	ls	$10,500.00	$10,500	
Testing	1	ls	$22,000.00	$22,000	
BIM	1	ls	$19,500.00	$19,500	
Temp power	1	ls	$24,000.00	$24,000	
Electrical Gear	1	ls	$100,000.00	$100,000	
Electrical Gear- 4000a	1	ls	$152,000.00	$152,000	
Gear Labor	1	ls	$22,500.00	$22,500	
Gear Labor 4000a	1	ls	$40,000.00	$40,000	
Feeder	1	ls	$156,000.00	$156,000	
MV feeder	1	ls	$42,000.00	$42,000	
Lighting Fixtures	53,850	sf	$14.00	$753,900	
Lighting Controls	53,850	sf	$2.00	$107,700	
Lighting Circuitry	53,850	sf	$2.00	$107,700	
Power Materials	53,850	sf	$3.25	$175,013	
Cable Tray LV conduits	53,850	sf	$1.50	$80,775	
AV Conduit	53,850	sf	$0.65	$35,003	
Fire Alarm and raceway	53,850	sf	$2.75	$148,088	
Lab components	31,486	sf	$2.50	$78,715	
Mechanical equipment	53,850	sf	$1.50	$80,775	
Labor	53,850	sf	$10.50	$565,425	
Transformers					
Demo 750kva transformer	1	ea	$9,000.00	$9,000	
New 750kva	1	ea	$40,000.00	$40,000	
New 1500KVA	1	ea	$62,000.00	$62,000	
Security					
CCTV at entrances	14	ea	$3,500.00	$49,000	
Card readers	35	ea	$3,000.00	$105,000	
Head in equipment	1	ls	$25,000.00	$25,000	
Bosh monitoring panels	4	ea	$6,500.00	$26,000	
Subtotal				**$3,037,594**	
LV Systems					
IS estimate	53,850	sf	$12.00	$646,200	use Onyx number/ sf provided by UO
Subtotal				**$646,200**	

5b. TIER ONE SEISMIC EVALUATION

University of Oregon
Huestis Hall
1425 East 13th Avenue
Eugene, Oregon

ASCE 41 Evaluation

October 6, 2017

Submitted to:
University of Oregon
Design and Construction
1295 Franklin Boulevard
Eugene, OR 97403

Submitted by:
Equilibrium Engineers, LLC
16325 Boones Ferry Road, Suite 202
Lake Oswego, OR 97035
Project No. 17082

University of Oregon-Huestis Hall

1425 East 13th Avenue
Eugene, Oregon

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University of Oregon-Huestis Hall

1425 East 13th Avenue
Eugene, Oregon

ASCE 41 Evaluation
October 6, 2017

Introduction

Huestis Hall is located at 1425 East 13th Avenue, on the campus of The University of Oregon in Eugene. The building was originally constructed around 1971, and is a four-story cast in place concrete structure, with the lowest level being a subgrade basement. For the purposes of this ASCE 41 evaluation, the structure will be classified as type C1: Concrete Moment Frame.

We evaluated the building using the Tier 1 Life Safety Performance Level criteria outlined by ASCE 41. A building which is compliant with the Tier 1 Life Safety Performance Level criteria is expected to have damage to both structural and nonstructural components during a design earthquake, such that:

1. At least some margin against either partial or total collapse remains
2. Injuries may occur, but the overall risk of life-threatening injury as a result of structural damage is expected to be low.
3. The building may require significant repairs post-earthquake, which may delay reopening of the building for its intended use. The cost of these repairs may be considerable.

Executive Summary

The building's lateral-load-resisting elements were evaluated using the criteria of ASCE 41 to determine their capacity to resist earthquake ground motion. Based on this review, the primary deficiency appears to be the soft story in the transverse (East/West) direction. Other deficiencies are also identified and described later in this report.

Scope

The University of Oregon retained Equilibrium Engineers, LLC to conduct a seismic evaluation of Huestis Hall using ASCE 41-13, *Seismic Evaluation and Retrofit of Existing Buildings*, published in 2014 by the American Society of Civil Engineers, as the basis of our assessment of the building as it relates to seismic hazards.

Our evaluation included a limited field reconnaissance to observe the general physical status of the building and the site and an assessment of significant structural deficiencies observed. No testing or demolition of finishes to expose the existing structural elements was conducted to determine their material properties. For this reason, several items of the evaluation are noted as unknown. We also performed a review of all original construction documents made available to us, and compared those with the as-built conditions.

Observations, analyses, and conclusions contained in this report reflect our best engineering judgment. Concealed problems with the construction of the building may exist that cannot be revealed through our review. Equilibrium Engineers, therefore, can in no way warrant or guarantee the condition of the existing construction of the building or the future performance of the building.

<u>Observations</u>

Our conclusions about the structural system are drawn from a review of the existing building drawings and our site observations of the structure made during a site visit on August 30, 2017. The following sections present our comments regarding our review of the available documents and site visit.

Document Review

Original building construction documents were provided by The University of Oregon and the sheets used as part of this evaluation are listed below. Original Construction Drawings by Skidmore, Owings and Merrill (undated).

51-01 through 56-01 Original Structural Construction Documents
21-01 through 27-01 Original Architectural Construction Documents
Original Structural Calculations

Site Reconnaissance

On August 30, 2017, a representative of Equilibrium Engineers, LLC made a site visit to assess the condition of the existing structure. The primary objective of the visit was to become familiar with the building, look for areas that may have some deterioration, and to verify and determine as many as-built conditions as possible.

The following observations were made:

- In general, Huestis Hall appears to be constructed as indicated on the available drawings.
- According to the original structural calculations, the building was originally designed to be 7 stories above grade, but only 3 were built. The building columns were extended above the roof to accommodate future expansion.
- There do not appear to have been many significant modifications made to the original building
- New buildings that were added adjacent to Huestis Hall were done so with accommodation for movement between the buildings.
- Exterior finishes did not appear to have major cracks or have significant damage.
- Fall prone contents were stacked on top of tall cabinets, sometimes adjacent to doors providing egress from classrooms.
- Tall, narrow shelving units did not appear to have adequate bracing

<u>Structural Evaluation</u>

The building's lateral-load-resisting components were evaluated to determine their capacity to resist earthquake ground motion. The general structural seismic evaluation was performed using the criteria of ASCE 41, *Seismic Evaluation and Retrofit of Existing Buildings*. The structure was evaluated at the Life Safety Performance Level in the BSE-1N earthquake scenario. The BSE-1N seismic event represents an earthquake with a 10% chance of occurring in the next 50 years and is intended to match the design earthquake ground motions in ASCE 7 for new buildings. This seismic hazard level was chosen by The University of Oregon as the basis for this assessment.

The ASCE 41 prescribes a three-tiered method to evaluate an existing building. See below for a description of each Tier. For this project, only Tier 1 was used.

- Tier 1 - Screening Phase. Includes completing checklists for the structure, foundations, and nonstructural items. During this tier phase, a review is performed of any available construction documents. A site visit is made to observe the building for any indications of deterioration of the structure and finishes, and to compare the as-built information with the construction documents. A limited structural analysis is performed and computed lateral forces are applied to the structure and expected demands are compared to assumed capacities.

- Tier 2 - Evaluation Phase. Includes analysis of the non-compliant elements from Tier 1, utilizing a simplified static analysis approach. A Tier 2 analysis assists in the further evaluation of non-compliant items to get a more accurate idea of how deficient the non-compliant items are compared to actual building code calculated demands and capacities.

- Tier 3 - Detailed Evaluation Phase. This phase consists of a non-linear analysis of the non-compliant Tier 2 and is beyond the scope of this report.

In the ASCE 41, the base shear, or the total seismic force on the building, is calculated by a prescribed formula accounting for geographic seismicity, the type of building structure, its stiffness, and its overall mass. The base shear is distributed to each story based on a weighted proportion of the floor's mass and height above the ground. The structural elements are analyzed with these seismic demand forces distributed to each element based on their relative stiffness. For a given structural element, a demand-capacity ratio (DCR) is calculated which is the demand (D) divided by the capacity (C) of the existing element, and is a relative measure of how much is required of the structure in its current condition. The capacity (C) of the element uses nominal values obtained from the current code and multiplying that value by an m factor which can be anywhere from 1 to 4 depending on the type of element we are evaluating. This method for evaluation of the existing capacity accounts for some greater strength based on the probability of how that material has performed historically. A DCR of 1.0 means the demand is equal to the capacity of that element. A DCR of more than one means the structure is required to resist more than its capacity. For example, a DCR of 2.0 means the element is required to resist a force twice its existing capacity. A DCR of less than one means the structure has reserve capacity. The demand on each structural component is compared to the capacity of that element. For the purposes of this evaluation, we calculated the DCR values for the concrete moment frames only.

General Summary

The ASCE 41 evaluation identifies specific areas where the building structure does not comply with seismic evaluation criteria. The evaluation checklists used are attached to this report. The specific areas where seismic performance deficiencies were identified (and listed as non-compliant in the attached evaluation checklists), are listed below. We have included items that are also marked as unknown in the checklists which we believe could pose a significant threat to life safety.

Basic Life Safety Structural Items:

- The separation joints between Huestis Hall and the buildings adjacent to it are not large enough to accommodate anticipated building displacements resulting from an earthquake. Consequently, in an earthquake scenario, the buildings could collide, causing severe damage and obstruction to egress paths from the buildings.

- The moment frames that resist transverse (east-west) seismic forces are comprised of a combination of concrete columns and in-plane wall segments supporting continuous concrete beams. The in-plane wall segments terminate at the second floor, creating a weak story and soft story mechanisms as well as a vertical irregularity in the lateral force resisting system that could lead to partial or complete collapse during an earthquake.

Building Type-Specific Structural Items:

- The building does not comply with the Tier 1 quick check procedure for moment frame column shear stresses at the ground level.

  DCR North South Direction : 0.62
  DCR East West Direction : 1.48

- The frames at the north and south ends of the building have frame members with inadequate shear capacity.
- Reinforcing in columns have inadequate splice lengths, and column tie spacing exceeds recommended limits

Nonstructural Components:

- Breakable containers with acid and other lab chemicals are on open shelves and not protected from falling.
- Brick veneer does not appear to be anchored to back up wall for out of plane forces
- Tall, narrow cabinets and are not anchored or braced for seismic loads
- Fall prone contents are evident in most classrooms, with some being located adjacent to the doors into the corridor.
- Suspended ductwork and piping did not appear to have sufficient lateral bracing in all locations.

Conclusions

Based on our analysis and assessment, we believe that the building's seismic lateral-force-resisting system requires some level of retrofit in order to meet the Life Safety Performance Level requirements of ASCE 41. Following are the primary reasons for the retrofit:

- The soft or weak story deficiency and lack of adequate lateral strength in the transverse direction is of concern, as it could be the source of partial or complete collapse in an earthquake.
- The reinforcement in the moment frame columns is not properly confined or lap spliced, which diminishes its viability in an earthquake.
- Fall prone contents will obstruct the ability of people to exit the building safely during or after an earthquake

If seismic strengthening was to be considered, we recommend the following items be addressed (in order of importance starting with the most important) to achieve a Life Safety Performance Level:

1. Add concrete shear walls in the transverse direction at the ground level and add shotcrete to the existing exterior north and south walls above the second floor, to resolve the inadequacies of the lateral force resisting system in that direction. These new walls will require doweling to all existing floor and roof diaphragms as well as new foundations. Reference Retrofit Sketches for locations of these walls.

2. Wrap all building columns with carbon fiber to provide adequate confinement of vertical reinforcing and improve their ductility.

3. Remove or store fall-prone materials in cabinets with latched doors. Secure all containers with hazardous materials in a cabinet with latched doors.

4. Anchor or otherwise laterally brace tall, narrow shelving units over 6 feet tall.

5. Anchor all brick veneer at 16" o.c. each way to concrete back-up wall with Helifix anchors.

6. Install lateral bracing at all unbraced ductwork, piping and mechanical equipment that is suspended from but not braced to the structure.

Evaluation Statement	Evaluation (1)
LIFE SAFETY BASIC CONFIGURATION CHECKLIST	
LOW SEISMICITY	
BUILDING SYSTEM	
General	
LOAD PATH: The structure shall contain a complete, well defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of elements of the building to the foundation. (Commentary: Sec. A.2.1.1, Tier 2: Sec. 5.4.1.1)	C
ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 4% of the height of the shorter building. This statement shall not apply for the following building types: W1, W1a, and W2. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2)	NC
MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3)	N/A
Building Configuration	
WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in an adjacent story above. (Commentary: Sec. A.2.2.2. Tier 2: Sec. 5.4.2.1) *In the transverse direction (East-West), the end wall frames terminate at second floor, creating a weak story*	NC

SEISMIC EVALUATION (Per ASCE-41-13)

Life Safety Basic Configuration Checklist
Building Name: U of O Huestis Hall
Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)
SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2) *The transverse (East-West) end wall frames are stiffer at second floor than they are at first floor.*	NC
VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Commentary: Sec. A.2.2.4. Tier 2: Sec. 5.4.2.3) *The transverse (East-West) end wall frames have wall/column elements that terminate on a transfer beam at the second floor with no special detailing.*	NC
GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories. Excluding one-story penthouses and mezzanines. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4)	C
MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Commentary: Sec. A.2.2.6. Tier 2: Sec. 5.4.2.5)	C
TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Commentary: Sec. A.2.2.7. Tier 2: Sec. 5.4.2.6)	C

SEISMIC EVALUATION (Per ASCE-41-13)

Life Safety Basic Configuration Checklist

Building Name: U of O Huestis Hall

Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)
MODERATE SEISMICITY Complete the Following Items in Additions to Items for Low Seismicity	
GEOLOGIC SITE HAZARDS	
LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 feet under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1)	U
SLOPE FAILURE: The building site is sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or is capable of accommodating any predicted movements without failure. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1)	C
SURFACE RAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: Sec. 5.4.3.1)	U
HIGH SEISMICITY Complete the Following Items in Additions to Items for Low and Moderate Seismicity	
FOUNDATION CONFIGURATION	
OVERTURNING: The ratio of least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than 0.6Sa. (Commentary: Sec. A.6.2.1. Tier 2: 5.4.3.3)	C
TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Commentary: Sec. A.6.2.2. Tier 2: 5.4.3.4) *Perimeter frames are founded on a continuous concrete basement wall. Interior columns are tied at ground floor level by first floor structure (backstay support)*	C

FOOTNOTES:

SEISMIC EVALUATION (Per ASCE-41-13)

Life Safety Basic Configuration Checklist

Building Name: U of O Huestis Hall

Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)

(1) C = Compliant; NC = Non-compliant; N/A = Not Applicable; U = Unable to Determine or Not Investigated

SEISMIC EVALUATION (Per ASCE-41-13)

Building Type C1: Concrete Moment Frames

Building Name: U of O Huestis Hall

Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)
LOW SEISMICITY	
SEISMIC-FORCE-RESISTING SYSTEM	
REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2. The number of bays of moment frames in each line is greater than or equal to 2. (Commentary: Sec. A.3.1.1.1. Tier 2: Sec. 5.5.1.1)	C
COLUMN AXIAL STRESS CHECK: The axial stress caused by unfactored gravity loads in columns subjected to overturning forces because of seismic demands is less than $0.20f_c$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.5.3.6, is less than $0.30f_c$. (Commentary: Sec. A.3.1.4.2. Tier 2: Sec. 5.5.2.1.3)	C
CONNECTIONS	
CONCRETE COLUMNS: All concrete columns are doweled into the foundation with a minimum of 4 bars. (Commentary: Sec. A.5.3.2. Tier 2: Sec. 5.7.3.1)	C
MODERATE SEISMICITY	
SEISMIC-FORCE-RESISTING SYSTEM	
INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements. (Commentary: Sec. A.3.1.2.1. Tier 2: Sec. 5.5.2.1.1) *Interior walls are primarily metal stud with plaster*	NA

SEISMIC EVALUATION (Per ASCE-41-13)

Building Type C1: Concrete Moment Frames

Building Name: U of O Huestis Hall

Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)
COLUMN SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 4.5.3.2, is less than the greater of 100lb/in^2 or $2\sqrt{f_c}$. (Commentary: Sec. A.3.1.4.1. Tier 2: Sec. 5.5.2.1.4) *DCR in North-South (Longitudinal) Direction=0.62* *DCR in East-West (Transverse) Direction = 1.48*	NC
FLAT SLAB FRAMES: The seismic-force-resisting system is not a frame consisting of columns and a flat slab of plate without beams. (Commentary: Sec. A.3.1.4.3. Tier 2: Sec. 5.5.2.3.1)	N/A
HIGH SEISMICITY	
SEISMIC-FORCE-RESISTING SYSTEM	
PRESTRESSED FRAME ELEMENTS: The seismic-force-resisting frames do not include any prestressed or posttensioned elements where the average prestress exceeds the lesser of 700lb/in^2 or $f_c/6$ at potential hinge locations. The average prestess is calculated in accordance with the Quick Check procedure of Section 4.5.3.8. (Commentary: Sec. A.3.1.4.4. Tier 2: Sec. 5.5.2.3.2)	N/A
CAPTIVE COLUMNS: There are no columns at a level with height/depth ratios less than 50% of the nominal height/depth ratio of the typical columns at that level. (Commentary: Sec. A.3.1.4.5. Tier 2: Sec. 5.5.2.3.3)	C

Building Type C1: Concrete Moment Frames
Building Name: U of O Huestis Hall
Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)
NO SHEAR FAILURES: The shear capacity of frame members is able to develop the moment capacity at the ends of the members. (Commentary: Sec. A.3.1.4.6. Tier 2: Sec. 5.5.2.3.4) *East West end wall frames are deficient*	NC
STRONG COLUMN—WEAK BEAM: The sum of the moment capacity of the columns is 20% greater than that of the beams at frame joints. (Commentary: Sec. A.3.1.4.7. Tier 2: Sec. 5.5.2.1.5)	C
BEAM BARS: At least two longitudinal top and two longitudinal bottom bars extend continuously throughout the length of each frame beam. At least 25% of the longitudinal bars provided at the joints for either positive or negative moment are continuous throughout the length of the members. (Commentary: Sec. A.3.1.4.8. Tier 2: Sec. A.5.5.2.3.6)	C
COLUMN-BAR- SPLICES: All column-bar lap splice lengths are greater than $35d_b$ and are enclosed by ties spaced at or less than $8d_b$. Alternatively, column bars are spliced with mechanical couplers with a capacity of at least 1.25 times the nominal yield strength of the spliced bar. (Commentary: Sec. A.3.1.4.9. Tier 2: Sec. 5.5.2.3.5) *Lap length specified as 24db. Tie spacing is 4”, which complies with this checklist item.*	NC
BEAM-BAR SPLICES: The lap splices or mechanical couplers for longitudinal beam reinforcing are not located within $l_b/4$ of the joints and are not located in the vicinity of potential plastic hinge locations. (Commentary: Sec. A.3.1.4.10. Tier 2: Sec. 5.5.2.3.6)	C

SEISMIC EVALUATION (Per ASCE-41-13)

Building Type C1: Concrete Moment Frames

Building Name: U of O Huestis Hall

Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)
COLUMN-TIE SPACING: Frame columns have ties spaced at or less than d/4 throughout their length and at or less than $8d_b$ at all potential plastic hinge locations. (Commentary: Sec. A.3.1.4.11. Tier 2: Sec. 5.5.2.3.7) *Typical tie spacing is specified as 18", which is greater than d/4 for all frame columns.*	NC
STIRRUP SPACING: All beams have stirrups spaced at or less than d/2 throughout their length. At potential plastic hinge locations, stirrups are spaced at or less than the minimum of $8d_b$ or d/4. (Commentary: Sec. A.3.1.4.12. Tier 2: Sec. 5.5.2.3.7)	C
JOINT TRANSVERSE REINFORCING: Beam-column joints have ties spaced at or less than $8d_b$. (Commentary: Sec. A.3.1.4.13. Tier 2: Sec. 5.5.2.3.8)	C
DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components. (Commentary: Sec. A.3.1.6.2. Tier 2: Sec. 5.5.2.5.2)	C
FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints. (Commentary: Sec. A.3.1.6.3. Tier 2: Sec. 5.5.2.5.3)	N/A
DIAPHRAGMS	
DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1)	C
CONNECTIONS	
UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps. (Commentary: Sec. A.5.3.8. Tier 2: 5.7.3.5)	N/A

FOOTNOTES:

SEISMIC EVALUATION (Per ASCE-41-13)

Building Type C1: Concrete Moment Frames

Building Name: U of O Huestis Hall

Building Location: Eugene, OR

Evaluation Statement	Evaluation (1)

(1) C = Compliant; NC = Non-compliant; N/A = Not Applicable; U = Unable to Determine or Not Investigated

(2) Quick Check refers to ASCE 31 Procedures

Evaluation Statement	Evaluation (1)
NONSTRUCTURAL CHECKLIST	
LIFE SAFETY SYSTEMS	
LS-LMH; PR-LMH (3). FIRE SUPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13. (Commentary: Sec A.7.13.1. Tier 2: Sec 13.7.4)	U
LS-LMH; PR-LMH. FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13. (Commentary: Sec. A.7.13.2. Tier 2: Sec. 13.7.4)	U
LS-LMH; PR-LMH. EMERGENCY POWER: Equipment used to power or control life safety systems is anchored or braced. (Commentary: Sec. A.7.12.1. Tier 2: Sec.13.7.7)	N/A
LS-LMH; PR-LMH. STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints. (Commentary: Sec. A.7.14.1. Tier 2: Sec. 13.7.6)	N/A
LS-MH; PR-MH. SPRINKLER CEILING CLEARANCE: Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13. (Commentary: Sec. A.7.13.3. Tier 2: 13.7.4)	N/A
LS-not required; PR-LMH. EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced. (Commentary: Sec. A.7.3.1. Tier 2: Sec.13.7.9)	C
HAZARDOUS MATERIALS	
LS-LMH; PR-LMH. HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers. (Commentary: Sec. A.7.12.2. Tier 2: Sec. 13.7.1)	N/A

Evaluation Statement	Evaluation (1)
LS-LMH; PR-LMH. HAZARDOUS MATERIAL STORAGE: Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods. (Commentary: Sec. A.7.15.1. Tier 2: Sec.13.8.4)	NC
LS-MH; PR-MH. HAZARDOUS MATERIAL DISTRIBUTION: Piping or ductwork conveying hazardous material is braced or otherwise protected from damage that would allow hazardous material release. (Commentary: Sec. A.7.13.4. Tier 2: Sec. 13.7.3 and Sec. 13.7.5)	N/A
LS-MH; PR-MH. SHUT-OFF VALVES: Piping containing hazardous material, including natural gas, has shut-off valves or other devices to limit spills or leaks. (Commentary: Sec. A.7.13.3. Tier 2: Sec. 13.7.3 and 13.7.5)	N/A
LS-LMH; PR-LMH. FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, has flexible couplings. (Commentary: Sec. A.7.15.4. Tier 2: Sec. 13.7.3 and 13.7.5)	N/A
LS-MH; PR-MH. PIPING OR DUCTS CROSSING SEISMIC JOINTS: Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Commentary: Sec. A.7.13.6. Tier 2: Sec. 13.7.3, 13.7.5, and 13.7.6)	U
PARTITIONS	
LS-LMH; PR-LMH. UNREINFORCED MASONRY: Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 feet in Low or Moderate Seismicity, or at 6 feet in High Seismicity. (Commentary: Sec. A.7.1.1. Tier 2: Sec. 13.6.2)	N/A
LS-LMH; PR-LMH. HEAVY PARTITIONS SUPPORTED BY CEILINGS: The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system. (Commentary: Sec. A.7.2.1. Tier 2: Sec. 13.6.2)	C

Evaluation Statement	Evaluation (1)
LS-MH; PR-MH. DRIFT: Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005. (Commentary A.7.1.2. Tier 2: Sec. 13.6.2) *No movement joints are indicated between moment frame columns and intersecting partition walls*	NC
LS-not required; PR-MH. LIGHT PARTITIONS SUPPORTED BY CEILINGS: The tops of gypsum board partitions are not laterally supported by an integrated ceiling system. (Commentary: Sec. A.7.2.1. Tier 2: Sec. 13.6.2) *Partitions are detailed to be braced to floor slab*	C
LS-not required; PR-MH. STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints. (Commentary: Sec. A.7.1.3. Tier 2: Sec. 13.6.2)	C
LS-not required; PR-MH. TOPS: The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 feet. (Commentary: Sec. A.7.1.4. Tier 2: Sec. 13.6.2)	N/A
CEILINGS	
LS-MH; PR-LMH. SUSPENDED LATH AND PLASTER: Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 square feet of area. (Commentary: Sec. A.7.2.3. Tier 2: Sec. 13.6.4)	U
LS-MH; PR-LMH. SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 square feet of area. (Commentary: Sec. A.7.2.3. Tier 2: Sec. 13.6.4)	U
LS-not required; PR-MH. INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 square feet, and ceilings of smaller areas that are not surrounded by restraining partitions, are laterally restrained at a spacing no greater than 12 feet with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression. (Commentary: Sec. A.7.2.2. Tier 2: Sec. 13.6.4)	NC

Evaluation Statement	Evaluation (1)
LS-not required; PR-MH. EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 square feet have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, ½"; in High Seismicity, ¾". (Commentary: Sec. A.7.2.4. Tier 2: Sec.13.6.4)	NC
LS-not required; PR-MH. CONTINUITY ACROSS STRUCTURE JOINTS: The ceiling system does not cross any seismic joint and is not attached to multiple independent structures. (Commentary: Sec. A.7.2.5. Tier 2: Sec. 13.6.4)	U
LS-not required; PR-H. EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 square feet are supported by closure angles or channels not less than 2" wide. (Commentary: Sec. A.7.2.6. Tier 2: Sec. 13.6.4)	NC
LS-not required; PR-H. SEISMIC JOINTS: Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2500 square feet and has a ratio of long-to-short dimension no more than 4-to-1. (Commentary: Sec. A.7.2.7. Tier 2: Sec. 13.6.4)	NC
LIGHT FIXTURES	
LS-MH; PR-MH. INDEPENDENT SUPPORT: Light fixtures that weigh more per square foot than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture. (Commentary: Sec. A.7.3.2. Tier 2: Sec. 13.6.4 and 13.7.9)	U
LS-not required; PR-H. PENDANT SUPPORTS: Light fixtures on pendant supports are attached at a spacing equal to or less than 6 feet and, if rigidly supported, are free to move with the structure to which they are attached without damaging adjoining components. (Commentary: Sec. A.7.3.3. Tier 2: Sec.13.7.9)	C
LS-not required; PR-H. LENS COVERS: Lens covers on light fixtures are attached with safety devices. (Commentary: Sec. A.7.3.4. Tier 2: Sec. 13.7.9)	U

Evaluation Statement	Evaluation (1)
CLADDING AND GLAZING	
LS-MH; PR-MH. CLADDING ANCHORS: Cladding components weighing more than 10 psf are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 feet; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 feet. (Commentary: Sec. A.7.4.1. Tier 2: Sec. 13.6.1) *There does not appear to be mention of veneer anchors on the architectural drawings*	NC
LS-MH; PR-MH. CLADDING ISOLATION: For steel or concrete moment frame buildings, panel connections are detailed to accommodate a story drift ratio of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in an seismicity, 0.02. (Commentary: Sec. A.7.4.3. Tier 2: Sec. 13.6.1)	N/A
LS-MH; PR-MH. MULTI-STORY PANELS: For multi-story panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in ay seismicity, 0.02. (Commentary: Sec. A.7.4.4. Tier 2: Sec. 13.6.1)	N/A
LS-MH; PR-MH. PANEL CONNECTIONS: Cladding panels are anchored out-of-plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections. (Commentary: Sec. A.7.4.5. Tier 2: Sec. 13.6.1.4)	N/A
LS-MH; PR-MH. BEARING CONNECTIONS: Where bearing connections are used, there is minimum of two bearing connections for each cladding panel. (Commentary: Sec. A.7.4.6. Tier 2: Sec. 13.6.1.4)	N/A
LS-MH; PR-MH. INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel. (Commentary: Sec. A.7.4.7. Tier 2: Sec. 13.6.1.4)	N/A
LS-MH; PR-MH. OVERHEAD GLAZING: Glazing panes of any size in curtain walls and individual interior or exterior panes over 16 square feet in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked. (Commentary: Sec. A.7.4.8. Tier 2: Sec. 13.6.1.5)	C

SEISMIC EVALUATION (Per ASCE-41-13)

Building Name: U of O Huestis Hall

Building Location: Eugene, Oregon

Evaluation Statement	Evaluation (1)
MASONRY VENEER	
LS-LMH; PR-LMH. TIES: Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2.66 square feet, and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36"; for Life Safety in High Seismicity and for Position Retention in any seismicity, 24". (Commentary: Sec. A.7.5.1. Tier 2: Sec. 13.6.1.2)	NC
LS-LMH; PR-LMH. SHELF ANGLES: Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor. (Commentary: Sec. A.7.5.2. Tier 2: Sec. 13.6.1.2)	C
LS-LMH; PR-LMH. WEAKENED PLANES: Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the location of flashing. (Commentary: Sec. A.7.5.3. Tier 2: Sec. 13.6.1.2)	NC
LS-LMH; PR-LMH. UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup. (Commentary: Sec. A.7.7.2. Tier 2: Sec. 13.6.1.1 and 13.6.1.2)	C
LS-MH; PR-MH. STUD TRACKS: For veneer with metal stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24" on center. (Commentary: Sec. A.7.6.1. Tier 2: Sec. 13.6.1.1 and 13.6.1.2)	N/A
LS-MH; PR-MH. ANCHORAGE: For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 feet along the floors and roof. (Commentary: Sec. A.7.7.1. Tier 2: Sec 13.6.1.1 and 13.6.1.2)	N/A
LS-not required; PR-MH. WEEP HOLES: In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing. (Commentary: Sec. A.7.5.6. Tier 2: 13.6.1.2)	N/A
LS-not required; PR-MH. OPENINGS: For veneer with metal stud backup, steel studs frame window and door openings. (Commentary: Sec. A.7.6.2. Tier 2: Sec. 13.6.1.1 and 13.6.1.2)	N/A

Building Name: U of O Huestis Hall

Building Location: Eugene, Oregon

Evaluation Statement	Evaluation (1)
PARAPETS, CORNICES, ORNAMENTATION AND APPENDAGES	
LS-LMH; PR-LMH. URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-to-thickness ratios no greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life and Safety in High Seismicity and for Position Retention in any seismicity, 1.5. (Commentary: Sec. A.7.8.1. Tier 2: Sec. 13.6.5)	N/A
LS-LMH; PR-LMH. CANOPIES: Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 feet; for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 feet. (Commentary: Sec. A.7.8.2. Tier 2: Sec. 13.6.6)	N/A
LS-MH; PR-LMH. CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement. (Commentary: Sec. A.7.8.3. Tier 2: Sec 13.6.5)	C
LS-MH; PR-LMH. APPENDAGES: Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 feet. This checklist item does not apply to parapets or cornices covered by other checklist items. (Commentary: Sec. A.7.8.4. Tier 2: Sec. 13.6.6)	N/A
MASONRY CHIMNEYS	
LS-LMH; PR-LMH. URM CHIMNEYS: Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, 3 times the least dimension of the chimney; for Life Safety in High Seismicity and for Positioning Retention in any seismicity, 2 times the least dimension of the chimney. (Commentary: Sec. A.7.9.1. Tier 2: Sec. 13.6.7)	N/A
LS-LMH; PR-LMH. ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof. (Commentary: Sec. A.7.9.2. Tier 2: Sec.13.6.7)	N/A

Evaluation Statement	Evaluation (1)
STAIRS	
LS-LMH; PR-LMH. STAIR ENCLOSURES: Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out-of-plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1; for Life and Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1. (Commentary: Sec. A.7.10.1. Tier 2: 13.6.8)	N/A
LS-LMH; PR-LMH. STAIR DETAILS: In moment frame structures, the connection between the stairs and the structure does not rely on shallow anchors in concrete. Alternatively, the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.5.3.1 without including any lateral stiffness contribution from the stairs. (Commentary: Sec. A.7.10.2. Tier 2: Sec. 13.6.8) *Stair towers are structurally separated from the building structure*	C
CONTENTS AND FURNISHING	
LS-MH; PR-MH. INDUSTRIAL STORAGE RACKS: Industrial storage racks or pallet racks more than 12 feet high meet the requirements of ANSI/MH 16.1 as modified by ASCE 7 Chapter 15. (Commentary: Sec. A.7.11.1. Tier 2: Sec. 13.8.1)	NC
LS-H; PR-MH. TALL NARROW CONTENTS: Contents more than 6 feet high with a height-to width ratio greater than 3-to-1 are anchored to the structure or to each other. (Commentary: Sec. A.7.11.2. Tier 2: Sec. 13.8.2)	NC
LS-H; PR-H. FALL-PRONE CONTENTS: Equipment, stored items, or other contents weighing more than 20 lbs whose center of mass is more than 4ft above the adjacent floor level are braced or otherwise restrained. (Commentary: Sec. A.7.11.3. Tier 2: Sec. 13.8.2)	NC
LS-not required; PR-MH. ACCESS FLOORS: Access floors more than 9" high are braced. (Commentary: Sec. A.7.11.4. Tier 2: Sec. 13.8.3)	N/A

Evaluation Statement	Evaluation (1)
LS-not required; PR-MH. EQUIPMENT ON ACCESS FLOORS: Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor. (Commentary: Sec. A.7.11.5. Tier 2: Sec. 13.7.7. and 13.8.3)	N/A
LS-not required; PR-H. SUSPENDED CONTENTS: Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components. (Commentary: Sec. A.7.11.6. Tier 2: Sec.13.8.2)	NC
MECHANICAL AND ELECTRICAL EQUIPMENT	
LS-H; PR-H. FALL-PRONE EQUIPMENT: Equipment weighing more than 20 lbs whose center of mass is more than 4 feet above the adjacent floor level, and which is not in-line equipment, is braced. (Commentary: Sec. A.7.12.4. Tier 2: Sec. 13.7.1 and 13.7.7)	NC
LS-H; PR-H. IN-LINE EQUIPMENT: Equipment installed in-line with a duct or piping system, with an operating weight more than 75 lbs, is supported and laterally braced independent of the duct or piping system. (Commentary: Sec. A.7.12.5. Tier 2: Sec. 13.7.1)	NC
LS-H; PR-MH. TALL NARROW EQUIPMENT: Equipment more than 6 feet high with a height-to-depth or height-to-width ratio greater than 3-to-1 is anchored to the floor slab or adjacent structural walls. (Commentary: Sec. A.7.12.6. Tier 2: Sec. 13.7.1 and 13.7.7)	NC
LS-not required; PR-MH. MECHANICAL DOORS: Mechanically operated doors are detailed to operate at a story drift ratio of 0.01. (Commentary: Sec. A.7.12.7. Tier 2: Sec.13.6.9)	N/A
LS-not required; PR-H. SUSPENDED EQUIPMENT: Equipment suspended without lateral bracing is free to swing or move with the structure from which is suspended without damaging itself or adjoining components. (Commentary: Sec. A.7.12.8. Tier 2: Sec. 13.7.1 and 13.7.7)	NC
LS-not required; PR-H. VIBRATION ISOLATORS: Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning. (Commentary: Sec. A.7.12.9. Tier 2: Sec. 13.7.1)	N/A

Evaluation Statement	Evaluation (1)
LS-not required; PR-H. HEAVY EQUIPMENT: Floor-supported or platform-supported equipment weighing more than 400 lbs is anchored to the structure. (Commentary: Sec. A.7.12.10. Tier 2: Sec. 13.7.1 and 13.7.7) *Rooftop Equipment appears to be anchored*	C
LS-not required; PR-H. ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure. (Commentary: Sec. A.7.12.11. Tier 2: Sec. 13.7.7)	U
LS-not required; PR-H. CONDUIT COUPLINGS: Conduit greater than 2½” trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections. (Commentary: Sec. A.7.12.12. Tier 2: Sec. 13.7.8)	U
PIPING	
LS-not required; PR-H. FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings. (Commentary: Sec. A.7.13.2. Tier 2: Sec. 13.7.3 and 13.7.5)	U
LS-not required; PR-H. FLUID AND GAS PIPING: Fluid and gas piping is anchored and braced to the structure to limit spills and leaks. (Commentary: Sec. A.7.13.4. Tier 2: Sec. 13.7.3 and 13.7.5)	U
LS-not required; PR-H. C-CLAMPS: One-sided C-clamps that support piping larger than 2½” in diameter are restrained. (Commentary: Sec. A.7.13.5. Tier 2: Sec. 13.7.3 and 13.7.5)	U
LS-not required; PR-H. PIPING CROSSING SESIMIC JOINTS: Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Commentary: Sec. A.7.13.6. Tier 2: Sec. 13.7.3 and 13.7.5)	U

Evaluation Statement	Evaluation (1)
DUCTS	
LS-not required; PR-H. DUCT BRACING: Rectangular ductwork larger than 6 square feet in cross-sectional area and round ducts larger than 28" in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 feet. The maximum spacing of longitudinal bracing does not exceed 60 feet. (Commentary: Sec. A.7.14.2. Tier 2: Sec. 13.7.6)	NC
LS-not required; PR-H. DUCT SUPPORT: Ducts are not supported by piping or electrical conduit. (Commentary: Sec. A.7.14.3. Tier 2: Sec. 13.7.6)	U
LS-not required; PR-H. DUCTS CROSSING SEISMIC JOINTS: Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements. (Commentary: Sec. A.7.14.5. Tier 2: Sec.13.7.6)	U
ELEVATORS	
LS-H; PR-H. RETAINER GUARDS: Sheaves and drums have cable retainer guards. (Commentary: Sec. A.7.16.1. Tier 2: Sec. 13.8.6)	N/A
LS-H; PR-H. RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight. (Commentary: Sec. A.7.16.2. Tier2: 13.8.6)	N/A
LS-not required; PR-H. ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored. (Commentary: Sec. A.7.16.3. Tier 2: Sec. 13.8.6)	N/A
LS-not required; PR-H. SEISMIC SWITCH: Elevators capable of operating at speeds of 150 ft/min or faster are equipped with seismic switches that meet the requirements of ASME A17.1 or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations. (Commentary: Sec. A.7.16.4. Tier 2: Sec. 13.8.6)	N/A

Evaluation Statement	Evaluation (1)
LS-not required; PR-H. SHAFT WALLS: Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking. (Commentary: Sec. A.7.16.5. Tier 2: Sec.13.8.6)	N/A
LS-not required; PR-H. COUNTERWEIGHT RAILS: All counterweight rails and divider beams are sized in accordance with ASME A17.1. (Commentary: Sec. A.7.16.6. Tier 2: Sec: 13.8.6)	N/A
LS-not required; PR-H. BRACKETS: The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1. (Commentary: Sec. A.7.16.7. Tier 2: Sec. 13.8.6)	N/A
LS-not required; PR-H. SPREADER BRACKET: Spreader brackets are not used to resist seismic forces. (Commentary: Sec. A.7.16.8. Tier 2: Sec. 13.8.6)	N/A
LS-not required; PR-H. GO-SLOW ELEVATORS: The building has a go-slow elevator system. (Commentary: Sec. A.7.16.9. Tier 2: Sec. 13.8.6)	N/A

FOOTNOTES:
(1) C = Compliant; NC = Non-compliant; N/A = Not Applicable; U = Unable to Determine or Not Investigated
(2) Quick Check refers to ASCE 41-13 Procedures
(3) Applies to: LS-LMH = Life Safety for Low, Moderate and High Levels of Seismicity; PR-LMH = Position Retention for Low, Moderate and High Levels of Seismicity

Summary Data Sheet

Building Data

Building Name: U of O Huestis Hall — Date: October 2017

Building Address: 1425 East 13th Avenue, Eugene, OR

Latitude: 44.04 — Longitude: -123.072 — By: Ed Quesenberry, S.E.

Year Built: 1971 — Year(s) Remodeled: Multiple — Original Design Code: 1970 UBC

Area (sf): 67,000 sf — Length (ft): 168 — Width (ft): 92

No. Stories: 4 (w/ Basement) — Story Height: 15' avg' — Total Height: 56'

Use ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☒ Educational ☐ Other: Institutional

Construction Data

Gravity Load Structural System: Cast In Place Concrete

Roof Materials/Framing: Concrete pan joist

Intermediate Floors/Framing: Concrete pan joist

Ground Floor: Concrete slab on grade

Columns: Cast in Place Concrete — Foundation: Concrete

General Condition of Structure: Fair

Levels Below Grade: One

Special Features and Comments:

Lateral-Force-Resisting System

	Longitudinal	Transverse
System:	Reinforced Concrete Moment Frames	Reinforced Concrete Moment Frames
Vertical Elements:	Reinforced Concrete Moment Frames	Reinforced Concrete Moment Frames
Diaphragms:	Concrete slab	Concrete slab
Connections:	Rebar Dowels	Rebar dowels

Evaluation Data

BSE-1N Spectral Response Accelerations: S_{XS} = 0.609 — S_{X1} = 0.428

Soil Factors: Class = D — Occupancy Category III

Level of Seismicity: High — Performance Level: Life Safety

Building Period: T = 0.48s

Spectral Acceleration: S_a = 0..609

Modification Factor: C = 1.0 — Building Weight: W = 8900 kips

Pseudo Lateral Force: $V = CS_AW$ = 5420 kips

BUILDING CLASSIFICATION: C1-Concrete Moment Frame

Photo 1 – End Wall w/ Discontinuous Lateral Elements and Unanchored Brick Veneer

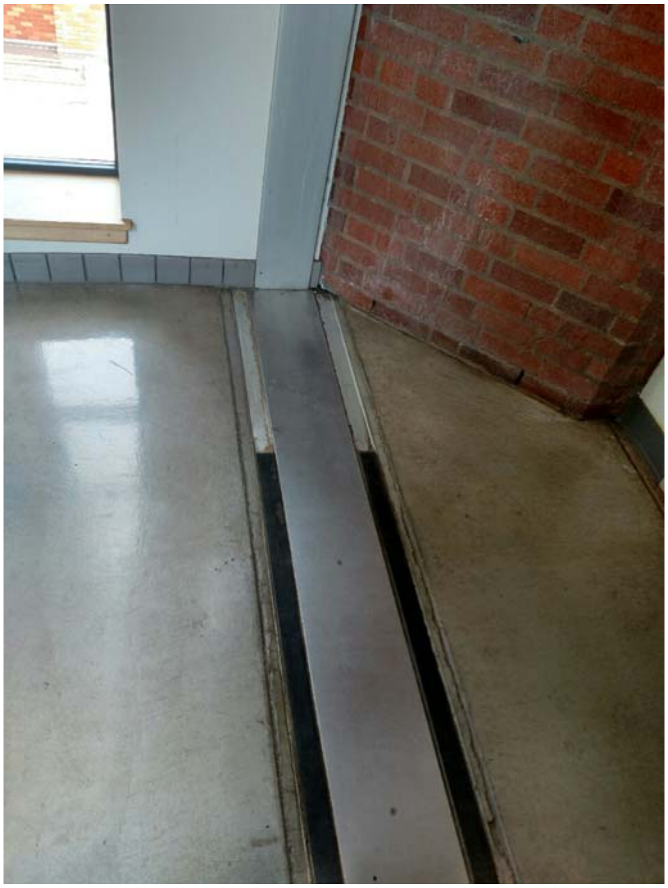


Photo 2 – Seismic Joint at Streisinger Hall

Photo 3 - Fall-Prone Contents in Lab Classroom

Photo 4 – Tall Unbraced Cabinets in Corridor

Photo 5 – Unbraced Tank In Mechanical Penthouse

Photo 6 – Unbraced Equipment Adjacent to Exit

G1

EQUILIBRIUM

ENGINEERS LLC

Huestis Hall
EE LLC Job No 17077

Roof Loads (PSF)

	Deck	Joist	Girder
Roofing	10		
Insulation	3		
4" slab	50		
Joists		45	
Girder			35
Columns			10
Ceiling/MEP		5	
Miscellaneous		2	
Dead Load	63	115	160
Snow Load (20 + 5 rain surch.)	25	25	25
Total Load	88	140	185

Seismic DL = 160 + Int Walls+ Exterior Walls
Weight of Mech Units Additional

Floor Loads (PSF) Floors 2-4

	Deck	Joist	Girder
Flooring	3		
4" Conc Slab	50		
Joists		45	
Girder			35
Columns			20
Ceiling/MEP		5	
Misc.			2
Dead Load	53	103	160
Live Load	50	50	50
Total Load	103	153	210

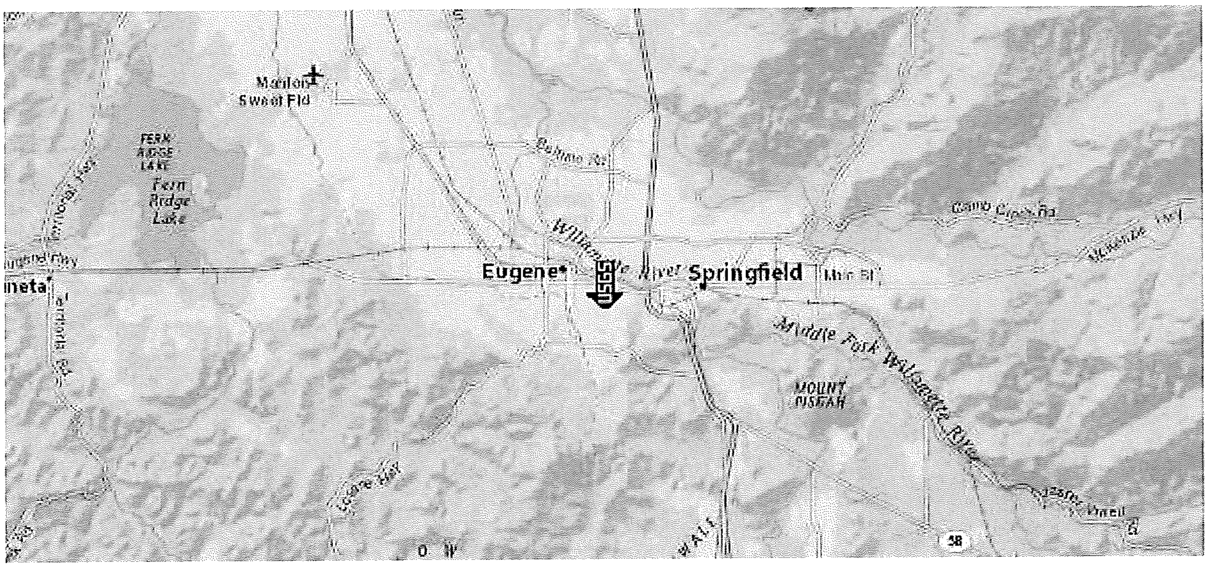
Seismic DL = 160 PSF + Interior Walls +Exterior Walls

C2

USGS Design Maps Summary Report

User–Specified Input

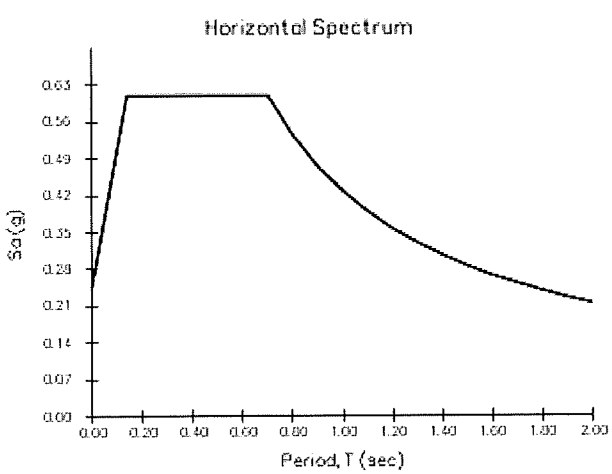
Report Title	Huestis Hall, U of O Sun October 1, 2017 20:40:00 UTC
Building Code Reference Document	ASCE 41-13 Retrofit Standard, BSE-1N (which utilizes USGS hazard data available in 2008)
Site Coordinates	44.0468°N, 123.072°W
Site Soil Classification	Site Class D – "Stiff Soil"

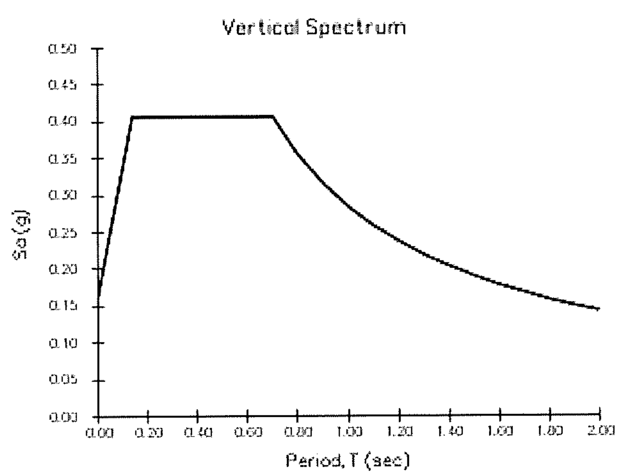


USGS–Provided Output

$S_{XS,BSE-1N}$ 0.609 g

$S_{X1,BSE-1N}$ 0.428 g





Project: HOESTIS	**EQUILIBRIUM ENGINEERS LLC**	By: Q	Sheet #: C3
Location:		Date: 9/30/17	
Client:		Revised:	Job #: 17077
		Date:	

ASCE 41 TIER 1 EVALUATION

- STRUCTURE IS TYPE C1 CONCRETE MOMENT FRAMES
- BUILDING IS OCCUPANCY CAT III ∴ EVALUATE TO LIFE SAFETY PERF LEVEL w/ $M_s = (4+2)/2 = 3.0$
- PER U of O USE BSE-1N SEISMIC HAZARD

$V = C S_a W \qquad C = 1.0$

PER USGS, $S_{XS} = .609$, $S_{X1} = .429$

$S_a = \frac{S_{X1}}{T} \qquad T = 0.018(56)^{.90} = .67 s$

$S_a = .429/.67 = .640 > S_{XS}$

$\therefore S_a = S_{XS} = .609$

$V = 1.0(.609)(W) = \underline{.609 W}$

BUILDING MASS

PERIM = (168+92)(2) = 520 LF

$A_{FLOOR} = 168(92) + 23(38) + 15(30) = 16800 SF$

$W_{ROOF} = .160(16800) + 100 \text{ (MECH)} + .015(13/2)(520) + .150(13/2)(8/12)(144 LF) \text{ (STAIR WALLS)}$

$= \underline{2900 K}$

$W_{FLOOR} = 160(16800) + 15(14')(520) + 100(14')(144)$

$= 3000 K$

TOTAL DL = 2900 + (2)(3000) (2 FLRS ABV GRADE)

$= \underline{8900 K}$

$V = .609(8900) = \underline{5420 K}$

COLUMN SHEAR STRESS CHECK

$v_{AVG} = \frac{1}{M_s}\left(\frac{n_c}{n_c - n_f}\right)\left(\frac{V_j}{A_c}\right)$

$n_c = 28$

$n_{f_{E/W}} = 7$

$n_{f_{N/S}} = 2 \qquad A_{c_{N/S}} = 36^2(8) = 10368 \text{ in}^2$

$A_{c_{E/W}} = 36^2(4) + (30\times36)(12) + (24\times42)(12)$

$= 30240 \text{ in}^2$

$v_{N/S} = \frac{1}{3.0}\left(\frac{28}{28-7}\right)\left(\frac{5420}{30240}\right) = .079 KSI$

$v_{E/W} = \frac{1}{3.0}\left(\frac{28}{28-2}\right)\left(\frac{5420}{10368}\right) = .187$

$2\sqrt{f'_c} = 2\sqrt{4000} = .126 KSI$

COLUMNS PASS QUICK CHECK E/W ONLY

$DCR_{E/W} = 1.48 \qquad DCR_{N/S} = 0.62$

Project Hubbstis	**EQUILIBRIUM ENGINEERS LLC**	By Q	Sheet # 4
Location		Date 9/30/17	
Client		Revised	Job # 17077
		Date	

COLUMN AXIAL STRESS CHECK

$P_{INT\ COL} = (160+50)(28)(\frac{57}{2})(3)$

$+ (160+25)(28)(\frac{57}{2})$

$+ 25^{K}_{MECH}$

$= 675^{K}$

$f_a = 675/(24 \times 42) = .669$ KSI

$.20 f'_c = .20(4) = .80$ KSI

OK

COLUMNS PASS AXIAL CHECK

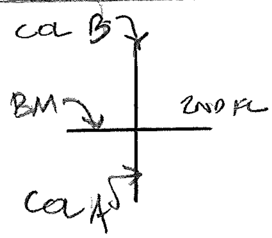
CHECK STRONG COL WEAK BM

COL A: $f'_c = 4000$ PSI

24"x36", d = 33"

$A_s = (4)\text{-}\#11$

$= 6.2\ in^2$



$\rho = 6.2/24(33) = .0078$

$\rho f_y/f'_c = .117$ $M_n/\phi f'_c b d^2 = .1089$

$M_n = \underline{850}$ K·F

COL B

24"x30" d = 27"

$A_s = 4\text{-}\#10$

$= 5.1\ in^2$

$\rho = .0078$

$\rho f_y/f'_c = .117$ $M_n/\phi f'_c b d^2 = .1089$

$M_n = \underline{572\ K{\cdot}F}$

BEAM - 24x30 $f'_c = 3000$ PSI

(2)#9 + (2)-#8 BOTT

d = 27" $A_s = 3.6\ in^2$

$\rho = .0056$ $\rho f_y/f_c = .112$

$M_n/\phi f'_c b d^2 = .1037$

$M_n = 408$ K·F

$\Sigma M_{n\ COL} = 1422$

$\Sigma M_{n\ BM} = 2(408) = 916$

$1422/916 = 1.55 > 1.20$ OK

(OK IN N/S DIRN)

CHECK OVERTURNING

$l_{FRAME\ EAST/WEST} = 31'$

$l/b = 31/42' = .74$

$.6\ S_a = .6(.609) = .365 < .74$ OK

5c. HUESTIS HALL ASBESTOS-CONTAINING MATERIALS REPORT

UNIVERSITY OF OREGON

Preliminary Asbestos Abatement Estimate
Huestis Hall
October 20, 2017

I. SITE

A. Building Address: 1425 East 13th
Eugene, Oregon 97403

II. SCOPE OF ASSESSMENT & LIMITATIONS

A. This asbestos assessment is provided to the design team to convey information about the known asbestos-containing materials in the building. EHS staff reviewed previous reports, analysis data, and other documents related to asbestos.

B. EHS staff conducted inspections in accessible areas of the building to confirm the locations and quantities of known asbestos-containing materials and to determine the extent of demolition that may be required for abatement. This work was conducted by Mike Eldredge, University of Oregon Safety and Risk Services, during September and October 2017.

C. Rough order of magnitude cost estimates are provided for removal of all asbestos-containing materials and include related demolition work to access materials. Cost estimates are also provided for asbestos survey, abatement design, abatement project management, and clearance air monitoring.

D. A comprehensive asbestos survey must be conducted prior to renovation work within the building. The survey will include sampling of all materials not previously sampled, including recently installed building materials.

E. This report includes current information available to EHS staff and includes minimal sample collection. Additional asbestos-containing materials may be found during the asbestos survey that may impact the abatement cost.

III. SUMMARY OF ASBESTOS-CONTAINING MATERIALS

A. This information is based on previous or current sample collection by an AHERA Certified Asbestos Inspector and analysis by a NVLAP Accredited laboratory. Materials may be known based on past sample data or presumed based on the judgement of field personnel.

- Floor tiles, 12" X 12" and mastic
- Cement-asbestos fume hood ducts and rope seals
- Tank insulation
- Duct joint tape
- Lab table tops
- Remnant fireproofing
- Rope seals
- Cement-asbestos board

- Waterproofing on sub -grade exterior walls (This material is not included in the cost estimate for abatement)

IV. COST ESTIMATES

A. The following cost estimates are provided for budgetary purposes:

Abatement of known asbestos-containing materials	$294,000
Asbestos survey	$7,500
Abatement design and project management	$18,000
Air Monitoring	$8,000

B. The cost for the asbestos survey, abatement design, and project management will be substantially lower if EHS staff can provide these services.

V. ABATEMENT CONSIDERATIONS

A. The abatement cost may be significantly impacted by project phasing, required abatement time period, and abatement area size. The most cost effective approach will be to specify abatement work in large areas that may include an entire building floor.

VI. BULK SAMPLE INVENTORY

A. EHS staff collected samples of extensive materials that may have a significant impact on the abatement cost. The sampled materials all tested negative for asbestos. The following table indicates the sample number, material description, sample location, and laboratory analytical results for each bulk sample. The laboratory analytical report with chain of custody documentation is attached.

Sample Number	Material	Sample Location	Analysis
17-4612	Brick mortar	North lobby, North wall	NAD
17-4613	Elastomeric paint on concrete	Exterior West side, North column side	NAD
17-4614	Elastomeric paint on concrete	Exterior East side, middle column	NAD

NAD = No Asbestos Detected

LabCor Eugene, Inc.
2440 Willamette St., Suite 101-D
Eugene, OR 97405

BULK SAMPLE ASBESTOS ANALYSIS

Asbestos and Environmental Analysis

Phone: (541) 654-8656
http://www.labcoreug.net

Client: University of Oregon
1260 University of Oregon
Eugene, OR 97403-1260

Report Number: 170553R01
Report Date: 10/18/2017
P.O. No: n/a

Job Number: 170553
Project Name: Huestis Hall
Project Number: Contract 102567-64-17-248/Work Order 398569
Project Notes:

Client Sample ID: 17-4612 **Sample ID:** S1 **Date Analyzed:** 10/18/2017
Client Sample Description: Mortar **Analyst:** Sarah Gallino

Asbestos Mineral Fibers	Layer Percent:	Chrysotile	Amosite	Crocidolite	Percent Asbestos:
Homogeneous					
granular compact powder, tan	100 %	-	-	-	**NAD**

Other Fibers	Fibrous Glass	Cellulose	Mineral Wool	Synthetic	Other		Matrix
	-	-	-	-	-	-	100 %

Client Sample ID: 17-4613 **Sample ID:** S2 **Date Analyzed:** 10/18/2017
Client Sample Description: Elastomeric paint **Analyst:** Sarah Gallino

Asbestos Mineral Fibers	Layer Percent:	Chrysotile	Amosite	Crocidolite	Percent Asbestos:
Homogeneous					
thin flexible material, gray/tan	100 %	-	-	-	**NAD**

Other Fibers	Fibrous Glass	Cellulose	Mineral Wool	Synthetic	Other		Matrix
	-	-	-	-	-	-	100 %

Client Sample ID: 17-4614 **Sample ID:** S3 **Date Analyzed:** 10/18/2017
Client Sample Description: Elastomeric paint **Analyst:** Sarah Gallino

Asbestos Mineral Fibers	Layer Percent:	Chrysotile	Amosite	Crocidolite	Percent Asbestos:
Homogeneous					
thin flaky material, gray/tan	100 %	-	-	-	**NAD**

Other Fibers	Fibrous Glass	Cellulose	Mineral Wool	Synthetic	Other		Matrix
	-	-	-	-	-	-	100 %

NVLAP LAB CODE 600145-0

LabCor Eugene, Inc.
2440 Willamette St., Suite 101-D
Eugene, OR 97405

BULK SAMPLE ASBESTOS ANALYSIS

Asbestos and Environmental Analysis

Phone: (541) 654-8656
http://www.labcoreug.net

Job Number: 170553

Report Number: 170553R01
Report Date: 10/18/2017

This laboratory participates in the National Voluntary Laboratory Accreditation Program (NVLAP). Testing method is per 40 CFR 763 Subpart F, Appendix A, PLM. This report and the data contained therein cannot be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

• "NAD" is No Asbestos Detected.
• Asbestos consists of the following minerals: chrysotile, amosite, crocidolite, tremolite, actinolite, anthophyllite.
• Material binders, such as those found in vinyl floor tiles, may prevent the detection of small diameter asbestos fibers. A gravimetric preparation and point-count is recommended for such samples.
• Quantitative analysis by PLM point count or TEM may be recommended for samples testing at < or = to 1% asbestos.
• The following estimate of error for this method by visual estimation of asbestos percent are as follows:
1% asbestos: 0-3% error, 5% asbestos: 1-9% error, 10% asbestos: 5-15% error, 20% asbestos: 10-30% error.
• This report pertains only to the samples listed on the report. Report considered valid only when signed by analyst.

Reviewed by:

x Sarah Gallino

Sarah Gallino

NVLAP LAB CODE 600145-0

Chain of Custody Record

170553

LabCor Eugene, Inc.
2440 Willamette St
Ste 101-D
Eugene, OR 97405

Office: (541) 654-8656
lab@labcoreug.net
www.labcor.net

Customer Name: University of Oregon
Customer Address: 1260 University of Oregon
City, State, Zip: Eugene, OR 97403-1260
Contact: Mike Eldredge Phone: 541-206-4488
Contact Email: mikee@uoregon.edu
Invoicing Email: ______
Other info (Verbals, etc): ______

Analytical Protocol:
X PLM – Visual estimate
___ PLM – 400 Pt. Count
___ PLM – Gravimetric
___ AHERA
___ EPAII, Mod EPA II
___ NIOSH 7402 (TEM)
___ NIOSH 7400 (PCM)
___ TEM Bulk
___ EPA/600/R-04/004 (TEM Vermiculite)
Other ______

Requested Turnaround Time:
___ 5 days
___ 3 days
___ 2 days
___ 24 hours*
___ 6 hours*
X 4 hours*
** Please call ahead for TATs of 24hrs or less, all TATs not available for all analyses*

Project Name: Huestis Hall **Project No.:** ______ **P.O. No.:** ______

Bulk Samples need only Sample Number, Description and Date (if avail).			Time			LPM - Flow Rate			Volume	IWA	OWA	Blank
Sample No.	Sample Description	Date	On	Off	Total	Begin	End	Avg	TOTAL			
17-4612	Mortar	10/18/17										
17-4613	Elastomeric paint	10/18/17										
17-4614	Elastomeric paint	10/18/17										

By signing below you are agreeing to comply with Lab/Cor's Terms and Conditions

Relinquished by: [signature] Date: 10/18/17 Time: 10 am Received by: [signature] Date: 10/18/17 Time: 10:00am

Relinquished by: ______ Date: ______ Time: ______ Received by: ______ Date: ______ Time: ______

Internal Lab Use Only:
Date/Time Prelim Released: ______ Date/Time Final Results Released: ______ Invoice Hardcopy/e-mailed: ______
By: ☐Phone ☐E-mail ☐Verbal By: ☐Phone ☐E-mail Reviewed By: ______

5d. HUESTIS HALL EXISTING ELEVATOR ANALYSIS

ELEVATOR CONDITION ASSESSMENT

Huestis Hall
University of Oregon
Eugene, Oregon

ONE (1) TRACTION PASSENGER ELEVATOR

September 27, 2017

Prepared For

Jenni Rogers
Robertson Sherwood Architects

Prepared By

Garry A. Norris
Senior Consultant

Elevator Consulting Services, Inc.
1117 31st Ave. S.
Seattle, WA 98144
(425) 957-4641
garryn@elevatoradvice.com

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II. Existing Equipment 4

III. Modernization Audit and Evaluation 5

IV. Existing Equipment Photos 9

V. ADA Compliance Checklist 13

I. Executive Summary

This report was commissioned to inspect and analyze the potential to enlarge the elevator car and cab at the Huestis Hall building at University of Oregon, to assess the elevator's current condition and compliance with current code and safety requirements, and to identify and recommend options for an elevator modernization. During the on-site audit, ECS inspected each elevator component to determine whether it should be reused, refurbished, or replaced with new equipment with much improved technology as part of an elevator modernization.

Audit Findings

The elevator at Huestis Hall is a basement set traction elevator with a capacity of 3,000 pounds and speed of 350 feet per minute. The elevator was originally installed in 1971 and received a partial upgrade/modernization in 2008. As part of the modernization, the original 1971 hoist machine was retained but received new thrust bearings, worm shaft bearings and sheave seals. The original DC motor and motor generator set was replaced with an AC variable frequency hoist motor. The brake was disassembled, cleaned and reassembled with new pins and brake linings. The original Montgomery relay logic controller was replaced with a new Motion Control Engineering controller. A new over-speed governor, tail sheave, governor ropes, hoist ropes, door operator, door rollers, interlocks, and roller guides were also provided as part of the 2008 upgrade. Other major components were retained and refurbished where required. The elevator equipment appears to be fairly well maintained and in its' current condition and configuration should be expected to provide another 10-12 years of reliable service.

ECS was asked to investigate the feasibility of enlarging the size of the existing elevator. To add size to an elevator platform requires an increase in the capacity of the elevator. This is a code driven requirement. The current hoistway dimensions are 7'-1" deep clear hoistway but only 6'-1" clearance from where the basement set machine protrudes into the hoistway, and 8'-7 ¼" wide. To increase elevator size to 35,500 pound capacity the hoistway would need to be widened by three-fourths inch (¾"). This option would only offer a gain of about 6" of additional space in the elevator cab.

Another option would be to convert from a basement set elevator to a 4,500 pound capacity overhead machine room less (MRL) configuration where the hoist machine is located at the top of the elevator hoistway. To accommodate this elevator, the hoistway would need to be increased to approximately 8'-2" by 10'-9 ¼". All existing entrances would need to be removed and new entrances installed. Since the hoistway is being altered, all elevator and affiliated building interfaces would have to be brought up to current 2012 IBC code. The elevator would be a service or hospital configuration and would lose approximately 12" in width but gain approximately 3'-0 in depth. The estimated cost of elevator work alone for this option would be $330,000 to $350,000.

If either enlargement option is considered, additional elevator and structural engineering studies would be required.

In its current condition and configuration, the elevator should be expected to provide another 10-12 years of reliable service. As time passes there will be increased risk that replacement parts will no longer be manufactured and may become difficult to source.

II. Existing Equipment

Elevator Type	Basement Geared Traction Elevator
ID Number	6195
Year Installed	1971
Manufacturer	Montgomery Elevator Company
Control System	Simplex Selective Collective
Controller/Selector	MCE Mod in 2008
Drive	AC
Door Equipment	GAL
Door Size	3'-6" x 7'-0"
Door Type	Single Speed Center Opening
Door Operation	Automatic
Landings/Openings	4 landings. 1=R, 2=F, 3=F, 4=F
Floor Designation	B, 1 ,2 3
Capacity	3000 pounds
Speed	350 FPM
Machine Room Location	Level B rear adjacent
Disconnect (AMPS/VAC)	60/600
Motor (HP/AMPS/VAC)	40/60480 200 amps/ 240 VAC on disconnect.

III. Modernization Audit and Evaluation

To evaluate the need for an elevator modernization, Elevator Consulting Services examines the elevator based on the following eight key categories to calculate the Elevator Profile Factor. The Elevator Profile Factor is then used to determine when an elevator modernization should be considered. These categories are:

1. Age of Equipment
2. Code Compliance
3. Preventive Maintenance
4. Operation and Performance
5. Frequency of Use
6. Energy Efficiency
7. Environmental Conditions
8. Design and Installation

1. Age of Equipment

If any factor drives the need for an elevator modernization, it is age of the equipment. Even with proper preventive maintenance, elevator equipment will not last forever, and substandard preventive maintenance can drastically reduce the life expectancy. With proper preventive maintenance, elevator equipment should be expected to last 25 to 30 years.

- The elevator at Huestis Hall is 46 years old and received a partial upgrade in 2008. In its current condition and configuration, the elevator should be expected to provide another 10-12 years of reliable service.

2. Code Compliance

Codes are evolutionary by design. New technology and better designs provide for safer equipment. An elevator can comply with the code under which it was installed but not have any of the latest safety features required on new equipment.

- The elevator does not comply with the 2010 year code that is in effect now but does comply with the 2008 code in effect at the time of the upgrade.

3. Preventive Maintenance

Preventive maintenance is the activity of performing systematic and periodic checks, tests and service on elevator equipment to ensure that it operates safely and within design parameters. Its goal is to ensure that the equipment will last and operate safely for its anticipated life span. Indicators of poor preventive maintenance are repeated shut downs and trouble calls, unscheduled repairs, poor adjustment, poor ride quality, accumulation of dirt and debris, and improper or lack of lubrication.

- The preventive maintenance needed to maintain this elevator is moderate, primarily the geared machine.

4. Operation and Performance

Operation and performance of the elevator refers to how each component and the overall elevator system performs. It's directly related to rider experience waiting for and riding the elevator. Elevator operation during starting, acceleration, deceleration, leveling, and door operation can give good indications of the quality of operation and performance. Continuous operation without numerous mechanical problems can also be a good indicator of operation and performance.

- The existing elevators' operation and performance is acceptable based on the 2008 upgrade.

5. Frequency of Use

The frequency of use illustrates how often demand is placed on the elevator equipment. More use results in more wear on the controls and mechanical components of an elevator. For example, office buildings will typically use elevators less than facilities that are active 24 hours per day such as airports, hospitals, apartments, and condominiums.

- The elevator has only moderate usage during school hours

6. Energy Efficiency

Today's technology seeks ways to make elevator equipment perform better while using less energy. New systems take advantage of Permanent Magnet Synchronous Motors (PMSM), which consume less energy than previous AC and generator control systems. Door operators are using newer technology to provide more efficient door operation with better control and safer operation, while also using less energy. Operating fixtures are beginning to use LED lamps that consume less energy and reduce overall fixture maintenance. Regenerative power is being provided on some systems that allow power to be fed back to the grid, thus reducing overall elevator energy costs to the building.

- The elevator was updated in 2008, but at just 10 years old, the equipment is outdated compared to terms of energy efficiency standards of today.

7. Environmental Conditions

Environmental conditions such as heat, moisture, salt water, caustic materials, and many other types of conditions contribute to the degradation of elevator equipment. Equipment installed in an enclosed, controlled environment tends to have the least impact from these environmental conditions. Equipment exposed to the outside environment will be more prone to deterioration that will contribute to more unscheduled shutdowns and requires more intense preventive maintenance. Environment can also include the locality of operation and the clientele that will normally use the equipment. Using a passenger elevator to carry freight can also have a negative impact on the life of the equipment.

- The elevator equipment is fairly well protected from the environment. The biggest environment factor is heat in the elevator machine rooms. Added ventilation or air conditioning should be considered to protect the more sensitive solid state equipment.

8. Design and Installation

The engineering design and installation of the elevator incorporates strength and durability, operational and performance standards, professional craftsmanship, adherence to code requirements, proper installation, and ease of maintenance and repairs. Strength of components and structural equipment is important to ensure that the guide rails, car platform, machines and overhead and pit structures do not shift during building settling or during normal operation, and will also withstand the loads imposed on the equipment. Field installation is a critical component of design. A poor installation will lead to continuous maintenance and repair problems and a shorter than expected life cycle. One factor that often lacks attention in designs is the ease with which equipment can be maintained and repaired. Designs that allow for the quick procurement of parts and reduced lubrication are desired.

- The design and installation of the elevator was acceptable based on the technology and standards when it was installed in 1971 and upgraded in 2008.

Elevator Consulting Services Elevator Equipment Profile

Client / Job Site: **Robertson Sherwood Architects – University of Oregon Huestis Hall**
Equipment: **Basement Set Traction Elevator**

	Age	Code Compliance	Preventive Maintenance	Performance & Operation	Frequency of Use	Environmental Conditions	Energy Efficiency	Design & Installation	TOTAL
5 Extreme									
4 High									
3 Moderate	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**24**
2 Low									
1 Minimal									

= Critical conditions.
= Moderate conditions.
= Acceptable conditions.

Profile Score = 24

Profile Score	Description	Time frame to replace
Greater than 30	Equipment condition is extreme. Major components expected to fail. Proper maintenance is difficult and parts are, or will become, obsolete. Multiple safety and code concerns. Modernize immediately.	Immediately
25 – 30	Equipment is nearing end of expected life. Potential failure of major components. Proper maintenance is becoming difficult and parts are becoming obsolete. Potential safety and code issues. Begin planning for modernization.	2 to 5 years
17 – 24	Equipment shows normal wear based on current age. Update and improve maintenance program. Include modernization in long term planning.	6 to 9 years
Less than 17	Equipment shows normal wear based on current age. Maintain existing maintenance program. Modernization should not be needed for 10+ years.	10 + years

IV. Existing Equipment Photos


Fig. 1 – Existing governor was replaced in 2008.


Fig. 2 – Governor tail sheave was replaced in 2008


Fig. 3 – Fire extinguisher mounted near door.


Fig. 4 – Divider beam (red) that can be relocated to the north by 8” to 10”.

Fig. 5 – Three phase disconnect mounted on hinge side of the door.

Fig. 6 – MCE 2008 start up manual.

Fig. 7 – Rope drop and cables that were replaced in 2008

Fig. 8 – Elevator car top

Fig. 9 – Current MCE controller with MAXTORQ drive. Replaced in 2008.

Fig. 10 – Pit ladder needs to be altered to current code – 48” above sill. 12” wide and a minimum of 4.5” from wall.

Fig. 11 – Original data tag for MCE controller.

Fig. 12 – Overhead deflector sheaves from original installation

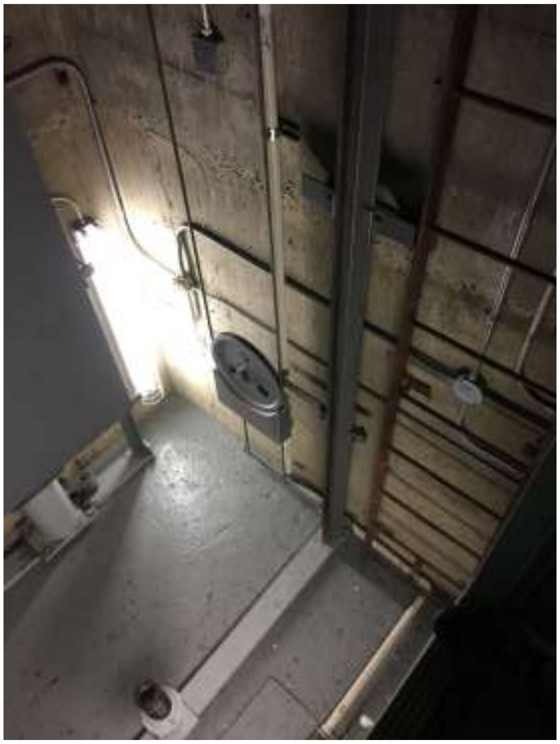

Fig. 14 – The hoistway is 6’-1” deep at the machine pedestal and 7’-1” at the counter weights. The current width is 8’-7 ¼” to divider steel. Relocating the divider steel can achieve additional 10” in width.

V. ADA Compliance Checklist

CODE	COMPLIANT		NOTES
4.10.3 Hall Call Buttons	**YES**	**NO**	
Are all buttons at least 3/4" in diameter?	X		
Are all button centered 42" above floor?	X		
Do all buttons illuminate when elevator is called and fade when answered?	X		
4.10.4 Hall Lanterns			
Are there visible and audile signals at each hoistway entrance to indicate which car is answering a call?	X		
Do audible signals sound once for "up" and twice for "down”?	X		
Are hall lantern fixtures centered at least 72" above lobby floor?	X		
Are all visual elements at least 2 1/2" in dimension?			Could not verify
Are signals visible from hall call button?	X		
4.10.5 Hoistway Signs			
Does elevator have Braille jamb plates on both jambs, centered 60" above floor?	X		
Are Braille characters at least 2" in height and raised 1/32" in sans serif type?	X		
4.10.6 Elevator Door Requirements			
Do doors have reopening device that will reopen doors if they becomes obstructed?	X		
Do doors remain open for at least 20 seconds?	X		
4.10.7 Door and Signal Timing for Hall Calls			
From notification that a car is answering a call until the doors start to close, does the time meet the formula of T = D/1.5 ft./s and a minimum of 5 seconds?	X		
4.10.8 Door Delay for Call Calls			
Do the elevator doors remain fully open in response to a car call for a minimum of 3 seconds?	X		
4.10.9 Floor Plan of Elevator Cars			
Is the clearance between the car platform sill and the edge of the hoistway landing no more than 1 1/4” ?			N/A

CODE	COMPLIANT		NOTES
4.10.11 Illumination Levels	**YES**	**NO**	
Is the illumination at the car controls, platform, car threshold and landing sill at least 5 ftc?		X	
4.10.12 Car Controls			
Are controls at least 3/4" in dimension?	X		
Are all buttons accompanied by raised characters or Braille that are a minimum 5/8" in height & uppercase sans serif)?	X		
Are all raised designations to left of the button to which they apply?	X		
Do all floor buttons have visual signals in which illuminate when a call is placed and fade when each call is answered?	X		
Are all floor buttons a max. of 48" above floor when forward reach is required and a max. of 54" above floor when side reach is required?	X		
Are all emergency controls grouped at the bottom of the panel with centerlines a minimum of 35" and maximum of 54" above floor?			N/A
4.10.13 Car Position Indicators			
Are visual car position indicators above the door or above control panel?	X		
Are the corresponding numbers illuminating when the car passes or stops at that floor, accompanied by an audible signal?			N/A
Are all numerals at least 1/2" high?	X		
Are all audible signals at least 20 decibels with a frequency no higher than 1500Hz?			Not measured.
4.10.14 Emergency Communications			
Does elevator have emergency communication that does not require voice communication?	X		
Is the highest operable part of the two-way communication system under the maximum 48" from the floor of the car?	X		
Is the length of the cord from the panel to the handset at least 29"?			N/A

5e. HUESTIS HALL EXISTING FIRE SUPPRESSION ANALYSIS

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SYSTEMS WEST ENGINEERS, INC.

MEMORANDUM

DATE: May 3, 2017 T017.04

TO: Jenni Rogers, AIA
Robertson Sherwood Architects

FROM: Steve Schual, PE
Systems West Engineers

PROJECT: UO Huestis Hall

RE: Existing Fire Sprinkler System

Systems West Engineers was retained to evaluate the existing Huestis Hall fire sprinkler system for compliance with Oregon Fire Code (OFC), NFPA 13, and NFPA 14 requirements. This narrative describes the results of the evaluation and includes a list of system deficiencies noted during our survey with associated code references and recommendations for proposed work to be performed for the system to meet Code.

The existing fire sprinkler and standpipe system is fed from the system riser in the basement mechanical room 13. The system is divided into five zones:

- Zone A: Zebrafish
- Zone B: Lokey laboratories
- First floor
- Second floor
- Third floor

A Class I standpipe system is in the north stairwell, with hose valve connections at each floor level and a 3-way hose valve connection at the roof. A combined fire sprinkler standpipe riser is in the south stairwell, with zone control valve assemblies at each floor and a 3-way hose valve connection at the roof. A 4-way fire department connection is located on the exterior wall and connects to the fire main piping below the south stairway.

Sprinkler head spacing, location, supports, and anchorage closely match the 2004 fire sprinkler upgrade as-built drawings with the following exceptions:

- The Lokey laboratory zone control valve assembly is in the basement mechanical room 46.
- Sprinkler pipe routing changes
- High temperature heads were installed in wash room 5 due to high temperature appliances in the space.

The fire sprinkler system has several system deficiencies, and is not currently up to current OFC, NFPA 13, and NFPA 14 standards. The matrix below shows system deficiencies noted during our site visits, code reference sections, and recommendations for correcting deficiencies. The matrix comments are grouped by zone, with comments referenced to individual rooms.

Basement (Zone A Zebrafish Laboratory)

Item	Room	Noted System Deficiencies	Code Reference	Recommendation
1	Mechanical Room 15 Main Riser	No check valves are installed in the system riser. This could result in backflow of water to the yard hydrant.	NFPA 13:8.16.1.1.3.1 Where there is more than one source of water supply, a check valve shall be installed in each connection.	Install a swing check valve in the system riser.
2	Mechanical Room 15	The 6" fire riser and main does not have lateral or longitudinal sway braces.	NFPA 13:9.3.5.1.1 The system piping shall be braced to resist both lateral and longitudinal horizontal seismic loads and to prevent vertical motion resulting from seismic loads.	Provide lateral and longitudinal bracing of the riser and main piping in basement.
3	Mechanical Room 15	The main riser is not in an accessible area of the basement. Access to the current location is not readily available in the mechanical room. Access to the valves is obtained by climbing over the piping in the racks.	NFPA 13: 8.16.1.1.1.1 Each sprinkler system shall be provided with a listed indicating valve in an accessible location to control all automatic sources of water supply.	Review the location and access of the riser with the Fire Marshal (FM). Relocate to a more accessible location if the FM requires.
4	Mechanical Room 15	The basement sprinkler zone flow switch cover is missing.	N/A	Replace the cover on the flow switch.
5	Mechanical Room 015	Upright sprinkler head deflectors are installed more than 22" below the structure.	NFPA 13 8.6.4.1.2 (1) Sprinkler deflectors installed within the horizontal planes of 1" – 6" below the structural members and a maximum distance of 22" below the ceiling/ roof deck.	Relocate the fire sprinkler so the deflector is within the 22" maximum distance to the ceiling.

Item	Room	Noted System Deficiencies	Code Reference	Recommendation
6	Mechanical Room 15	A check valve is not installed in the Zone A Zebrafish zone control assembly.	NFPA 13 8.2.4.1 Multi-story buildings exceeding two stories in height shall be provided with a floor control valve, check valve, main drain valve, and flow switch for isolation, control, and annunciation of water flow for each individual floor level.	Install a check valve in the zone control valve assembly.
7	Office 21	There is a visible hole in the ceiling tile around the fire sprinkler.	N/A	Replace the ceiling tile with one that has a smaller opening for the sprinkler.
8	Hall	No sprinklers are installed within the closet.	NFPA 13 8.5.5.4 Closets.	Provide a fire sprinkler in the closet.
9	Staging 16C and Food Culture 4	The large underfloor mechanical equipment area does not have sprinkler coverage.	NFPA 8.15.1 Concealed Spaces Requiring Sprinkler Protection.	Provide fire sprinkler coverage for underfloor mechanical areas.
10	Fish Housing B 16B	Pendent heads on the east side of the room are showing visible rust on the deflectors. One of the heads has a bent deflector.	NFPA 13 6.2.6.1 Listed corrosion-resistant sprinklers shall be installed in locations where chemicals, moisture, or other corrosive vapors sufficient to cause corrosion of such devices exists.	Replace corroded and damaged heads with corrosion-resistant heads.
11	Storage 5A	The glycol fill station for the Lokey lab emergency exit has rust on the reverse pressure backflow preventer and on the sprinkler piping. Pipes are unpainted. The room is subject to humid conditions.	NFPA 8.16.4.2.3 Where corrosive conditions exist or piping is exposed to the weather, corrosion resistant coatings shall be used.	Remove corrosion and paint pipes for corrosion resistance.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
12	Storage 5A	The ceiling temperature could exceed 100°F due to the steam flash tank in the room. An ordinary temperature sprinkler head is installed.	NFPA 8.3.2.2 Where maximum celling temperatures exceed 100°F, sprinklers with temperature ratings in accordance with the maximum ceiling temperatures of Table 6.2.5.1 shall be used.	Replace the sprinkler head with an intermediate temperature head.
13	Office 20/ Copy Server 20A	Upright sprinkler head deflectors are installed more than 22” below the structure.	NFPA 13 8.6.4.1.2 (1) Sprinkler deflectors installed within the horizontal planes of 1” – 6” below the structural members and a maximum distance of 22”. below the ceiling/ roof deck.	Relocate the fire sprinkler so the deflector is within the 22” maximum distance to the ceiling.

Basement (Zone B Lokey Laboratory)

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
14	Corridor H45	The area to the north of stair S50 does not have sprinklers at the ceiling level.	NFPA 13 8.5.5.1 Sprinklers shall be located so as to minimize obstructions to discharge, or additional sprinklers shall be provided to ensure adequate coverage of the hazard.	Provide fire sprinkler coverage to the area.
15	Corridor H46	This corridor is an outside air plenum subject to freezing temperatures. A standard sidewall wet head is installed.	NFPA 13 8.16.4.1 Protection of piping against freezing.	Replace the fire sprinkler with a dry-type sidewall head.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
16	Lab Manager Office B001 and Vest BL002	Record documents from LISB show a fire pipe coming from Streisinger Hall. This could result in possible building separation issues.	N/A	Fire sprinkler systems should cover up to the building separations. Rooms Vest BL002 and Lab Manager B001 appear to be within the Lokey Lab area. Demo the fire sprinkler supply pipe fed from Streisinger Hall and supply fire sprinklers from Lokey Lab. Review building zones and fire separations with the Fire Marshal.
17	Mechanical Room 46	No fire sprinkler coverage under ducts over 4' wide.	NFPA 13 8.6.3.3 Sprinklers shall be installed under fixed obstructions over 4' wide, such as ducts.	Provide fire sprinklers under ducts.
18	Mechanical Room 46	Relief air openings to the outdoors create ceiling pockets that do not have sprinkler coverage.	NFPA 13 8.6.4.1 Distance below ceilings.	Provide fire sprinklers in ceiling pockets. Provide adequate freeze protection.
19	Corridor L-H50	No sprinkler coverage for the corridor area to the west of the lab manager office B001. The sidewall head on the opposite wall is approx. 17' away and out of range.	NFPA 13 8.7.3 Maximum distance between sprinklers.	Provide a sidewall sprinkler at the east side of L-H50 to cover the area.
20	Corridor L-H50	No sidewall sprinkler near the ceiling above the duct.	NFPA 13 8.5.5.1 Sprinklers shall be located so as to minimize obstructions to discharge, or additional sprinklers shall be provided to ensure adequate coverage of the hazard.	Provide a fire sprinkler near the ceiling.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
21	Printing 86	The sprinkler head is closer than 1” to the acoustical panel.	NFPA 13 8.6.5.1.2 Obstruction to flow. Maximum allowable distance of deflector above bottom of obstruction is 0” for less than 1’ distance.	Relocate the acoustical panel to a minimum of 1’ away from the sprinkler head.
22	Collaboration Area 90	No heads in the skylight area.	NFPA 13 8.5.7.1 Sprinklers shall be permitted to be excluded from skylights not exceeding 32 sqft in the area.	Provide sprinkler heads in the ceiling pocket of the skylight.
23	Collaboration Area 90	The upright sprinkler head deflector is installed within 1" of the structure.	NFPA 13 8.6.4.1 Minimum 1” distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1” to the structure.
24	Micro Analytical 87	The upright sprinkler head deflector is installed less than 1" to the structure in multiple locations.	NFPA 13 8.6.4.1 Minimum 1” distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1” to the structure.
25	Equipment Galley 87A	The upright sprinkler head deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1” distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1” to the structure
26	Semi-Conductor Lab 63	The upright sprinkler head deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1” distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1” to the structure.
27	Prep Lab 53A	No sprinkler is provided under the 4’ wide duct.	NFPA 13 8.6.3.3 Sprinklers shall be installed under fixed obstructions over 4’ wide, such as ducts.	Provide a fire sprinkler under the duct.

First Floor

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
28	Interactive Area 150 and Lobby L150	No escutcheon around the ceiling penetration.	NFPA 13 6.2.7 Escutcheons and Cover Plates	Provide a listed fire sprinkler escutcheon at the sprinkler penetration of the ceiling.
29	Bicycle storage area on the west side of the building	No fire sprinklers are provided in the outdoor overhang areas near the entry and at the bicycle storage. This is required by the Fire Marshal.	NFPA 13 8.15.7.5 Sprinklers shall be installed under exterior projections greater than 2' wide over areas where combustibles are stored.	Review the coverage of exterior areas with the Fire Marshal. If necessary, provide a dry-type sidewall head through the exterior wall connected to the first-floor sprinkler system.
30	Lobby L102, L103, Telecom 147, and Elec 49	Telecom, electrical closet, and elevator lobby are served from the second-floor zone.	NFPA 13 8.2.4.1 Multistory buildings exceeding two stories in height shall be provided with a floor control valve, check valve, main drain valve, and flow switch for isolation, control, and annunciation of water flow for each individual floor level.	Demolish the fire sprinkler piping from the second floor and connect the fire sprinklers to the first-floor system.
31	Telecom 147	A sprinkler tee fitting appears to be leaking in to Telecom 147.	N/A	Repair leaking pipe.
32	Lobby L102	The upright head near the northeast corner is covered in dust.	N/A	Clean or replace fire sprinkler.
33	Room 125	Sprinkler deflector is 10" above storage. Storage racks are 13' tall and should have coverage for high piled storage.	NFPA 13 8.5.6.1 Distance between deflector and top of storage shall be 18" or greater. NFPA 13 3.9.1.16 Storage in excess of 12' in height is considered High Piled storage.	Remove the upper shelf of the storage rack to keep storage height under 12', and the distance from the sprinkler deflector greater than 18".

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
34	Room 120	The room contains heat-producing sterilizer equipment. Ordinary temperature heads are currently installed.	NFPA 8.3.2.2 Where maximum ceiling temperatures exceed 100°F, sprinklers with temperature ratings in accordance with the maximum ceiling temperatures of Table 6.2.5.1 shall be used.	Replace the fire sprinkler with an intermediate temperature sprinkler.
35	Hall H101 near room 130	The sprinkler head escutcheon is missing from the pendent head in Hall H101 near room 130.	NFPA 13 6.2.7	Install listed fire sprinkler escutcheon.
36	L103	The sidewall fire sprinkler is greater than 16' to the opposite wall and does not provide coverage for the room.	NFPA 13 8.7.2.1 Standard spray sidewall head maximum throw of 14' for light hazard construction	Provide an additional sprinkler for coverage of the area.
37	S101	The first-floor zone control valve does not include a check valve.	NFPA 13: 8.2.4.1 Multistory buildings exceeding two stories in height shall be provided with a floor control valve, check valve, main drain valve, and flow switch….	Install a check valve in the zone control assembly upstream of the flow switch.
38	Throughout floor	Branch lines are installed without restraints. The requirement for restraint of branch lines was added to NFPA 13 in 2007.	NFPA 13 9.3.6 Restraint of branch lines.	Provide restraint of the branch lines.
39	Hall H201	Multiple sprinkler heads are obstructed by ducts in the second-floor hall.	NFPA 8.5.5.1 Sprinklers shall be located to minimize obstructions to discharge as defined in 8.5.5.2 and 8.5.5.3, or additional sprinklers shall be provided to ensure adequate coverage of the hazard.	Relocate fire sprinklers.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
40	V200	The second-floor zone control valve does not include a check valve.	NFPA 13: 8.2.4.1 Multistory buildings exceeding two stories in height shall be provided with a floor control valve, check valve, main drain valve, and flow switch.	Install a check valve in the zone control assembly upstream of the flow switch.
41	Room 225B	An upright sprinkler head deflector is touching the ceiling.	NFPA 13 8.6.4.1 Minimum 1” distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1” to the structure.
42	Room 227A	Sprinkler coverage is obstructed by the duct.	NFPA 13 8.6.5 Obstructions to construction.	Relocate the fire sprinkler.
43	Room 227A	An upright sprinkler deflector is installed less than 1” to the structure.	NFPA 13 8.6.4.1 Minimum 1” distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1” to the structure.
44	Rooms 233A, 233B, and 233C	There is no hanger on the pipe.	NFPA 13 9.2.2 Maximum distance between hangers.	Install a hanger on the pipe.
45	Room 239	There is no hanger on the pipe.	NFPA 13 9.2.2 Maximum distance between hangers.	Install a hanger on the pipe.

Second Floor

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
46	Hall 201 (north end near room 238A)	The longitudinal sway brace is attached to the lateral sway brace and not to the sprinkler pipe.	NFPA 13 9.3.5.11.1 Bracing shall be attached directly to the system pipe.	Install a sway brace assembly per NFPA 13 and detail on 2004 Fire Sprinkler plans.
47	Hall H201	The upright fire sprinkler flow is obstructed by ducts and pipe in multiple locations.	NFPA 8.5.5.1 Sprinklers shall be located to minimize obstructions to discharge as defined in 8.5.5.2 and 8.5.5.3, or additional sprinklers shall be provided to ensure adequate coverage of the hazard.	Install additional heads to cover the area below the obstructions.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
48	Rooms 209 and 211A	An upright sprinkler deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1" distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1" to the structure.
49	Room 225A	An upright sprinkler deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1" distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1" to the structure.
50	Room 225B	An upright sprinkler deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1" distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1" to the structure.
51	Room 229A	A sprinkler head is obstructed by the duct.	NFPA 8.5.5.1 Sprinklers shall be located so as to minimize obstructions to discharge as defined in 8.5.5.2 and 8.5.5.3, or additional sprinklers shall be provided to ensure adequate coverage of the hazard.	Relocate the fire sprinkler.
52	Room 235	An upright sprinkler deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1" distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1" to the structure.
53	Rooms 226A and B	There is no access to the rooms. The 2004 as-built plans show a single sidewall head covering a room 15'-9" long. Typical sidewall heads are not capable of this coverage.	NFPA 13 8.7.2.1 Standard spray sidewall head maximum throw of 14' for light hazard construction	Install additional fire sprinklers for full coverage of the area.
54	Room 208B	Room does not have sprinkler heads.	N/A	Install sprinkler heads.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
55	Room 206C	No lateral and longitudinal brace is installed within 2' of the change in direction of the cross main.	NFPA 13 9.3.5.5.2.2 Spacing shall not exceed a maximum interval of 40' on center.	Install sway bracing.
56	Room 212	Fire sprinkler head is covered with paper.	N/A	Remove paper from sprinkler.
57	Room 214	An upright sprinkler deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1" distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1" to the structure.
58	Room 220A	No fire protection provided in the soundproof experiment booth.	N/A	Review this requirement with the Fire Marshal. Install a fire sprinkler if necessary.
59	Room 238	An upright sprinkler head is obstructed by a duct.	NFPA 8.5.5.1 Sprinklers shall be located to minimize obstructions to discharge as defined in 8.5.5.2 and 8.5.5.3, or additional sprinklers shall be provided to ensure adequate coverage of the hazard.	Relocate the fire sprinkler.
60	L202	A sidewall fire sprinkler is greater than 16' to the opposite wall and does not provide the required coverage for the room.	NFPA 13 8.7.2.1 Standard spray sidewall head maximum throw of 14' for light hazard construction.	Install additional sprinklers for full coverage of the area.
61	Throughout Floor	Branch lines are installed without restraints. The requirement for restraint of branch lines was added to NFPA 13 in 2007.	NFPA 13 9.3.6 Restraint of branch lines.	Provide restraint of branch lines.

Third Floor

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
62	Hall H301	Upright fire sprinkler flow is obstructed by ducts and pipe in multiple locations.	NFPA 8.5.5.1 Sprinklers shall be located to minimize obstructions to discharge as defined in 8.5.5.2 and 8.5.5.3, or additional sprinklers shall be provided to ensure adequate coverage of the hazard.	Install fire sprinklers below obstructions to cover the area.
63	Hall H301, near room 306	A sprinkler pipe is cut and capped in the hall. A sprinkler pipe segment with a head has been removed.	N/A	Install fire sprinkler piping to reconnect the system.
64	L302	A sidewall fire sprinkler is greater than 16' to the opposite wall and does not provide the required coverage for the room.	NFPA 13 8.7.2.1 Standard spray sidewall head maximum throw of 14' for light hazard construction	Install additional fire sprinklers for full coverage of the area.
65	Room 314A	There is paint on an upright head.	N/A	Replace the fire sprinkler head.
66	Room 324	An upright sprinkler deflector is installed less than 1" to the structure.	NFPA 13 8.6.4.1 Minimum 1" distance between deflector to ceiling.	Relocate the fire sprinkler so the deflector is greater than 1" to the structure.
67	South Stair	The third-floor zone control valve does not include a check valve.	NFPA 13 8.2.4.1 Multistory buildings exceeding two stories in height shall be provided with a floor control valve, check valve, main drain valve, and flow switch for isolation, control, and annunciation of water flow for each individual floor level.	Install a check valve at the zone control assembly upstream of the flow switch.
68	Hall and Room 306A	A pipe escutcheon is hanging on the pipe.	N/A	Reconnect the escutcheon.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
69	Throughout floor	Branch lines are installed without restraints. The requirement for restraint of branch lines was added to NFPA 13 in 2007.	NFPA 13 9.3.6 Restraint of branch lines.	Provide restraint of branch lines.

Stairs

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
70	S101	No fire department hose connections are provided in the south stairway.	OFC 905.4: Class 1 standpipe hose connections shall be provided in every required stairway for each floor level. Hose connections shall be located at intermediate landings.	Install a standpipe system in the south stairway with a hose connection at intermediate levels. Review with the Fire Marshal.
71	S101 and S102	A 6” fire protection pipe through the floor does not have a gap around the pipe, but is filled with solid grout.	NFPA 13 9.3.4.2 Where pipe passes through floors, the diameter of the holes is nominally 4” larger than the pipe for pipes larger than 4”.	Remove grout from around the pipe and fill with flexible fireproof sealant.
72	S101	The isolation valve for the rooftop hose connections is closed and the drain valve is open. The isolation valve should remain open and the drain valve shut.	NFPA 14 6.3.7.1 System water supply valves, isolation control valves, and other valves in feed mains shall be supervised in an approved manner in the open position.	Monitor the isolation valve to remain in the open position. Close the drain valve. Indicate an alarm when the valve is closed.
73	S102	The fire hose connections in the stairwell is inside of an old hose cabinet. This is a typical condition at each floor.	NFPA 14 7.3.1 Hose connection not obstructed.	Remove fire hose cabinets.

Item	Room	Noted System Deficiencies	Code Reference	Recommendations
74	S102 basement	There is no cap on the hose connection.	NFPA 14 4.7.3 Hose connections shall be protected with threaded caps to protect the hose threads.	Provide a cap over the threaded hose connection.
75	S102	Hose connections have a reducer fitting to 2”. Verify with the Fire Marshal.	NFPA 14 5.3.1 Class 1 standpipe shall provide 2-1/2” hose connections.	Verify the required size of the hose connection with the Fire Marshal. Remove reducer if necessary.
76	S102	No fire sprinkler is installed at the top of the stairway.	NFPA 13 8.15.3.2.1 Sprinklers shall be installed at the top of the shaft and under the first accessible landing above the bottom of the shaft.	Provide a fire sprinkler at the top of the stairs.

In summary, several upgrades are required for the system to meet current Codes as noted above. The most significant changes include the following:

- Install check valves on the system riser and zone control valve assemblies upstream of the flow switches.
- Install Class I standpipe hose connections at each intermediate level in the south stairs.
- Install seismic bracing on main and cross main piping.
- Install additional sprinkler heads in areas not covered.
- Install intermediate temperature heads in areas where ceiling temperatures are expected to be above 100°F.
- Replace corroded and damaged sprinkler heads.
- Relocate heads that are too close to structural members, or too far below the ceiling.
- Relocate the system riser.

Relocation of the system riser will require extensive excavation and construction and will have a high cost impact in upgrading the system. For new systems, the Fire Marshal typically requires the riser to be installed in an area directly accessible from the exterior of the building. Due to the age of the system and because the valves can be accessed, Systems West suggests they meet the NFPA 13 requirement. This condition will need to be reviewed and approved by the Fire Marshal.

Additional items to review with the Fire Marshal include:

- Building zones and fire separations at the Lokey Lab and Streisinger Hall.
- Sprinkler coverage of exterior areas.
- Verify if sprinkler head coverage is required in soundproof booth.
- Verify if Class I hose connections can be installed near zone control assemblies at the floor level or if they are needed at intermediate landings at the south stair.
- Verify size of threaded hose connections at the standpipe hose valve connections.

END OF MEMORANDUM

Steven Glen Schual, PE, LEED AP

SGS:\kaa

Sent via Email

\\swe\company\Projects\T017.04\02 Reports\2017-05-03 Fire Protection Memorandum.docx

5f. AUTOCLAVE CUT SHEETS

AMSCO® 400 SERIES SMALL STEAM STERILIZERS

APPLICATION

AMSCO 400® Series Small Steam Sterilizers are designed for sterilization of materials used in healthcare facilities.

The sterilizers are designed for fast, efficient sterilization of heat- and moisture-stable materials in addition to sterilization of items for immediate use. AMSCO 400 Series Small Steam Sterilizers are equipped with prevacuum, gravity, leak test, and daily air removal test cycles. An optional Steam Flush Pressure Pulse (SFPP) configuration sterilizer adds SFPP cycles.

Each sterilizer is equipped with either a single or double door, for open or recessed mounting. (Recess mounting is not available for 16 x 16 x 26" double door sterilizers.)

DESCRIPTION

AMSCO 400 Series Small Steam Sterilizers are the next advancement in the STERIS line of steam-jacketed sterilizers and are equipped with the latest features in both state-of-the-art technology and ease of use.

Primary Product Features

The **control system** for the AMSCO 400 Series Small Steam Sterilizers features enhanced functionality and user-friendly interface screen.

- Touch-screen with 30-line x 40-character display area
- Ink-on-paper impact printer
- Help screens for programming and troubleshooting alarm conditions
- Automatic check of control program and cycle data maintains process integrity
- Service reprogrammable flash ROM memory

(Typical – details may vary.)

- Available with optional water-saving electric **vacuum pump**
- **Vertical sliding door** with hands-free loading and unloading capability.
- Foot pedal activated door opening and closing
- Non-lubricated, steam-activated door seal

Selections Checked Below Apply To This Equipment

Size/Type

❑ 16 x 16 x 26", Prevacuum with Liquid Cycle
❑ 20 x 20 x 38", Prevacuum with Liquid Cycle
❑ 16 x 16 x 26", SFPP and Prevacuum with Liquid Cycle
❑ 20 x 20 x 38", SFPP and Prevacuum with Liquid Cycle

Steam Source

❑ **Facility Steam**[1]
  ❑ 120 Volt Control

❑ **Integral Steam Generator**[2]
  • Control Voltage: ❑ 120 Volt Control[3] ❑ 220 Volt Control[4]
  • Electrical (for generator power):
    ❑ 208 Volts ❑ 480 Volts
    ❑ 240 Volts ❑ 380/415 Volts

❑ **Vacuum System**
  ❑ Water Ejector
  ❑ Vacuum Pump
    ❑ 208V-240V ❑ 480V

1. External Supplied Steam (Facility Steam/Stand-Alone Steam Generator)
2. 16 x 16 x 26" double door sterilizers are not available with integral steam generator.
3. 120V control is used for 208V, 240V, and 480V powered integral steam generators.
4. 220V control is always used with the 380/415V powered integral steam generator.
5. Available for 20 x 20 x 38" double door sterilizers only.
6. Based on CA requirements.

Doors ❑ Single ❑ Double[2]

Single Door Mounting
❑ Cabinet Enclosed/Freestanding
❑ Recessed

Double Door Mounting
❑ Recessed through One Wall
❑ Recessed through Two Walls[5]

Remote Monitoring
❑ ProConnect® Technical Support Services (Remote Monitoring, Priority Technical Support, Customer Care Center Access, Equipment Performance Reports). Available in U.S. and Canada only. (GP09162)

Accessories
❑ Loading Rack and Two Shelves standard on 16 x 16 x 26" sterilizers (optional on 20 x 20 x 38" sterilizer)
  ❑ Single Door (FV021011) ❑ Double Door (FV022011)
❑ One Spare Shelf (20 x 20 x 38" sterilizer, only) (FV020012) - Intermediate Shelf
❑ Loading Car (20 x 20" units only) (FV020001)
❑ Transfer Carriage (20 x 20" units only) (FV020002)
❑ Chamber Track Assembly (20 x 20" units only)
  ❑ Single Door (FV021003) ❑ Double Door (FV022003)
❑ Loading Car, Transfer Carriage, and Track Assembly (20 x 20" units only)
  ❑ Single Door (FV021004) ❑ Double Door (FV022004)
❑ Seismic Tie-Down Kit[6] (FS2000000000000001)

Item ________________________
Location(s)___________________
____

- **Valve manifolds** increase dependability and reduce servicing time.
- Reduced piping components increase reliability
- Emergency manual exhaust valve
- Electronic water saving control

Interior Chamber Dimensions

- 16 x 16 x 26" (406 x 406 x 660 mm)
- 20 x 20 x 38" (508 x 508 x 965 mm)

STANDARDS

Each sterilizer meets applicable requirements of the following listings and standards, and carries the appropriate symbols:

- **ANSI/UL 61010-1** and **CAN/CSA-C22.2 No. 61010-1** – Standard for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements
- **ANSI/UL 61010A-2-041** – Standard for Electrical Equipment for Measurement, Control and Laboratory Use, Part 2: Particular Requirements for Autoclaves using Steam for the Treatment of Medical Materials and Laboratory Processes
- **ANSI/AAMI-ST8:2008** "Hospital Steam Sterilizers" American National Standard
- **ASME Code, Section VIII, Division 1** for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. Shell and door are constructed to withstand working pressure of 50 psig (344.7 kPa).
- **ASME Code, Section I, Part PMB** for power boilers, if optional steam generator is supplied.
- **CAN/CSA-C22.2 No. 61010-1**

FEATURES

Rack and shelf design accepts wider loads:

16 x 16" sterilizers – chamber clearance is12**"** (304 mm) for top shelf and 14" (357 mm) for bottom shelf.
20 x 20" sterilizers – chamber clearance is 18" (457 mm) for intermediate shelves, and 15" (381 mm) for bottom shelf.

User-programmable cycle names allow for load specific naming of cycles. These cycle names are displayed and printed in addition to the factory-default cycle type and aid in identifying the proper cycle to be used with a specific load.

Hinged front cabinet panel fully opens for convenient access to sterilizer piping and control.

Software calibration is performed in the Service Mode, accessible through the touch-screen displays, and accomplished using external or internal temperature and pressure sources. Control system provides printed record of all calibration data for verification of current readings.

Lighted DIN connectors are installed on all steam, water and exhaust valves for reliability and ease of maintenance.

Steam generator units are equipped with **an automatic flush and drain system**. This system helps the generator to operate at peak performance and extends the life of the heaters.

ProConnect® Technical Support Services – Maximize operational efficiencies with secure, Internet-based, real-time equipment monitoring. Data from your equipment is used by STERIS to provide pro-active Customer alert notifications, technical support, and predictive maintenance. Online parts ordering, equipment performance dashboards, and online service scheduling at steris.com is also available. (ProConnect Technical Support Services is available in U.S. and Canada only.) Refer to Tech Data sheet *SD983, ProConnect Technical Support Services*, for details.

UTILITIES CONSERVATION FEATURES

Resistance Temperature Detectors (RTD) are installed for sterilizer temperature control. The chamber drain line RTD senses and controls temperature variations within the sterilizer chamber. A jacket RTD provides temperature control within the jacket space. These RTD signals, converted into electrical impulses, provide accurate control inputs and readouts throughout entire cycle and minimizes utilities usage.

Electronic water saving control includes a condenser RTD to control the amount of water used in condensing the exhausted chamber steam. Control software minimizes amount of water used to cool condensate.

Automatic utilities startup/shutdown may be programmed to activate at the end of any designated cycle or time of day. When activated, control system automatically shuts off all utility valves, conserving steam and water usage. Sterilizer utilities can be restarted either by programmed time or manual operation. A different shutdown and restart time can be programmed for each day.

Insulation, one-inch thick, asbestos-free spin-glass (rated at 500°F [260°C] continuous) encompasses the exterior of the sterilizer vessel and is sealed in an oil and water resistant outer jacket.

Vacuum System

Water ejector reduces chamber pressure during prevacuum and post-drying phases. Air is drawn from chamber through the vacuum system. Following dry phase, chamber vacuum is relieved to atmospheric pressure by admitting air through a bacteria-retentive filter.

An **optional vacuum pump** can be ordered in place of the standard water ejector. The vacuum pump provides equivalent performance, but reduces cooling water consumption by up to 60%, helping facilities to conform with Leadership in Energy and Environmental Design (LEED) requirements.

PROCESSING CYCLES

All cycles validated to AAMI standard ST8:2008.

Prevacuum Sterilizer Models feature the following cycles:

Immediate Use, Prevac Cycle (4-minute exposure): Cycle type is for sterilizing porous and non-porous loads. Examples – A single unwrapped instrument tray or up to a full load of unwrapped instrument trays, each with a maximum weight of 25 lb (11 kg).

» Sterilize exposure temperature: 270°F (132°C)

» Sterilize exposure time: 4 minutes

» Dry time:1 minute

*NOTE: Items sterilized for **immediate use** must be used within the shortest possible time after removal from the sterilizer and **must** be taken to the sterile field using aseptic transfer protocols.*

- *A sterilized item intended for immediate use must not be stored.*
- *An item sterilized for immediate use cannot be held for use on a future case.*
- *The Prevac immediate use cycle is the preferred immediate use cycle. The Gravity immediate use cycle is only safe for simple instruments that contain no hinges or other features that could trap air.*
- *Always refer to instrument manufacturer's instructions for use to determine processing requirements.*

Prevac Cycle (4-minute exposure): Cycle type is for sterilizing porous and non-porous loads. Example – Wrapped 25 lb (11 kg) instrument tray(s) or fabric packs.

» Sterilize exposure temperature: 270°F (132°C)

» Sterilize exposure time: 4 minutes

» Dry time: 30 minutes (full load of instruments trays), 20 minutes (full load of fabric packs) or 5 minutes (Customer option, for a single fabric pack)

Prevac Cycle (3-minute exposure): This cycle is for sterilizing porous and non-porous loads. Example – Wrapped 25 lb (11 kg) instrument trays.

» Sterilize exposure temperature: 275°F (135°C)

» Sterilize exposure time: 3 minutes

» Dry time: 30 minutes

Immediate Use, Gravity Cycle (3-minute or 10-minute exposure): Cycle type is for sterilizing non-porous loads. Example – A single unwrapped instrument tray or up to a full load of unwrapped instrument trays, each with a maximum weight of 25 lb (11 kg).

» Sterilize exposure temperature: 270°F (132°C)

» Sterilize exposure time: 10 minutes or 3 minutes

» Dry time:1 minute

See *Note* on previous page regarding immediate use.

SFPP Sterilizer Models also feature the following cycles (in addition to those found on Prevacuum models):

SFPP Cycle (4-minute exposure): This cycle is for sterilizing porous and non-porous loads. Example – A wrapped 25 lb (11 kg) instrument tray.

» Sterilize exposure temperature: 270°F (132°C)

» Sterilize exposure time: 4 minutes

» Dry time: 30 minutes (full load of instruments trays), 20 minutes (full load of fabric packs) or 5 minutes (Customer option, for a single fabric pack)

SFPP Cycle (3-minute exposure): This cycle is for sterilizing porous and non-porous loads. Example – A wrapped 25 lb (11 kg) instrument tray.

» Sterilize exposure temperature: 275°F (135°C)

» Sterilize exposure time: 3 minutes

» Dry time: 30 minutes.

OPTIONAL CYCLES:

The following cycles are available on Prevac and SFPP sterilizers, and can be made accessible for use by the departmental supervisor:

Gravity Cycles:

Full load, non-porous instrument trays.

» Sterilize exposure temperature: 270°F (132°C)

» Sterilize exposure time: 15 minutes

» Dry time: 30 minutes

Full load, non-porous instrument trays.

» Sterilize exposure temperature: 250°F (121°C)

» Sterilize exposure time: 30 minutes

» Dry time: 30 minutes

Full load, fabric packs.

» Sterilize exposure temperature: 270°F (132°C)

» Sterilize exposure time: 25 minutes

» Dry time: 15 minutes

Full load, fabric packs.

» Sterilize exposure temperature: 250°F (121°C)

» Sterilize exposure time: 30 minutes

» Dry time: 15 minutes

Liquid Cycle: This cycle is used for sterilizing liquids in borosilicate containers with vented closures. The 16" sterilizer can process a maximum load of fifteen 1000 mL containers. The 20" sterilizer can process a maximum load of thirty two 1000 mL containers.

» Sterilize temperature: 250°F (121°C)

» Factory programmed sterilize time: 45 minutes

» Dry time: not applicable

Important: The liquid cycle is for non-patient contact use only.

PREVACUUM TESTING CYCLES

- **Vacuum Leak Test:** This cycle is used for testing the vacuum integrity of sterilizer piping. The sterilizer chamber must be empty while running this test cycle. Temperature: 270°F (132°C); all timing is preprogrammed and cannot be adjusted. This cycle is validated to AAMI standard ST8:2008.
- A preprogrammed **Bowie-Dick Test Cycle** is used to test for adequate air removal from the sterilizer chamber. Recommended load is a Dart® testing apparatus from STERIS, or a properly prepared Bowie-Dick test pack. Preprogrammed cycle parameters cannot be adjusted by user. Sterilize exposure temperature: 270°F (132°C); sterilize exposure time: 3-1/2 minutes; dry time: 1 minute. This cycle is validated to AAMI standard ST8:2008.

CONTROL SYSTEM

Design Features

The **control system** for the AMSCO 400 Series Small Steam Sterilizer monitors and controls all sterilizer operations and functions. The control system is factory-programmed with standard sterilizing cycles. Each cycle is adjustable, and cycle names are user-programmable, to meet specific processing requirements. Cycle parameters cannot be adjusted to less than preset, validated settings. All control configuring is performed through touch-screen display.

Important: Always refer to instrument manufacturer's instructions for use to determine processing requirements.

Cycle values and operating features may be adjusted and verified prior to cycle operation. Once cycle is started, cycles and cycle values cannot be changed until cycle is complete. On completion of cycle, timers reset to the previously selected values, eliminating the need to reset values between repeated cycles. If chamber temperature drops below setpoint during the exposure phase the timer stops. It automatically resets once normal operating temperature is reached.

Critical control system components are housed within a compartment to protect the components from moisture and heat generated during sterilization. A cooling fan with filter maintains air flow within the compartment, keeping components cool.

Operator interface control panel, consisting of a touch-screen and impact printer, is located on the operating end (OE – loading end or nonsterile end) of the sterilizer. If sterilizer is equipped with double doors, an additional touch-screen (but no printer) is provided on the sterilizer non-operating end (unloading or sterile).

- **Touch-Screen** features a 30-line x 40-character graphics display. The control touch-screen, from which all sterilizer functions are controlled, features a wide viewing angle and high-visibility back-lighting.

The display indicates any abnormal conditions that may exist, either in or out of cycle. Displayed messages are complete phrases with no codes to be cross-referenced.

- **Ink-On-Paper Impact Printer,** located near touch-screen, provides an easy-to-read printed record of all pertinent cycle data. Data is automatically printed at the beginning and end of each cycle and at transition points during the cycle.

  Printer take-up spool stores an entire roll of paper, providing cycle records which can be saved for future reference. Three paper tape rolls are furnished with each unit.

Non-operating end (NOE) control panel, equipped on double-door sterilizers only, includes a touch-screen similar to the operating end screen, but no printer. Preprogrammed cycles can be started from the NOE control panel. Display concurrently shows the same information as the operating end screen display.

Cycle configuration is performed by accessing the Change Values menu through the operating end touch-screen. In addition to adjustment of cycle values, the following operating parameters can also be changed through the Change Values menu:

- **Time Display and Printout Units –** Standard AM/PM or 24-hour.
- **Access Code** – accessing Change Values menu causes display to request the entry of an access code. If access code is not properly entered, display returns to menu screen, denying user access to the sterilizer programming. Supervisors can allow operators to change chosen cycle and parameters; or lock them out from making any changes.
- **Audible Signals** – are adjustable. Sounds made when **touching the screen** and for **end-of-cycle signals** can be adjusted to one of four sound levels (off, low, medium or high) as required for the operating environment. The **alarm signal** can be adjusted to low, medium or high; but cannot be turned off.
- **Print Format** – allows selection of either a full or condensed printout of the cycle information during processing.
- **Temperature Display and Printout Units** – Fahrenheit (°F) or Celsius (°C). Temperature is set, displayed, controlled and printed to the nearest 0.1°. Recalibration is not required when changing temperature units from °F to °C and vice versa.
- **Pressure/Vacuum Display and Printout Units** – psig/In Hg, millibar or psia. Recalibration is not required when changing pressure units.
- **Utilities Control** – This parameter permits the operator to program the sterilizer to automatically shut off its steam and water at the end of the work day, to conserve utilities. It also allows control for shut down and power-up of an integral steam generator.
- **Languages** – This parameter can be used to select English, French or Spanish as the default for displays and printouts. The sterilizer can also be set to allow quick changes between available languages.
- **Machine Number** – This parameter assigns a six-character, alphanumeric code to the sterilizer. This code appears in the heading of all printouts.
- **Automatic Duplicate Print** – Sterilizer can be set to automatically furnish a duplicate printout of each cycle at the end of the cycle. First line reads “DUPLICATE PRINT.”

Technical Data

Control system consists of a microcomputer control board and peripheral function circuit boards, located within the control board housing behind the front cabinet service panel above the chamber.

A memory backup system maintains cycle settings indefinitely and current cycle information for approximately five days. If a power failure occurs during a cycle, the battery backup system ensures that cycle memory is retained and proper cycle completion occurs once power is restored. When power is lost, the cycle is held in phase until power is restored, exceeding the minimum government specification of one minute. Once power returns, the event is recorded on the printout and the cycle automatically resumes or restarts, depending on what phase the cycle was in at the time of power loss. If necessary, the operator can manually abort the cycle.

SAFETY FEATURES

Control senses when the door is closed and sealed, preventing cycle start until a limit switch signal is received. If control loses appropriate signal during cycle, alarm activates, cycle aborts and chamber safely vents with a controlled exhaust.

Chamber Float Switch activates alarm, aborts cycle and safely vents chamber with a controlled exhaust if excessive water is detected in the vessel chamber.

Pressure Relief Valve limits amount of pressure buildup so that rated pressure of vessel is not exceeded.

CONSTRUCTION

Shell Assembly

Two fabricated Type 316L stainless-steel shells, welded one within the other, form the sterilizer vessel. Type 316L stainless-steel end frame(s) is welded to door end. On single door units, back of chamber is fitted with welded, 316L stainless-steel formed head.

Sterilizer vessel is ASME rated at 50 psig and insulated. Vessel (20 x 20" units only) includes one 1.0"-NPT welded chamber bushing for Customer use.

Steam-supply opening inside the chamber is shielded by a Type 316L stainless-steel baffle.

Chamber Door(s)

Door is constructed of a single formed piece of Type 316L stainless steel.

During cycle operation, door is sealed by a steam-activated door seal. Door seal is constructed of a special long-life rubber compound. When sterilizer cycle is complete, the seal retracts under vacuum into a machined groove in the sterilizer end frame. Door seal can be manually retracted to open door and remove critical load in emergency situation if loss of vacuum or loss of power occurs.

Door is suspended by cables attached to a counterweight. Chamber door is opened (lowered) and closed (raised) by pressing a foot pedal located on the same end as the door being operated. In case of a power or mechanical failure, door can be operated manually.

A long-life proximity switch is used by the control to determine if door is closed. An additional seal pressure switch prevents inadvertent cycle initiation if door is not sealed.

The door assembly is equipped with a mechanical locking mechanism that ensures the door cannot be opened as long as the seal is intact and energized and more than 2.0 psi pressure is in the chamber.

The sterilizer door opening is fitted with a textured thermoplastic bezel. This bezel insulates the operator from the chamber end ring, lessening the chance of accidental contact with a hot metal surface.

Chamber Drain System

Drain system is designed to prevent pollutants from entering into the water-supply system and sterilizer. The automatic condensing system converts chamber steam to condensate and disposes condensate to waste. Cooling water flow is regulated by the waste line RTD to minimize water usage. Water supply shutoff valve is located behind the front cabinet service panel under the chamber.

Steam Source

Sterilizers are piped, valved and trapped to receive building-supplied steam delivered at 50 to 80 psig dynamic. If building steam source is not available, an electric carbon-steel steam generator may be provided to supply steam to the sterilizer. Steam piping is constructed of brass and includes a shutoff valve, steam strainer, flush system and a brass pressure regulator.

Piping

All piping connections terminate within the confines of the sterilizer and are accessible from front and side of sterilizer.

- **Solenoid Valves** in the manifold with DIN connectors simplify sterilizer piping and can be serviced individually.
- **Manual Shutoff Valves** are pressure rated at 125 psig for saturated steam. Valve handles are low-heat conducting.

MOUNTING ARRANGEMENT

Sterilizers are arranged for either freestanding or recessed installation, as specified. Each sterilizer is equipped with a height-adjustable steel floor stand. Sterilizer subframe is equipped with a synthetic rubber gasket to ensure tight fit between the cabinet panels on freestanding units or between the front cabinet panel and wall partition on recessed units.

On freestanding units, stainless-steel side panels and a louvered top panel enclose the sterilizer body and piping.

ACCESSORY

Seismic Tie-Down Kit – conforms to California Code of Regulations.

PREVENTIVE MAINTENANCE

A global network of skilled service specialists can provide periodic inspections and adjustments to help ensure low-cost peak performance. STERIS representatives can provide information regarding annual maintenance agreements.

NOTES

1. The sterilizer is not supplied with a vacuum breaker or backflow preventer and, where required by local codes, installation of such a device in the water line is not provided by STERIS.
2. Pipe sizes shown indicate terminal outlets only. Building service lines (not provided by STERIS), must supply the specified pressures and flow rates.
3. Disconnect switches (with OFF position lockout only; not provided by STERIS) should be installed in electric supply lines near the equipment.
4. Access to the recessing area from the control end of the sterilizer is recommended.
5. Clearances shown are minimal for installing and servicing the equipment.
6. If loading car and carriage are to be used with a 20 x 20 x 38" sterilizer, front clearance should be at least 76" (1930 mm). This permits complete withdrawal of the loading car from the chamber and allows convenient maneuverability of the transfer assembly to and from the sterilizer.
7. Floor drain should be provided within confines of sterilizer framework.

UTILITY REQUIREMENTS

Sterilizer Using Facility Steam

- Steam – 1/2" NPT, 50 to 80 psig, dynamic, 97 to 100% vapor quality.
- Drain – 1-1/2" ODT drain terminal. (Floor drain capacity must handle peak water consumption; refer to Engineering Data.)
- Electrical - Controls –
  - » 120 Volt, 50/60 Hz, 1-phase, 2.0 Amps
  - » 220 Volt, 50/60 Hz, 1-phase, 1.5 Amps
- Sterilizer Feed Water – 1" NPT,
  - » 30 to 50 psig for water ejector[1]
  - » 20 to 50 psig for vacuum pump.
  - » Minimum 40 psig for SFPP sterilizers.

  NOTE: Backflow prevention (not supplied on unit) is not provided by STERIS.

*1. Water is used for ejector (creating chamber vacuum), exhaust cooling and cooling the generator drain. Refer to **Table 1** for recommended water quality. Use of feed water within the nominal conditions optimizes equipment performance and helps reduce maintenance.*

Sterilizer Equipped with Integral Carbon Steel Steam Generator

Every AMSCO 400 Series Small Steam Sterilizer equipped with an electric steam generator includes an automatic flush and drain package.

- **Drain** – 1-1/2" ODT drain terminal. (Floor drain capacity must handle peak water consumption; refer to Engineering Data.)
- **Generator Drain** – 1/2" ODT
- **Electrical** - Controls
  - » 120 Volt, 50/60 Hz, 1-phase, 9.5 Amp[1]
    Consumption – Peak:
    Per Load:
  - » 220 Volt, 50/60 Hz, 1-phase, 5.0 Amp[2]
    Consumption – Peak:
    Per Load:
- Electrical - Integral Steam Generator
  208 Volt, 50/60 Hz, 3-phase, 83.2 Amps
  240 Volt, 50/60 Hz, 3-phase, 72.2 Amps[2]
  380/415 Volt, 50/60 Hz, 3-phase, 38/42 Amps[3] or
  480 Volt, 50/60 Hz, 3-phase, 37 Amps[2]

- **Electrical – Vacuum Pump Option**
  208 Volt, 50/60 Hz, 3-phase, 83 Amps
  240 Volt, 50/60 Hz, 3-phase, 72 Amps
  480 Volt, 50/60 Hz, 3-phase, 36 Amps

Sterilizer Feed Water – 1.0" NPT, 30 to 50 psi for water ejector, 20 to 50 psi for vacuum pump, dynamic. Refer to **Table 1** for water specification guidelines.

Steam Generator Feed Water – 1/2" NPT, 20 to 50 psig dynamic. Refer to **Table 2** for required water quality. Use of feed water within the nominal conditions optimizes equipment performance and reduces maintenance.

NOTE: Backflow prevention (not supplied on unit) is not provided by STERIS.

Requirements for ProConnect® Technical Support Services Refer to Tech Data sheet *SD983, ProConnect Technical Support Services*. (Available in U.S. and Canada only.)

CUSTOMER IS RESPONSIBLE FOR COMPLIANCE WITH APPLICABLE LOCAL AND NATIONAL CODES AND REGULATIONS.

The base language of this document is ENGLISH. Any translations must be made from the base language document.

1. *The 120V, 50/60 Hz control is always used with the 208V, 240V, and 480V integral steam generator/vacuum systems.*
2. *The 220V, 50/60 Hz control is always used with the 380/415V integral steam generator/vacuum system.*

Table 1. Recommended Feed Water Quality for Sterilizers

Condition	Nominal Conditions	Maximum Conditions
Temperature	40°-60°F (4°-16°C)	70°F (21°C)
Total Hardness as $CaCO_3$*	50-120 ppm	171 ppm
Total Dissolved Solids	100-200 ppm	500 ppm
Total Alkalinity as $CaCO_3$	70-120 ppm	180 ppm
pH	6.8-7.5	6.5-8.5
Total Silica	0.1 - 1.0 ppm	2.5 ppm
Chlorides	1.0 – 8.0 ppm	10.0 ppm
Cu	0.0 – 0.08 ppm	0.1 ppm
Fe	0.0 – 0.08 ppm	0.1 ppm
Zn	0.0 – 0.08 ppm	0.1 ppm
Al	0.0 – 0.08 ppm	0.1 ppm
Mg	0.0 – 0.08 ppm	0.1 ppm

* *17.1 ppm = 1.0 grain hardness*

Table 2. Required Feed Water Quality for Carbon-Steel Steam Generators

Condition	Nominal Conditions	Maximum Conditions
Temperature	40-140°F (4-60°C)	150°F (66°C)
Total Hardness as $CaCO_3$*	0-17 ppm	130 ppm
Total Dissolved Solids	50-150 ppm	250 ppm
Total Alkalinity as $CaCO_3$	50-100 ppm	180 ppm
pH	6.8-7.5	6.5-8.5
Total Silica	0.1 - 1.0 ppm	2.5 ppm
Resistivity - Ω·cm†	2000-6000	26000
Chlorides	1.0 – 8.0 ppm	10.0 ppm
Cu	0.0 – 0.08 ppm	0.1 ppm
Fe	0.0 – 0.08 ppm	0.1 ppm
Zn	0.0 – 0.08 ppm	0.1 ppm
Al	0.0 – 0.08 ppm	0.1 ppm
Mg	0.0 – 0.08 ppm	0.1 ppm

* *17.1 ppm = 1.0 grain hardness*

† *WARNING – BURN HAZARD: Sterilizer operator may be severely burned by scalding water if the water level control malfunctions. The steam generator level control may malfunction if the supply water exceeds 26,000 Ω·cm (38.5 micro-ohms conductivity min.). Do not connect to treated water (e.g., distilled, reverse osmosis, deionized) unless water resistivity is determined to be acceptable. If water exceeds 26,000 Ω·cm, contact STERIS Service Engineering for information concerning modifications required to the generator control system.*

Refer to the Following Equipment Drawings for Installation Details	
Equipment Drawing Number	**Equipment Drawing Title**
129394-044	16 x 16 x 26", single door, cabinet enclosed with steam heat
129394-045	16 x 16 x 26", single door, recessed one wall with steam heat
129394-046	16 x 16 x 26", single door, recessed one wall with electric heat
129394-047	16 x 16 x 26", single door, cabinet enclosed with electric heat
129394-048	16 x 16 x 26", double door, recessed one wall with cabinet and steam heat
129394-049	20 x 20 x 38", single door, cabinet enclosed with steam heat
129394-050	20 x 20 x 38", single door, recessed one wall with steam heat
129394-051	20 x 20 x 38", double door, recessed one wall with cabinet and steam heat
129394-052	20 x 20 x 38", double door, recessed two walls, with steam heat
129394-053	20 x 20 x 38", single door, cabinet enclosed with electric heat
129394-054	20 x 20 x 38", single door, recessed one wall with electric heat
129394-055	20 x 20 x 38", double door, recessed one wall with electric heat and cabinet
129394-056	20 x 20 x 38", double door, recessed two walls with electric heat
10066840	16 x 16 x 26", single door, recessed one wall with steam heat and vacuum pump
10066841	16 x 16 x 26", single door, cabinet with steam heat and vacuum pump
10066842	16 x 16 x 26", single door, recessed one wall with electric steam heat and vacuum pump
10066843	16 x 16 x 26", single door, cabinet with electric steam heat and vacuum pump
10066844	20 x 20 x 38", single door, recessed one wall with steam heat and vacuum pump
10066845	20 x 20 x 38", single door, cabinet with steam heat and vacuum pump
10066846	20 x 20 x 38", single door, recessed one wall with electric heat and vacuum pump
10066847	20 x 20 x 38", single door, cabinet with electric heat and vacuum pump

ENGINEERING DATA

Size in (mm)	Heating	Maximum Operating Weight* lbs (kg)		HEAT LOSS† BTU/hr at 70°F (21°C)						
				Single Door			Double Door			
		Single Door	Double Door	Cabinet Enclosed	Recessed		Recessed One Wall		Recessed Two Walls	
				To Room	Front of Wall	Back of Wall	Front of Wall	Back of Wall	At Each End	Between Walls
16 x 16 x 26 (406 x 406 x 660)	Steam‡	750 (340)	989 (449)	4300	1600	2700	1600	3700	N/A	N/A
	Electric**	890 (404)	N/A	6050	2300	3750	N/A	N/A	N/A	N/A
20 x 20 x 38 (508 x 508 x 965)	Steam‡	1230 (558)	1606 (728)	7000	2500	4500	2500	5300	2500	4500
	Electric**	1371 (622)	1726 (782)	8750	3300	5600	3300	6300	3300	6300

* *Based on chamber fully loaded with water flasks.*

† *At 70°F (21°C).*

‡ *In the Heating column, "Steam" refers to External Supplied Steam (Facility Steam/Stand-Alone Steam Generator).*

** *In the Heating column, "Electric" refers to Integral Steam Generator.*

SIZE in (mm)	Heating	Water Ejector (WE) or Optional Vacuum Pump (VP)	UTILITIES CONSUMPTION*									Electrical Consumption (kW-hr per Typical Cycle)
			Water†						Steam			
			Cold			Hot‡						
			Peak gpm (lpm)	Average Usage gal/cycle (l/cycle)	Idle gph (lpm)	Peak gpm (lpm)	Per Cycle gal/cycle (l/cycle)	Idle gph (lph)	Peak** lb/hr (kg/hr)	Per Cycle lb/cycle (kg/cycle)	Idle lb/hr (kg/h)	
16 x 16 x 26 (406 x 406 x 660)	Steam††	WE	15 (57)	135 (511)	12 (45)	N/A	N/A	N/A	158 (72)	30 (14)	7 (3)	0.156
		VP	10 (38)	50 (186)								24.327
	Electric‡‡	WE	15 (57)	135 (511)	12 (45)	1 (4)	3 (11)	1 (4)	N/A	N/A	N/A	1.148
		VP	10 (38)	50 (186)								23.335
20 x 20 x 38 (508 x 508 x 965)	Steam††	WE	15 (57)	175 (662)	12 (45)	N/A	N/A	N/A	158 (72)	42 (19)	9 (4)	0.156
		VP	10 (38)	70 (261)								24.409
	Electric‡‡	WE	15 (57)	175 (662)	12 (45)	1 (4)	5 (19)	1 (4)	N/A	N/A	N/A	1.148
		VP	10 (38)	70 (261)								26.401

* *Data is based on 270°F (132°C), 4 minute sterilize, 30 minute dry cycle, processing 25 lb (11kg) instrument trays, maximum load in chamber.*

† *Backflow preventer device in water line, when required by local codes, is installed by others.*

‡ *Hot water recommended for units equipped with electric steam heat.*

** *Peak steam demand (lb/hr) may vary depending on operating conditions.*

†† *In the Heating column, "Steam" refers to External Supplied Steam (Facility Steam/Stand-Alone Steam Generator).*

‡‡ *In the Heating column, "Electric" refers to Integral Steam Generator*

For further information, contact:

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APPLICATION

This Prevacuum sterilizer is designed for fast, efficient sterilization of heat- and moisture-stable materials. Prevacuum configuration sterilizers are equipped with prevacuum, gravity, liquid, leak test and daily air removal (Bowie-Dick) test cycles.

Horizontal-Sliding Door Model

Hinged-Door Model

(Typical – details may vary.)

DESCRIPTION

AMSCO 400 Series Medium Steam Sterilizers are equipped with the latest features in both state-of-the-art technology and ease of use.

Product Configurations

Interior Chamber Dimensions

- 26 x 37.5 x 36" (660 x 950 x 910 mm)
- 26 x 37.5 x 48" (660 x 950 x 1220 mm)
- 26 x 37.5 x 60" (660 x 950 x 1520 mm)

36", 48" and 60" configurations include the choice of a single or double door.

- **Hinged door** with fast operating, low-effort door lock mechanism. Door handle lock lever requires a single 30° handle movement to lock or unlock.
- **Horizontal-sliding door** with quiet, motor-driven cable and pulley mechanism. Door travels horizontally right to left to open, and is controlled from the touch screen.

The Selections Checked Below Apply To This Equipment

Size

❑ 26 x 37.5 x 36" (660 x 950 x 910 mm)
❑ 26 x 37.5 x 48" (660 x 950 x 1220 mm)
❑ 26 x 37.5 x 60" (660 x 950 x 1520 mm)

Chamber Length for Accessories

❑ 36" (910 mm) Chamber Length
❑ 48" (1220 mm) Chamber Length
❑ 60" (1520 mm) Chamber Length

Vacuum Pump Electric Service

❑ 208/240 Vac, 60 Hz, 3-Phase, 6A per phase
❑ 480 Vac, 60 Hz, 3-Phase, 3A per phase

Door Configuration

❑ **Single-Door**
❑ Hinged
❑ Horizontal-Sliding

Select direction of door swing, as viewed from the sterilizer operating end:

❑ Left-Hand
❑ Right-Hand (not available for sliding-door units)

❑ **Double-Door**
❑ Hinged Door

NOTE: Operating End hinge position listed first; Non-operating End hinge listed second.

❑ Right-Hand/Left-Hand
❑ Right-Hand/Right-Hand
❑ Left-Hand/Right-Hand
❑ Left-Hand/Left-Hand

❑ Horizontal-Sliding Door

Single-door Mounting

❑ Cabinet Enclosed/Freestanding
❑ Recessed

Double-door Mounting

❑ Recessed through One Wall
❑ Recessed through Two Walls

Accessories

❑ Loading Car, Transfer Carriage, and Track Assembly
❑ Single Door ❑ Double Door
❑ (36" Units only) Chamber Rack and Shelf
❑ Seismic Tie-Down Kit

Remote Monitoring

❑ ProConnect® Technical Support Services (Remote Monitoring, Priority Technical Support, Customer Care Center Access, Equipment Performance Reports).

Item ______________________
Location(s)__________________
____

STANDARDS

Each sterilizer meets the applicable requirements of the following listings and standards, and carries the appropriate symbols:

- **Underwriters Laboratory (UL) Standard 61010-1** as certified by ETL Testing Laboratories, Inc.
- **CAN/CSA-C22.2 No. 61010-1.**
- **ASME Code, Section VIII, Division 1** for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is provided with shipment. Shell and door are constructed to withstand working pressure of 45 psig.

FEATURES

26 x 37.5" chamber cross-sections are sized for efficient, high-volume sterilization processing.

Fast-operating, low-effort manual door lock mechanism (hinged-door models) allows door to be locked or unlocked using a single 30° handle motion.

Power door drive systems consists of a cable and pulley arrangement driven by an electric motor. Power door is arranged horizontally and controlled from the touch screen. Door slides horizontally on a rigid rail assembly housed within stainless-steel paneling.

The **control system** for the AMSCO 400 Series Medium Steam Sterilizer features enhanced functionality and user-friendly interface screen.

- Touch-sensitive screen with 30-line x 40-character display area.
- Ink-on-paper impact printer.
- Help screens for programming and troubleshooting alarm conditions.
- Automatic check of control program and cycle data maintains process integrity.

Software calibration is performed in *service mode* using external or internal temperature and pressure sources. Control system provides a printed record of all calibration data for verification.

Steam purge feature is provided to assist in air removal and to preheat the load.

Lighted DIN connectors are installed on all steam, water and exhaust valves, for reliability and ease of maintenance.

ProConnect® Technical Support Services – Minimize response time and unscheduled equipment downtime. Secure, Internet-based, 24/7 remote monitoring enables Predictive Maintenance and instantly alerts STERIS when equipment enters an alarm state. Priority technical support, online parts ordering, equipment performance dashboards and scheduling service at eservice.steris.com is included.

UTILITIES CONSERVATION FEATURES

Vacuum pump effectively pulls chamber to specified vacuum levels and reduces water consumption.

Resistive Thermal Detectors (RTD) are installed for sterilizer temperature control. Dual element chamber drain line RTD senses and controls temperature variations within sterilizer chamber. Dedicated RTD provides jacket-space temperature control.

Electronic water saving control includes an RTD to control water quantity used in condensing chamber steam exhaust.

Automatic utilities start-up/shutdown permits utilities conservation. Shutdown may be programmed to activate at end of designated cycle or time of day. When used, utilities control automatically shuts off utility valves, conserving steam and water. Sterilizer utilities can be restarted automatically or manually. Different daily shutdown and restart times can be programmed.

Insulation, one-inch thick, asbestos-free spin-glass (rated at 500 °F [260 °C] continuous) encompasses the exterior of the sterilizer vessel and is sealed in an oil and water resistant outer jacket.

PROCESSING CYCLES

All processing cycles factory programmed into the sterilizer control have been validated to **AAMI ST8.**

AMSCO 400 Series Medium Steam Sterilizers, models 36 H, 48 H, 60 H, 36 SL, 48 SL and 60 SL are provided with the following default cycles:

Prevac Cycles (4-minute exposure): Cycle type is for sterilizing porous and non-porous loads. Wrapped 25 lb (11 kg) instrument tray(s) or fabric packs.

» Sterilize exposure temperature: 270°F (132°C)

» Sterilize exposure time: 4 minutes

» Dry time: 30 minutes (full load of instruments trays), 20 minutes (full load of fabric packs) or 5 minutes (Customer option, for a single fabric pack)

Prevac Cycle (3-minute exposure): This cycle is for sterilizing porous and non-porous loads. Wrapped 25 lb (11 kg) instrument trays.

» Sterilize exposure temperature: 275°F (135°C)

» Sterilize exposure time: 3 minutes

» Dry time: 30 minutes

Gravity Cycle (30-minute exposure): This cycle is for sterilizing items such as a single fabric pack.

» Sterilize exposure temperature: 275°F (135°C)

» Sterilize exposure time: 30 minutes

» Dry time: 15 minutes

Liquid Cycle (45-minute exposure): This cycle is used for sterilizing liquids in borosilicate containers with vented closures.

» Sterilize temperature: 250°F (121°C)

» Factory programmed sterilize time: 45 minutes

» Dry time: not applicable

TESTING CYCLES

- **Vacuum Leak Test** is used for testing vacuum integrity of sterilizer piping. Sterilizer chamber must be empty while running this test. Preprogrammed cycle parameters cannot be adjusted by user.
- A preprogrammed **Bowie-Dick Test Cycle** is used to test for adequate air removal from the sterilizer's chamber. Recommended load is a Dart® testing apparatus from STERIS, or a properly prepared Bowie-Dick test pack. Preprogrammed cycle parameters cannot be adjusted by user.

  » Sterilize temperature: 270°F (132°C)

  » Sterilize time: 3.5 minutes

  » Dry time: 1 minute

CONTROL SYSTEM

Design Features

The **Control System** for AMSCO 400 Series Medium Steam Sterilizers monitors and controls all sterilizer operations and functions. The control system is factory-programmed with standard sterilizing cycles. Cycle values and operating features may be adjusted and verified prior to cycle operation.

Important: If cycle parameters (sterilize time, dry time, temperature) other than those listed are required, it is the responsibility of the healthcare facility to consult and follow the device manufacturer's written instructions.

Once the cycle is started, cycle values cannot be changed until cycle completes.

Critical control system components are housed within a sealed compartment for protection from moisture and heat. A compartment cooling fan with filter is provided.

Operator interface control panel consists of a touch screen and impact printer located at sterilizer's operating end (OE – loading or non-sterile side). If sterilizer is equipped with double doors, an additional touch screen is provided at sterilizer's non-operating (i.e., unload or sterile) end.

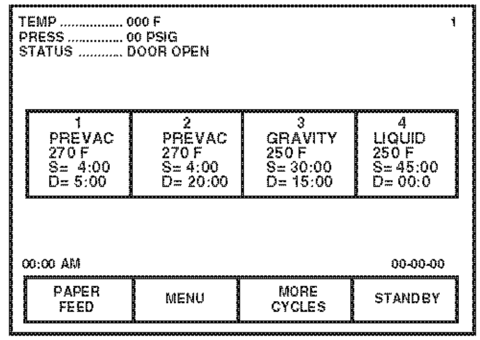
- **Touch-Sensitive Screen** features a multi-color, touch-screen graphics display. Sterilizer is operated by pressing touch-sensitive areas on display (touch pads). Appropriate touch pads, operator prompts and status messages necessary for sterilizer operation appear on display as needed. Display also indicates any alarm conditions either in or out of cycle.
- **Ink-On-Paper Impact Printer,** located near touch screen, provides an easy-to-read printed record of all pertinent cycle data on 2-1/4" wide paper. Printer take-up spool stores an entire roll of paper. Three paper tape rolls and two printer ribbons are furnished with each unit.

Non-Operating End (NOE) Control Panel (double-door sterilizers only) includes a touch screen similar to operating end, but without printer. Preprogrammed cycles can be started from NOE control panel. OE and NOE displays concurrently show identical information.

Cycle Configuration is accomplished at OE control Change Values menu. Cycle values and following operating parameters can be changed using Change Values:

- **Time Display and Printout Units** AM/PM or 24-hour notation.
- **Access Code** requires entry of a four-digit access code to change cycle values or change operating parameters.
- **Audible Signals** are adjustable. **Touch pad** and **end-of-cycle signals** can be adjusted to low, medium, high or off. **Alarm signal** can be adjusted to low, medium or high; but cannot be turned off.
- **Print Format** allows selection of full or condensed cycle printout.
- **Temperature Display and Printout Units** are Fahrenheit (°F) or Celsius (°C). Temperature is set, displayed, controlled and printed to nearest 1°. Recalibration is not required when changing temperature units.
- **Pressure/Vacuum Display and Printout Units** in psig/InHg or bar. Recalibration is not required when changing pressure units.

Prevac Configuration Sterilizer



Typical Touch Screen Displays

SAFETY FEATURES

Control lockout switch prevents cycle from starting until limit switch signal is received. If signal is lost during cycle, alarm activates, cycle aborts and chamber safely vents controlled exhaust.

Chamber float switch activates alarm, aborts cycle and safely vents chamber if detecting excessive condensate.

Pressure relief valve releases pressure buildup in chamber if approaching or reaching rated pressure.

Power door safety feature causes door movement to stop if sliding door encounters an obstruction.

CONSTRUCTION

Shell Assembly

Sterilizer vessel is formed from two fabricated Type 316L stainless-steel shells, welded one within the other. Type 316L stainless-steel end frame(s) is welded to the door end. On single door units, the back of the chamber is fitted with a welded 316L stainless-steel dished head.

Sterilizer vessel is ASME rated at 45 psig and insulated. Vessel includes one 1"-NPT chamber port for Customer use.

Steam-supply opening inside chamber is shielded by a stainless-steel baffle.

Chamber Door(s)

Door is constructed of Type 316L stainless steel.

During operation, door is sealed by steam-activated door seal. Door seal is constructed of long-life rubber compound. When cycle is complete, seal retracts (under vacuum) into a machined groove in end frame.

Long-life proximity switch detects if door is closed, or locking plates are engaged. An additional seal pressure switch prevents starting a cycle if door is not sealed.

Hinged-door sterilizer is equipped with a solenoid door lock. Horizontal sliding-door units are provided with a mechanically-locking door assembly. Locking assemblies prevent door from opening as long as seal is intact, energized and chamber is pressurized at 2 psi or more.

The sterilizer door is fitted with a stainless-steel panel that insulates operator from chamber end frame, reducing chances of accidental contact with hot metal surfaces.

Chamber Drain System

Drain system is designed to prevent sterilizer effluent from entering water-supply system and chamber. An automatic system of a stainless-steel plate-type condenser, converts chamber steam to condensate, disposing condensate to waste. Cooling water flow is regulated by waste line RTD, minimizing water usage. Water supply shut off valve is located in unit's recessed area.

Vacuum System

Vacuum pump reduces chamber pressure during prevacuum and post-drying phases. Following dry phase, chamber vacuum is relieved to atmospheric pressure by admitting air through a bacteria-retentive filter.

Steam Source

Sterilizers are piped, valved and trapped to receive building-supplied steam at 50 to 80 psig, dynamic. Steam piping is brass and includes a shut-off valve, steam strainer and pressure regulator.

Piping

All piping connections terminate within confines of sterilizer frame and are accessible from front, left side.

- **Solenoid Valves** with DIN connectors simplify sterilizer piping, and can be serviced individually.
- **Manual Shut-off Valves** are pressure rated at 125 psig (8.62 bar) for saturated steam. Valve handles are heat-insulated.

MOUNTING ARRANGEMENT

Sterilizers are arranged for either freestanding or recessed installation, as specified. Each sterilizer is height-adjustable. Sterilizer subframe is equipped with a synthetic rubber gasket to provide a tight fit between cabinet panels on freestanding units, or between front cabinet panel and wall partition on recessed units.

On freestanding units, stainless-steel side panels and a louvered top panel enclose sterilizer body and piping.

ACCESSORY

Seismic Tie-Down Kit conforms to Title 24 California Code of Regulations, 2001 Amendment Section 1632(A).

Material Handling Accessories include stainless-steel chamber tracks and stainless-steel loading cars with painted-steel carriages. Stainless-steel chamber rack and shelf are available for 36" sterilizers. See Tech Data SD978 for details.

PREVENTIVE MAINTENANCE

A global network of skilled service specialists can provide periodic inspections and adjustments to help ensure low-cost peak performance. STERIS representatives can provide information regarding annual maintenance agreements.

NOTES

1. Sterilizer is not supplied with a vacuum breaker or backflow prevention device and, where required by local codes, installation of such a device in water line is the Customer's responsibility.
2. Pipe sizes shown indicate terminal outlets only. Building service lines, provided by third parties, must supply the specified pressures and flow rates.
3. Disconnect switches (with OFF position lockout only; by third parties) should be installed in electric supply lines near the equipment.
4. Access to the recessing area from the control end of the sterilizer is recommended.
5. Clearances shown are minimal for installing and servicing the equipment.
6. Depending on the loading equipment used, additional clearance is required:
   - If shelves are used, clearance should be length of the sterilizer plus 24" (610 mm) at each door.
   - If loading car and carriage are used, clearance should be twice the length of the sterilizer at each door.
7. Floor drain should be provided within confines of the sterilizer framework.
8. Units require a minimum 38" door opening for transport within facility prior to installation.

UTILITY REQUIREMENTS

Steam

1" NPT, 50 to 80 psig (3.5 to 5.6 bar) dynamic, 97% to 100% vapor quality.

Drain

2" ODT drain terminal. (Floor drain capacity must handle peak water consumption; refer to Utilities Consumption, page 6.)

Electrical – Controls

120 Volt, 50/60 Hz, 1-phase, 2.0 Amp

Electrical – Vacuum Pump

- 208/240 Volt, 50/60 Hz, 3-phase, 6 Amp per phase
- 480 Volt, 50/60 Hz, 3-phase, 3 Amp per phase

Sterilizer Feed Water

1" NPT, 20 to 50 psig (1.4 to 3.5 bar) dynamic. Water is used for vacuum pump, heat exchanger and trap cooling. Refer to *Water Quality Recommendations* listed on page 6.

NOTE: Back-flow prevention is by third parties; not supplied on unit.

Telecommunications Requirements for ProConnect® Technical Support Services

- Each sterilizer requires an active wired TCP/IP network, 10/100BaseT Ethernet connection located as indicated on the equipment drawing, Internet access and an IP address on the facility network.
- For connection via a separate PC: 10 GB of available hard drive space to run the necessary technical support programs. Can be installed on:
  - » Dedicated PC running on Windows XP or Windows 7 (32-bit mode only)[1] with 2.5 GHz dual core processor, 2 GB of RAM.
  - » Virtual Machine
  - » Server
- Local STERIS login at the PC with a username of STERIS and the password should be ProConnect (STERIS Customer Number).

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1. *Windows® is a registered trademark of Microsoft Corporation in the United States and other countries.*

- Ethernet cable to connect each piece of STERIS equipment and the dedicated PC to the facility network.

CUSTOMER IS RESPONSIBLE FOR COMPLIANCE WITH APPLICABLE LOCAL AND NATIONAL CODES AND REGULATIONS.

The base language of this document is ENGLISH. Any translations must be made from the base language document.

Reference the Following Equipment Drawings for Installation Details

Equipment Drawing Number	Chamber Size	Equipment Configuration
129394-138	26 x 37.5 x 36"	Single-Door, Hinged, Cabinet Enclosed
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	
129394-139	26 x 37.5 x 36"	Single-Door, Hinged, Recessed, One Wall
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	
129394-140	26 x 37.5 x 36,	Double-Door, Hinged, Recessed, One Wall
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	
129394-141	26 x 37.5, x 36	Double-Door, Hinged, Recessed, Two Wall
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	
129394-142	26 x 37.5 x 36"	Single-Door, Horizontal-Sliding, Cabinet Enclosed
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	
129394-143	26 x 37.5 x 36"	Single-Door, Horizontal-Sliding, Recessed, One Wall
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	
129394-144	26 x 37.5 x 36"	Double-Door, Horizontal-Sliding, Recessed, One Wall
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	
129394-145	26 x 37.5 x 36"	Double-Door, Horizontal-Sliding, Recessed, Two Wall
	26 x 37.5 x 48"	
	26 x 37.5 x 60"	

Operating Weight*:	26 x 37.5 x 36"	3800 lb (1720 kg)
	26 x 37.5 x 48"	4200 lb (1900 kg)
	26 x 37.5 x 60"	4700 lb (2125 kg)

** Operating weight includes a full load in the chamber.*

UTILITIES CONSUMPTION

Consumption Values for AMSCO 4000 Series Medium Steam Sterilizers			Water Consumption			Steam Consumption		
			Peak	Average	Average	Peak	Average	Average
			gal/min	gal/cycle	gal/hr	lb/hr	lb/cycle	lb/hr
Equipment Drawing Number	Chamber Size	Configuration	in cycle	in cycle	out of cycle	in cycle	in cycle	out of cycle
129394-138	26 x 37.5 x 36"	Single-Door, Hinged, Cabinet Enclosed	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34
129394-139	26 x 37.5 x 36"	Single-Door, Hinged, Recessed, One Wall	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34
129394-140	26 x 37.5 x 36"	Double-Door, Hinged, Recessed, One Wall	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34
129394-141	26 x 37.5, x 36"	Double-Door, Hinged, Recessed, Two Wall	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34
129394-142	26 x 37.5 x 36"	Single-Door, Horizontal-Sliding, Cabinet Enclosed	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34
129394-143	26 x 37.5 x 36"	Single-Door, Horizontal-Sliding, Recessed, One Wall	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34
129394-144	26 x 37.5 x 36"	Double-Door, Horizontal-Sliding, Recessed, One Wall	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34
129394-145	26 x 37.5 x 36"	Double-Door, Horizontal-Sliding, Recessed, Two Wall	13	115	10	190	112	22
	26 x 37.5 x 48"			120	12	255	148	28
	26 x 37.5 x 60"			125	15	335	185	34

WATER QUALITY RECOMMENDATIONS

Condition	Nominal Conditions	Maximum Conditions
Temperature	40°-60°F (4°-16°C)	70°F (21°C)
Total Hardness as $CaCO_3$*	50-120 mg/L	171 mg/L
Total Dissolved Solids	100-200 mg/L	500 mg/L
Total Alkalinity as $CaCO_3$	70-120 mg/L	180 mg/L
pH	6.8-7.5	6.5-8.5
Total Silica	0.1 - 1.0 mg/L	2.5 mg/L

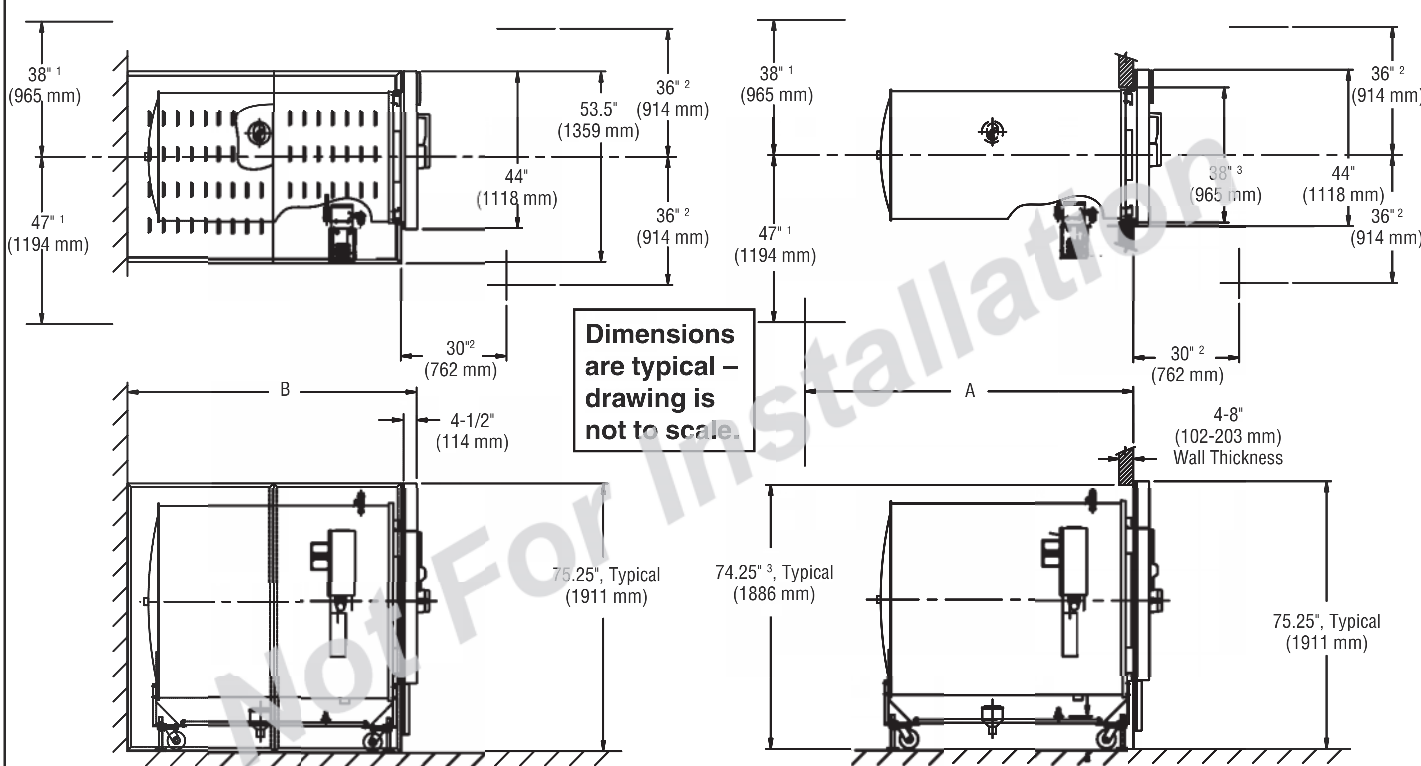
* *17.1 mg/L = 1.0 grain hardness*

OVERALL INSTALLED LENGTH

Refer to Illustrations on Following Pages

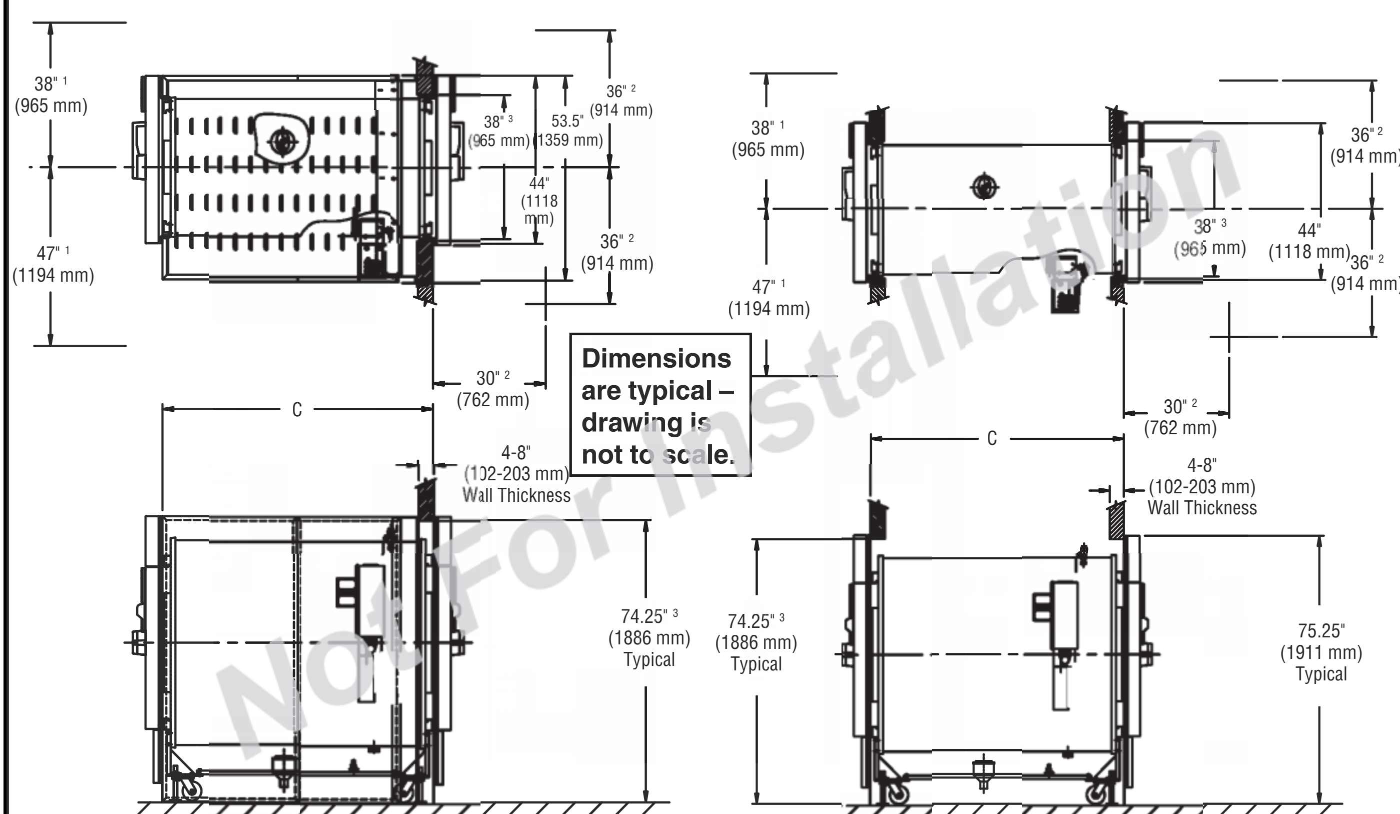
	Chamber Length		
	36" (914 mm)	48" (1219 mm)	60" (1524 mm)
A	69" (1753 mm)	81" (2057 mm)	93" (2362 mm)
B	58" (1473 mm)	70" (1778 mm)	82" (2082 mm)
C	48" (1219 mm)	60" (1524 mm)	72" (1829 mm)
D	59" (1499 mm)	71" (1803 mm)	83" (2108 mm)
E	71-1/2" (1816 mm)	83-1/2" (2121 mm)	95-1/2" (2425 mm)
F	53-1/4" (1352 mm)	65-1/4" (1657 mm)	77-1/4" (1762 mm)

Single Hinged-Door, Cabinet Enclosed | **Single Hinged-Door, Recessed, One Wall**

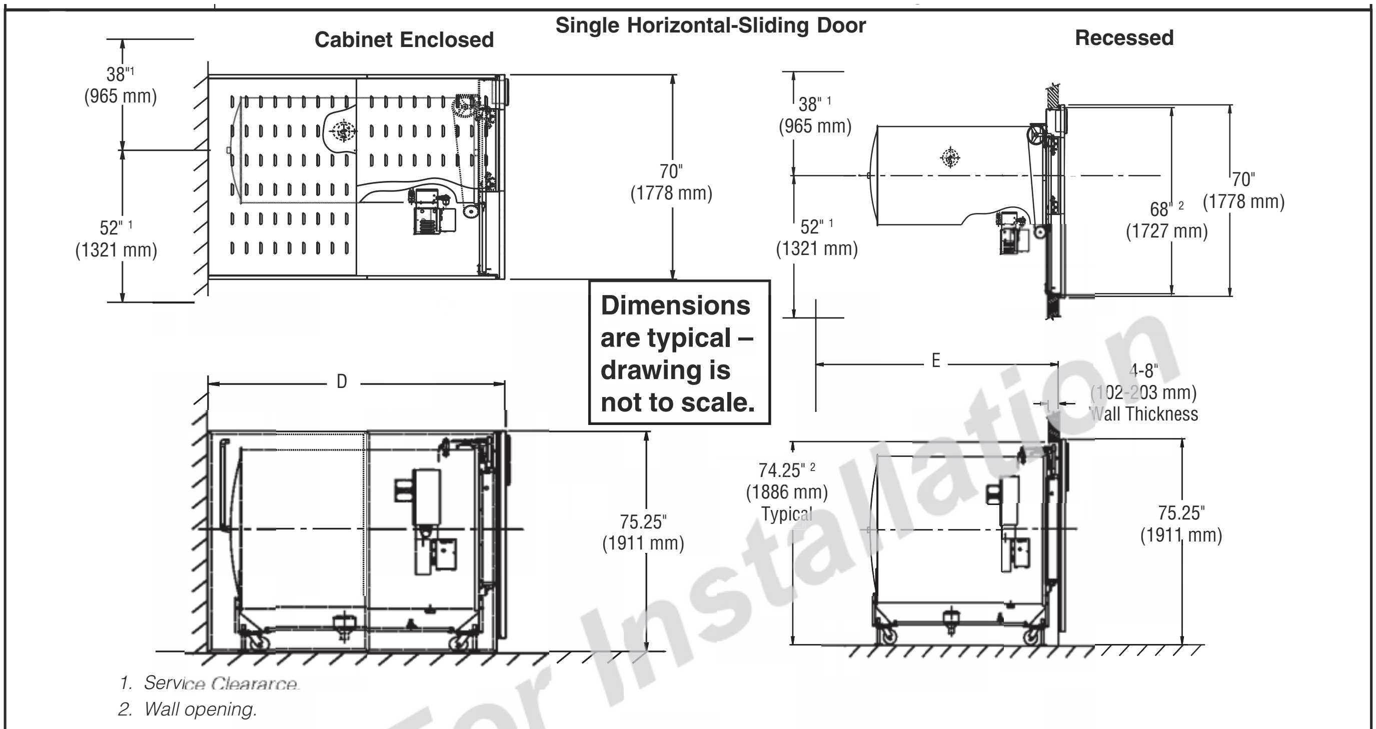


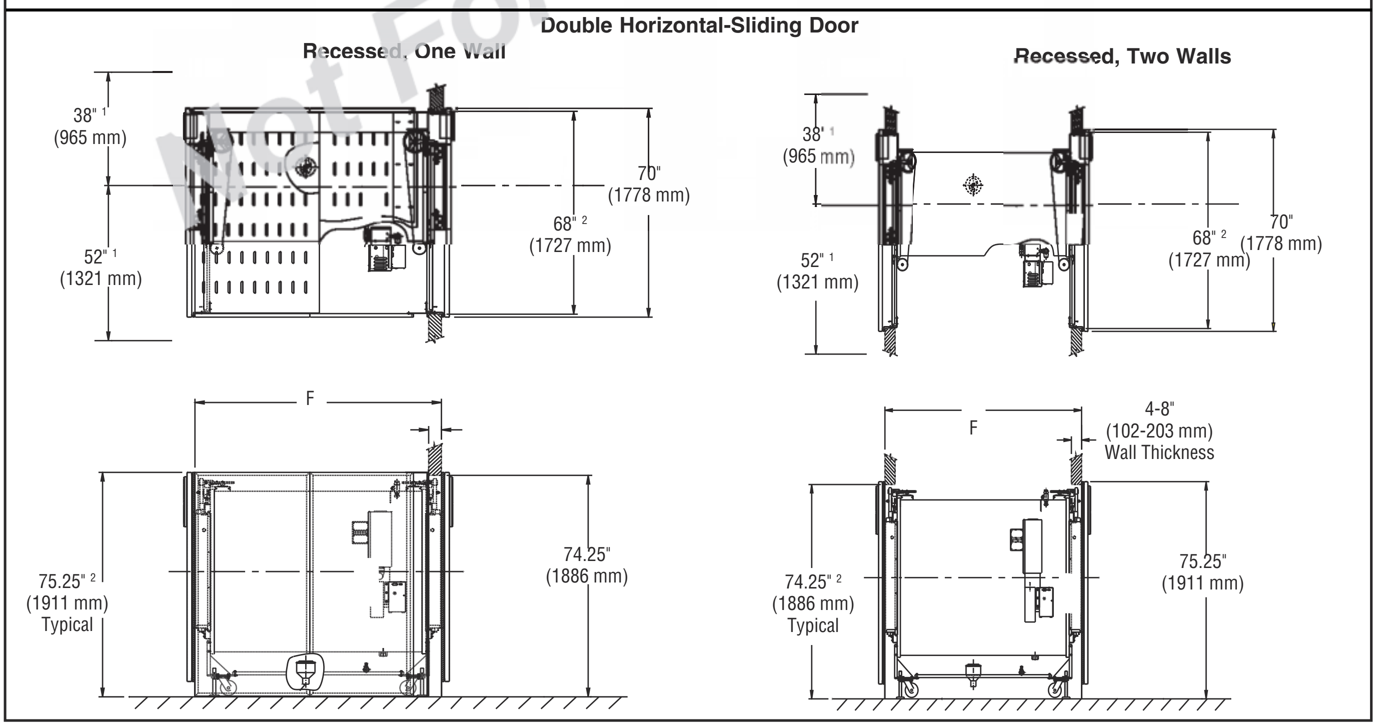
1. *Service Clearance – new construction only. Unit may be installed into existing AMSCO brand 24 x 36" sterilizer space (Medallion, Eagle 2000, Eagle 3000) without facility modification.*
2. *Door swing (left hand swing shown).*
3. *Wall opening.*

Double Hinged-Door, Recessed, One Wall | **Double Hinged-Door, Recessed, Two Walls**



1. *Service Clearance – new construction only. Unit may be installed into existing AMSCO brand 24 x 36" sterilizer space (Medallion, Eagle 2000, Eagle 3000) without facility modification.*
2. *Door swing (left hand swing shown).*
3. *Wall opening.*





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