COLLABORATIVE AEROSPACE RESEARCH CENTER DESIGN

PROJECT NUMBER: 2399-23

RFP #2024-014554

ADDENDUM NO. 1

ISSUE DATE: March 25, 2024

CONTRACT ADMINISTRATOR:
Brooke Davison, Construction Contracts Officer
Construction Contracts Administration
Email: ConstructionContracts@oregonstate.edu

This Addendum is hereby issued to inform you of the following revisions and or clarifications to the above-referenced RFP and/or the Contract Documents for the Project, to the extent they have been modified herein. Any conflict or inconsistency between this Addendum and the Solicitation Document or any previous addenda will be resolved in favor of this Addendum. Proposals shall conform to this Addendum. Unless specifically changed by this Addendum, all other requirements, terms and conditions of the Solicitation Document and or Contract Documents, and any previous addenda, remain unchanged and can be modified only in writing by OSU. The following changes are hereby made:

MODIFICATIONS:

Item 1 — Section 1.5, paragraph beginning with "For all phases, the Design Professional…" REVISE the first sentence to read: "For Design Development and Construction Documents phases, the Design Professional is required to provide design meeting minutes and facilitate the work necessary to make project decisions and complete required documentation (the awarded Contractor will be required to provide meeting minutes during the Construction Administration phase)."

REFERENCE/SUPPLEMENTAL MATERIALS: The following documents are provided as reference and or supplemental information.

Item 2 — SD Estimate, dated November 10, 2023 (Estimate 1 Rev 2) developed by Fortis Construction Inc.

Item 3 — Schematic Design Scope Summary, dated October 13, 2023 developed by Rowell Brokaw.

Item 4 — Mechanical System Selection, dated May 30, 2023 developed by Rowell Brokaw.

Item 5 Electrical Service and Loading Narrative, dated May 30, 2023 developed by Rowell Brokaw.

Item 6 Hazardous Materials Inventory Survey (file name: 2023-0131 Blunck Inventory_Aero 104.xlsx)

Item 7 Existing and or new lab-specific OFOI/OFCI equipment list with some technical specifications (file name: AEL Equipment List_Dims.xlsx)

QUESTIONS:

Item 8 **Q:** Will OSU share the Schematic Design Scope Summary (Basis of Design)?

A: See Item 3 above.

Item 9 **Q:** Will OSU share the SD Estimate?

A: See Item 2 above.

Item 10 **Q:** Will OSU confirm the scope represented in the SD package aligns with the available funds for the Project?

A: The funding is currently aligned with the scope summary presented in Item 3 above. However, further efficiencies, alternates, and or cost-effective VE solutions may be discussed and can occur in the design development phase.

Item 11 **Q:** Will OSU share the Equipment List used for SD including electrical requirements?

A: See Items 4, 5 and 7 above. Additionally, information is provided in the SD drawing set and SD Pricing Set Scope Summary previously shared.

Item 12 **Q:** Will OSU share the Hazardous Materials Inventory Survey (HMIS) information for the existing adjacent jet propulsion lab?

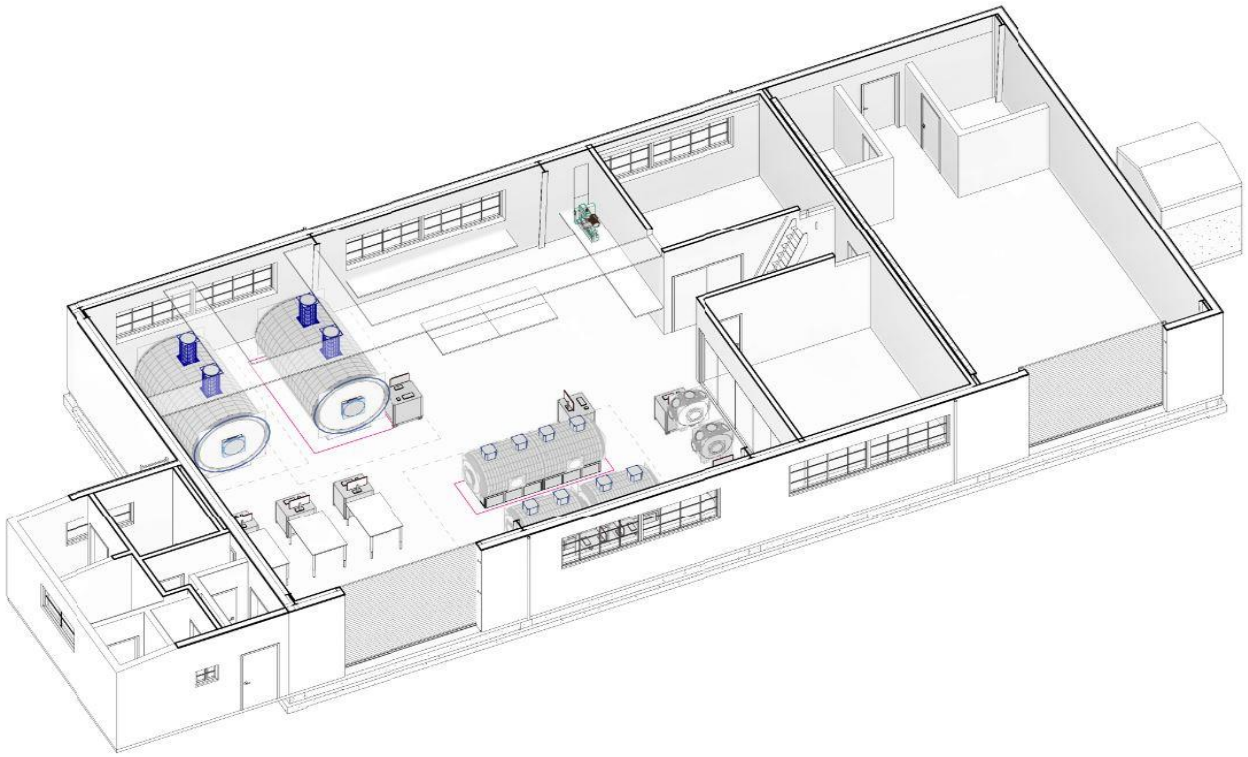
A: See Item 6 above.

END OF ADDENDUM NO. 1

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate Submitted to Oregon State University

November 10, 2023 - Estimate 1 Rev 2



FORTIS CONSTRUCTION INC.

FORTIS CONSTRUCTION INC.

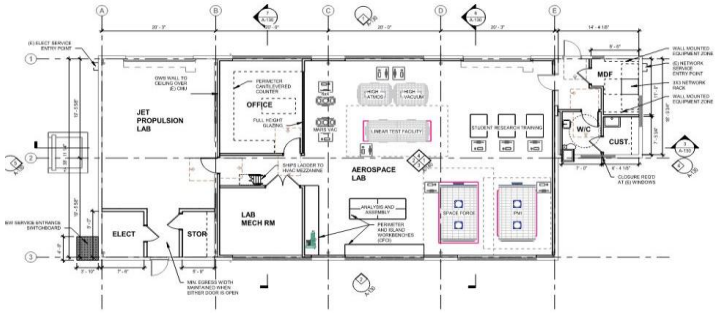
OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Estimate No. 1
Revision No. 2
Estimate Date: November 10, 2023
Documents dated 10/23/2023

Client: Oregon State University
Architect: Rowell Brokaw
Precon Manager: Ashley Buchanan
Sr. Project Engineer: Will Mau
will.mau@fortisconstruction.com

Project Location: Corvallis, Oregon
Project Duration: 5 months
Project Size: 4,006 sf



COST $3,890,057

Construction Costs		$	883.66 /sf	$	3,539,939
Design Contingency	7.0%	$	54.24 /sf	$	217,272
Escalation	4.0%	$	33.16 /sf	$	132,846
Total		$	971.06 /sf	$	3,890,057

Other Project Costs: By Others

Design	
Design Fees	By Owner
Permit/Inspection Fees	
Plan Check Fees	By Owner
Building Permit Fee	By Owner
Fire Life Safety Fee	By Owner
City Business Tax	By Owner
MEP Trade Permit Fee	By Trade
Special Code Req'd Inspections	By Owner
System Development Fees	
SDC Fees, PGE Fees	By Owner
Furnishings and Equipment	
Systems Furniture	By Owner
Relocate Existing Furniture	By Owner
Exterior Building Signage	By Owner
Telecom/Data	
Phone & Active Equipment	By Owner
Security Access/CCTV System	Included
Voice/Data System & Cabling	Included

Scope Description:

- Includes a $500k allowances for OFCI lab equipment installation, hookup, utilities, etc. Final startup and commissioning by OSU.

- Includes 4 brace footings and braces for mezzanine structure, which are not noted but expected to be needed.

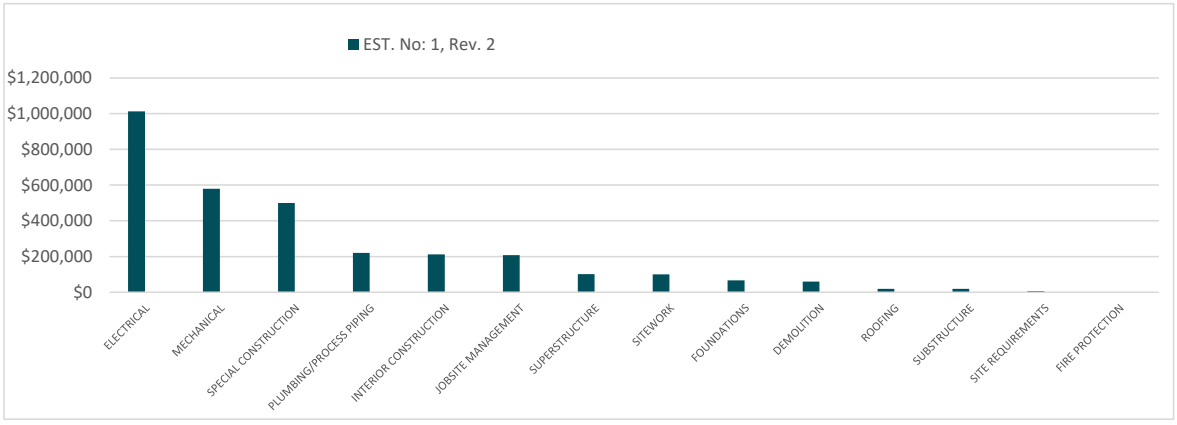
FORTIS CONSTRUCTION INC.

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate	Date	Version
Based on Documents dated 10/23/2023	November 10, 2023	Estimate No. 1, Rev. 2

SD Estimate
EST. No: 1, Rev. 2
10-Nov-23
4,006 sf

	Description		Total	$/sf
01	DEMOLITION	$	59,933	$14.96
02	SITEWORK	$	99,617	$24.87
03	FOUNDATIONS	$	67,115	$16.75
04	SUBSTRUCTURE	$	18,902	$4.72
05	SUPERSTRUCTURE	$	101,428	$25.32
07	ROOFING	$	18,940	$4.73
08	INTERIOR CONSTRUCTION	$	212,010	$52.92
10	SPECIAL CONSTRUCTION	$	500,000	$124.81
11	PLUMBING/PROCESS PIPING	$	219,698	$54.84
12	FIRE PROTECTION	$	-	$0.00
13	MECHANICAL	$	578,915	$144.51
14	ELECTRICAL	$	1,013,350	$252.96
15	JOBSITE MANAGEMENT	$	207,405	$51.77
16	SITE REQUIREMENTS	$	6,575	$1.64
	SUBTOTAL	$	3,103,887	$774.81
	MARKUPS			
	Design Contingency	7.0% $	217,272	$54.24
	Escalation	4.0% $	132,846	$33.16
	Construction Contingency	4.0% $	138,160	$34.49
	Permits and Fees - None	0.0% $	-	$0.00
	All Risk Insurance	0.7% $	23,349	$5.83
	Liability Insurance	1.3% $	47,002	$11.73
	Sub Default Insurance	1.3% $	47,613	$11.89
	Contractor Bond	0.8% $	29,681	$7.41
	Fee	3.5% $	130,893	$32.67
	Preconstruction	0.5% $	19,354	$4.83
	TOTAL CURRENT ESTIMATE	**$**	**3,890,057**	**$971.06**



Alternate Summary

OSU Nancy Squires Aerospace Laboratory Renovation

Schematic Design Estimate
October 11, 2023

Alternates

The following alternates are identified in the SD scope summary. These items are not included in the base estimate.

#	Allowance	Value	Notes
1	Catwalk - Pre-Engineered	$ 84,413	Includes column and footing support, assume PEMB cannot support the load from above.
2	Exterior Paint	$ 26,568	Paint OSU black to match west façade.
	Total	**$ 110,981**	

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Based on Documents dated 10/23/2023

Estimate No. 1, Rev. 2
Date: November 10, 2023
Building Area: 4,006 sf

Fortis System
Phase

Description	Quantity	Unit	Unit Cost	Total	Notes
01 DEMOLITION	**4,006.00**	**sf**	**$ 14.96**	**$ 59,933**	
01.021111 Interior Demolition				**$ 4,250**	
Demo Interior Walls	26.00	lf	$ 125.00	$ 3,250	
Demo Doors at CMU	4.00	lf	$ 250.00	$ 1,000	
01.021116 Concrete				**$ 25,004**	
Saw Cut And Remove SOG - Plumbing	443.00	sf	$ 28.00	$ 12,404	
Saw Cut And Remove SOG - Footings	450.00	sf	$ 28.00	$ 12,600	
01.021131 Plumbing Systems				**$ 7,000**	
Demo Plumbing Systems	3,500.00	sf	$ 2.00	$ 7,000	
01.021151 Mechanical Systems				**$ 7,000**	
Demo Mechanical Systems	3,500.00	sf	$ 2.00	$ 7,000	
01.021161 Electrical Systems				**$ 14,000**	
Demo Electrical System	3,500.00	sf	$ 4.00	$ 14,000	
01.999999 Misc. Demolition				**$ 2,679**	
GPR Scanning	893.00	sf	$ 3.00	$ 2,679	
02 SITEWORK	**4,006.00**	**sf**	**$ 24.87**	**$ 99,617**	
02.022003 Site Preparations				**$ 22,041**	
Sidewalk Prep - Base Rock/Fine Grade	1,363.00	sf	$ 4.00	$ 5,452	
Sitework Mobilization	1.00	ls	$ 12,500.00	$ 12,500	
Sidewalk Prep - Clear and Grub	1,363.00	sf	$ 3.00	$ 4,089	
02.022505 Civil Layout				**$ 2,000**	
Layout	4,000.00	sf	$ 0.50	$ 2,000	
02.025102 Site Walls				**$ 1,800**	
CMU Wall Patch	40.00	sf	$ 45.00	$ 1,800	At Propulsion Lab door way reducing from double door to single.
02.025109 Flatwork				**$ 17,156**	
Tactile Warning Surface	2.00	ea	$ 400.00	$ 800	
Sidewalks	1,363.00	sf	$ 12.00	$ 16,356	
02.027200 Storm Drain				**$ 48,520**	
French Drain Excavation	60.00	cy	$ 65.00	$ 3,900	
Connections to Storm Drain	5.00	ea	$ 400.00	$ 2,000	
Storm Drain - Excavation and Backfill	52.00	cy	$ 65.00	$ 3,380	
Storm Drain Piping	144.00	lf	$ 125.00	$ 18,000	
Trench Drain - Remove and replace	39.00	lf	$ 160.00	$ 6,240	
French Drains	60.00	cy	$ 90.00	$ 5,400	
Area Drains	4.00	ea	$ 2,400.00	$ 9,600	
02.029004 Landscaping				**$ 7,500**	
Landscape Repair	5,000.00	sf	$ 1.50	$ 7,500	
02.055001 Site Misc. Metals				**$ 600**	
Bollard - Push Button at Entry Door	1.00	ea	$ 600.00	$ 600	

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Based on Documents dated 10/23/2023

Estimate No. 1, Rev. 2
Date: November 10, 2023
Building Area: 4,006 sf

Fortis System
Phase

Description	Quantity	Unit	Unit Cost	Total	Notes
03 FOUNDATIONS	**4,006.00**	**sf**	**$ 16.75**	**$ 67,115**	
03.030001 Spread Foundations				**$ 61,115**	
Footing Excavation	83.00	cy	$ 205.00	$ 17,015	
Furnish and Install Rebar	3,500.00	lb	$ 1.80	$ 6,300	
Footing Concrete, 4000 PSI	27.00	cy	$ 1,400.00	$ 37,800	Includes 4 brace frame strip footings
03.036001 Anchor Bolts/Metal Embeds				**$ 6,000**	
Col AB's w/template, Small	8.00	ea	$ 450.00	$ 3,600	
Grout Base Plate, Small	8.00	ea	$ 300.00	$ 2,400	
04 SUBSTRUCTURE	**4,006.00**	**sf**	**$ 4.72**	**$ 18,902**	
04.030001 Slab on Grade				**$ 18,902**	
Patch S.O.G. @ Sawcut	643.00	sf	$ 14.00	$ 9,002	
Drill and epoxy dowels	220.00	ea	$ 45.00	$ 9,900	
05 SUPERSTRUCTURE	**4,006.00**	**sf**	**$ 25.32**	**$ 101,428**	
05.030001 Conc. Fill on Metal Deck				**$ 6,888**	
Concrete Fill on Metal Deck	492.00	sf	$ 14.00	$ 6,888	
05.030013 Building Curbs				**$ 8,136**	
Housekeeping Pads - Electrical MDP	36.00	sf	$ 18.00	$ 648	
Housekeeping Pads - Electrical EUSERC	36.00	sf	$ 18.00	$ 648	
Housekeeping Pads - OFCI Equipment	380.00	sf	$ 18.00	$ 6,840	
05.051001 Structural Steel				**$ 53,360**	
Beams - Steel	4.00	tn	$ 7,200.00	$ 27,360	
Seismic Brace	4.00	ea	$ 6,500.00	$ 26,000	Assumes need for lateral bracing.
05.053001 Steel Floor Deck				**$ 5,166**	
Metal Decking	492.00	sf	$ 10.50	$ 5,166	
05.055003 Roof Ladder				**$ 3,200**	
Steel Ships Ladder - Painted	1.00	ea	$ 3,200.00	$ 3,200	
05.055013 Roof Screens				**$ 17,025**	
Roof Screen System	227.00	sf	$ 75.00	$ 17,025	
05.061003 Posts/Columns				**$ 4,608**	
4x4 Posts	1.00	tn	$ 7,200.00	$ 4,608	
05.061015 Wall Framing				**$ 1,320**	
Perimeter Blocking - Addition Roof	66.00	lf	$ 20.00	$ 1,320	
05.061016 Roof Framing				**$ 1,725**	
Supplemental Roof Joist Reinforcement - Addition	69.00	lf	$ 25.00	$ 1,725	
07 ROOFING	**4,006.00**	**sf**	**$ 4.73**	**$ 18,940**	
07.061001 Rough Carpentry				**$ 1,200**	
Mechanical Curb - Addition	40.00	sf	$ 30.00	$ 1,200	
07.075003 Membrane Roofing				**$ 7,640**	

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Based on Documents dated 10/23/2023

Estimate No. 1, Rev. 2
Date: November 10, 2023
Building Area: 4,006 sf

Fortis System
Phase

Description	Quantity	Unit	Unit Cost	Total	Notes
Patch Roofing - MEP Penetrations	17.00	ea	$ 120.00	$ 2,040	
New Roof - Addition	350.00	sf	$ 16.00	$ 5,600	
07.076001 Metal Flashing				**$ 3,680**	
Flashing - Mechanical Screen	46.00	lf	$ 80.00	$ 3,680	
07.076003 Gutters & Downspouts				**$ 3,920**	
Gutter, Galv Sht Mtl 4" Wide	141.00	lf	$ 20.00	$ 2,820	
Downspouts	55.00	lf	$ 20.00	$ 1,100	
07.078001 Access Ladders				**$ 2,500**	
Access Ladder - Steel, Galvanized	1.00	ea	$ 2,500.00	$ 2,500	
08 INTERIOR CONSTRUCTION	**4,006.00**	**sf**	**$ 52.92**	**$ 212,010**	
08.055001 Handrails & Railings				**$ 1,800**	
Steel guardrail, removable - 2" wire mesh panels	4.00	lf	$ 450.00	$ 1,800	
08.064001 Custom Casework				**$ 21,600**	
Lab Workbenches	48.00	lf	$ 450.00	$ 21,600	
08.064003 Base Cabinets				**$ 17,060**	
Office Countertop	47.00	lf	$ 280.00	$ 13,160	
Countertop Supports	13.00	ea	$ 300.00	$ 3,900	
08.080004 Doors, Frames & Hardware				**$ 50,900**	
Single HM Frame/Door	3.00	ea	$ 4,500.00	$ 13,500	
Double HM Frame/Door	1.00	ea	$ 5,500.00	$ 5,500	
Single HM Frame/Wood Door	5.00	ea	$ 4,890.00	$ 24,450	
Auto Operator - Entry	1.00	ea	$ 5,300.00	$ 5,300	
Auto Operator - Restroom	1.00	ea	$ 2,150.00	$ 2,150	
08.088002 Aluminum & Glazing				**$ 12,714**	
Interior Storefront - Kawneer VG 450	163.00	sf	$ 78.00	$ 12,714	
08.092501 Metals Studs & Drywall				**$ 66,384**	
Interior Partitions	3,674.00	sf	$ 16.00	$ 58,784	4" metal studs, batt insulation, 5/8" GWB
Drywall Ceilings	380.00	sf	$ 20.00	$ 7,600	
08.093002 Ceramic Tile Walls				**$ 5,611**	
Wall Tile	181.00	sf	$ 31.00	$ 5,611	
08.095002 2x4 Acoustical Ceiling				**$ 4,752**	
2x4 ACT	264.00	sf	$ 18.00	$ 4,752	
08.096503 Rubber Base				**$ 2,142**	
4" Base	476.00	lf	$ 4.50	$ 2,142	
08.097601 Concrete Floor Treatment				**$ 18,258**	
Polished Concrete Floor	2,165.00	sf	$ 7.50	$ 16,238	
Sealed Concrete	808.00	sf	$ 2.50	$ 2,020	
08.099001 Latex Painting				**$ 9,021**	
Paint - Walls	4,760.00	sf	$ 1.25	$ 5,950	
Paint - Ceilings	380.00	sf	$ 1.25	$ 475	
Paint Steel Structure	472.00	sf	$ 5.50	$ 2,596	

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Based on Documents dated 10/23/2023

Estimate No. 1, Rev. 2
Date: November 10, 2023
Building Area: 4,006 sf

Fortis System
Phase

Description	Quantity	Unit	Unit Cost	Total	Notes
08.099002 Epoxy Painting				**$ 1,768**	
Epoxy Paint	272.00	sf	$ 6.50	$ 1,768	
10 SPECIAL CONSTRUCTION	**4,006.00**	**sf**	**$ 124.81**	**$ 500,000**	
10.116101 Laboratory Equipment				**$ 500,000**	
OFCI Equip - Insertion into building & final placement	1.00	ls	$ 50,000.00	$ 50,000	from delivery drop off location (on site)
OFCI Equip - Securing equipment in place	1.00	ls	$ 25,000.00	$ 25,000	bolting to floor, walls or strapping
OFCI Equip - Connection of equipment - power & data	1.00	ls	$ 300,000.00	$ 300,000	power and data
OFCI Equip - Connection of equipment - mechanical, ver	1.00	ls	$ 125,000.00	$ 125,000	ventilation, piped
OFCI Equip - Final calibration & Testing by Owner	-	ea	$ -	$ -	final startup & commissioning by Owner
11 PLUMBING/PROCESS PIPING	**4,006.00**	**sf**	**$ 54.84**	**$ 219,698**	
11.15401 Plumbing System				**$ 43,750**	
Plumbing Systems, Coordination/Layout, Subcontractor C	3,500.00	sf	$ 12.50	$ 43,750	
11.15405 Storm Drainage Systems				**$ 5,800**	
Connect existing downspouts to new SD	40.00	lf	$ 145.00	$ 5,800	connection at 5' beyond by civil
11.15410 Waste Drainage Systems				**$ 46,782**	
Scope existing underground sewer piping	1.00	ls	$ 5,000.00	$ 5,000	
Replace existing SS - Not Included	-	n/a	$ 1.50	$ -	No allowance held to reconfigure existing SS to remain
C.I. Waste & Vent AG 4" - Vent	120.00	lf	$ 46.00	$ 5,520	
C.I. Waste & Vent UG 4" - Underground Waste	238.00	lf	$ 44.36	$ 10,558	
Trenching/Backfill - Plumbing Systems	2,142.00	cf	$ 12.00	$ 25,704	
11.15415 Domestic Hot & Cold Water				**$ 37,240**	
L-Cu Distribution Piping, Makeup Water Lab ICW	180.00	lf	$ 86.00	$ 15,480	
L-Cu Branch Piping, HW/CW supply	320.00	lf	$ 68.00	$ 21,760	3/4"
11.15416 Natural Gas Piping				**$ 11,400**	
Nat.Gas Piping	190.00	lf	$ 60.00	$ 11,400	
11.15421 Lab Gas Systems				**$ 25,300**	
L-Cu CFOS Tube piping - Compressed Air	195.00	lf	$ 120.00	$ 23,400	
Compressed Air - Service Drops/Connections	5.00	ea	$ 380.00	$ 1,900	filter regulators, quick connect
11.15425 Piping Insulation				**$ 8,946**	
1" Pipe Insulation	497.00	lf	$ 18.00	$ 8,946	
11.15465 Plumb. Fix/Comm. w/Ro. In				**$ 20,400**	
WC Water Closet- ADA height floor mount	1.00	ea	$ 4,200.00	$ 4,200	
L1 Lavatory - Restroom Sink	1.00	ea	$ 3,800.00	$ 3,800	
FD Floor drains - 4" cast iron	5.00	ea	$ 1,800.00	$ 9,000	
MS Mop Sink, Floor mounted precast	1.00	ea	$ 3,400.00	$ 3,400	
11.15480 Plumbing Equipment				**$ 20,080**	
EWH Water Heater, Electric 60 gal	1.00	ea	$ 5,500.00	$ 5,500	
In Line Recirc. Pump 3/4"	1.00	ea	$ 2,800.00	$ 2,800	
Existing Air Compressor - relocate, anchor	1.00	ea	$ 980.00	$ 980	reuse existing

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Estimate No. 1, Rev. 2

Based on Documents dated 10/23/2023

Date: November 10, 2023

Building Area: 4,006 sf

Fortis System
Phase

Description	Quantity	Unit	Unit Cost	Total	Notes
Equipment/Fixture Connections	6.00	ea	$ 1,800.00	$ 10,800	
12 FIRE PROTECTION	**4,006.00**	**sf**	**$ -**	**$ -**	
12.153001 Fire Sprinkler System				**$ -**	
None	-	n/a	$ -	$ -	Building is to remain non-sprinklered
13 MECHANICAL	**4,006.00**	**sf**	**$ 144.51**	**$ 578,915**	
13.150001 HVAC System				**$ 49,000**	
HVAC Systems, Coordination/Layout, Subcontractor GCs	4,000.00	sf	$ 6.00	$ 24,000	
HVAC Relocate	1.00	ls	$ 25,000.00	$ 25,000	relocate items in conflict with new program
13.150601 Chilled Water Piping				**$ 89,560**	
Type L Copper - Distribution Piping, 2" PCWS/R	412.00	lf	$ 90.00	$ 37,080	
Type L Copper - Branch Piping, 1" PCWS/R	320.00	lf	$ 84.00	$ 26,880	at drop locations
1" PCWS/R Station with SOV, Flowmeter, Balance Valve	16.00	ea	$ 1,600.00	$ 25,600	
13.150641 Refrigerant Piping				**$ 44,460**	
Refrigerant Piping	1,170.00	lf	$ 38.00	$ 44,460	
13.152501 Insulation				**$ 34,200**	
Pipe Insulation	1,900.00	lf	$ 18.00	$ 34,200	
13.156501 Chilled Water Equipment				**$ 68,520**	
PCH - Chiller Packaged Unit - Air-cooled, 5-ton	1.00	ea	$ 68,520.00	$ 68,520	Indoor chiller will have integral pump and tank package with makeup water, expansion tank and filtration
13.158500 Specialty AHU				**$ 45,000**	
HP, ACCU Mini-Split System	2.00	ea	$ 22,500.00	$ 45,000	(1) for Office, (1) for MDF room
13.158503 AHU CHW & HW Coil				**$ 59,200**	
AHU - packaged indoor air-handler	3,600.00	cfm	$ 16.44	$ 59,200	w/ gas heating
13.158504 Heat Pumps				**$ 8,075**	
ACCU - Heat Pump Condenser	95.00	mbh	$ 85.00	$ 8,075	
13.158509 Unit Heaters				**$ 2,200**	
Electric Wall Heater	1.00	ea	$ 2,200.00	$ 2,200	
13.158601 Exhaust/Return Fans				**$ 22,500**	
Exhaust Fans - Restroom/EVS closet	1.00	ea	$ 2,800.00	$ 2,800	Shared EF. Rooms are conditioned by transfer air only
Exhaust Fans - Mechanical Equipment Rooms	2.00	ea	$ 3,200.00	$ 6,400	room is conditioned by transfer air only
EF-1 Exhaust Fans - Laboratory General Exhaust	1.00	ea	$ 4,500.00	$ 4,500	2,000 cfm
EF-2 Relief Fan	1.00	ea	$ 5,200.00	$ 5,200	2,400cfm
Lab EF - VFD Variable Frequency Drive	1.00	ea	$ 3,600.00	$ 3,600	
13.158902 Scrubbed Exhaust Duct				**$ 18,000**	
GenExhaust Duct - G90 Galv. Spiral Duct	2,250.00	lb	$ 8.00	$ 18,000	non-insulated, with drops for future hose connections (by others)
13.159101 Air Distribution Devices				**$ 4,200**	
Supply Diffusers Louvered	3.00	ea	$ 1,400.00	$ 4,200	Roof Vent (ventilation), Wall Vents (Relief Air)
13.159601 BMS Controls				**$ 84,000**	

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Based on Documents dated 10/23/2023

Estimate No. 1, Rev. 2
Date: November 10, 2023
Building Area: 4,006 sf

Fortis System
Phase

Description	Quantity	Unit	Unit Cost	Total	Notes
DDC Building Automation System	4,000.00	sf	$ 21.00	$ 84,000	
13.159990 Mechanical Project Requirements				**$ 50,000**	
Lab Equip Ventilation, Piping - see special construction	-	ls	$ -	$ -	see Special Construction section of estimate
Lab Equip Connections	1.00	ls	$ 50,000.00	$ 50,000	For hookups/connections
14 ELECTRICAL	**4,006.00**	**sf**	**$ 252.96**	**$ 1,013,350**	
14.16010 Electrical System				**$ 52,000**	
Electrical Systems, Coordination/Layout, Subcontractor C	4,000.00	sf	$ 8.50	$ 34,000	
Temporary Electrical Systems, Temp Lighting	4,000.00	sf	$ 4.50	$ 18,000	
14.16400 Primary Power Distribution				**$ 16,150**	
New Power Pole - Primary Power Service by PP&L	-	n/a	$ -	$ -	By Utility
Primary Feeder - By PP&L	-	n/a	$ -	$ -	By Utility
Conduit Raceway for Primary Feeder	90.00	lf	$ 85.00	$ 7,650	Trench & Conduit - One (1) 6"
New PP&L transformer by PP&L	-	n/a	$ -	$ -	By Utility
New Transformer Pad w/Precast Box	1.00	ea	$ 8,500.00	$ 8,500	
14.16403 Main Switchboards				**$ 165,000**	
Electric Gear - MDP, EUSERC Cabinet	4,000.00	sf	$ 41.25	$ 165,000	2000A MDP + Meter Cabinet
14.16410 Secondary Feeders				**$ 156,600**	
120-208v Secondary Feeders w/ Conduit - xfrmr to meter	75.00	lf	$ 540.00	$ 40,500	Seven (7) 4" conduit; wire by PP&L
120-208v Secondary Feeders w/ Conduit & Wire - meter	24.00	lf	$ 775.00	$ 18,600	Six (6) 4" conduit and wire
120-208v Branch Feeders w/ Conduit & Wire - MDP to P	780.00	lf	$ 125.00	$ 97,500	
14.16425 Distribution Panels				**$ 42,800**	
225A Panel, 120/208V	8.00	ea	$ 4,500.00	$ 36,000	
400A Panel, 120/208V	1.00	ea	$ 6,800.00	$ 6,800	
14.16483 Equipment Power & Hookup				**$ 106,000**	
Lab Equip Power and Connections - see special construc	-	ls	$ -	$ -	see Special Construction section of estimate
Mech-Plumb Equip Power & Connections	4,000.00	sf	$ 20.00	$ 80,000	
Power Devices	4,000.00	sf	$ 6.50	$ 26,000	
14.16485 Branch Circuiting				**$ 50,000**	
Branch Circuiting, Branch Receptacles	4,000.00	sf	$ 12.50	$ 50,000	Office, MDF, bathroom etc. standard branch
14.16510 Lighting & Controls				**$ 175,000**	
Interior Lighting - Light Fixtures, F&I	4,000.00	sf	$ 20.00	$ 80,000	
Interior Lighting - Branch Lighting	4,000.00	sf	$ 12.00	$ 48,000	
Interior Lighting - Lighting Controls	4,000.00	sf	$ 5.50	$ 22,000	
Emergency Egress Lighting - Lighting Inverter	1.00	ea	$ 25,000.00	$ 25,000	
14.16514 Exterior Lighting				**$ 43,400**	
Exterior LED lighting sconces at Building Perimeter	8.00	ea	$ 1,800.00	$ 14,400	
Light Poles - Pole, Fixture, Base, Excavation and Backfill	4.00	ea	$ 5,500.00	$ 22,000	Campus standard Visco light pole and fixture
Branch Circuiting, Light Poles	250.00	lf	$ 28.00	$ 7,000	
14.16516 Grounding				**$ 14,000**	
Grounding	4,000.00	sf	$ 3.50	$ 14,000	
14.16625 Standby Generators				**$ -**	

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Based on Documents dated 10/23/2023

Estimate No. 1, Rev. 2
Date: November 10, 2023
Building Area: 4,006 sf

Fortis System / Phase / Description	Quantity	Unit	Unit Cost	Total	Notes
Emergency System - not provided	-	n/a	$ -	$ -	An emergency/standby generator will not be provided
14.16721 Fire Alarm				**$ 46,000**	
Fire Alarm System	4,000.00	sf	$ 11.50	$ 46,000	
14.16724 Card Access System				**$ 42,800**	
Card Readers (per Door)	6.00	ea	$ 2,800.00	$ 16,800	Includes campus standard single-user control at restroom
Headend	1.00	ea	$ 26,000.00	$ 26,000	
14.16742 Telecom Equipment				**$ 103,600**	
Tel-Com Cabling, Racks, Devices	4,000.00	sf	$ 16.00	$ 64,000	
Tel-Com Raceways - Overhead Cable Tray	120.00	lf	$ 130.00	$ 15,600	4" wide tray from MDF to each OFCI equip location
Tel-Com Rough-In (Conduit, Jboxes)	4,000.00	sf	$ 6.00	$ 24,000	
15 JOBSITE MANAGEMENT	**4,006.00**	**sf**	**$ 51.77**	**$ 207,405**	
15.01000 Management				**$ 189,480**	
Project Manager	20.00	wk	$ 628.00	$ 12,560	
Project Engineer	20.00	wk	$ 3,090.00	$ 61,800	
Assist. Superintendent	20.00	wk	$ 4,840.00	$ 96,800	
Sr. Safety Manager	20.00	wk	$ 592.00	$ 11,840	
Sr. Project Accountant	20.00	wk	$ 324.00	$ 6,480	
15.02000 Jobsite Office				**$ 10,300**	
Jobsite Set-up	1.00	ls	$ 2,500.00	$ 2,500	
Computer	5.00	mn	$ 400.00	$ 2,000	
Technology	1.00	ls	$ 5,800.00	$ 5,800	
15.03000 Vehicles/Travel				**$ 5,500**	
Truck Rental	5.00	mnth	$ 1,100.00	$ 5,500	
15.04000 Jobsite Office Eq/Servcs				**$ 2,125**	
Drinking Water	5.00	mn	$ 125.00	$ 625	
Postage/Federal Express	5.00	mn	$ 300.00	$ 1,500	
16 SITE REQUIREMENTS	**4,006.00**	**sf**	**$ 1.64**	**$ 6,575**	
16.02000 Equipment & Tools				**$ 3,000**	
Site Requirements	5.00	mn	$ 600.00	$ 3,000	
16.03000 Safety/Cleanup				**$ 2,700**	
Debris Boxes	6.00	exch	$ 450.00	$ 2,700	
16.04000 Temporary Services				**$ 875**	
Temporary Toilets	5.00	mn	$ 175.00	$ 875	
SYSTEMS SUBTOTAL	**4,006.00**	**sf**	**$ 774.81**	**$ 3,103,887**	
Design Contingency	7.00%			$ 217,272	
Escalation	4.00%			$ 132,846	

OSU Nancy Squires Aerospace Laboratory Renovation

SD Estimate

Based on Documents dated 10/23/2023

Estimate No. 1, Rev. 2
Date: November 10, 2023
Building Area: 4,006 sf

Fortis System
Phase

Description	Quantity	Unit	Unit Cost	Total	Notes
Construction Contingency	4.00%			$ 138,160	
Permits and Fees - None	0.00%			$ -	
All Risk Insurance	0.65%			$ 23,349	
Liability Insurance	1.30%			$ 47,002	
Sub Default Insurance	1.30%			$ 47,613	
Contractor Bond	0.80%			$ 29,681	
Fee	3.50%			$ 130,893	
Preconstruction	0.50%			$ 19,354	
MARKUPS SUBTOTAL	4,006.00	sf	$ 196.25	$ 786,170	
PROJECT TOTAL	4,006.00	sf	$ 971.06	$ 3,890,057	

SD Package 10/13/2023

Nancy Squires Aerospace Laboratory Building

Schematic Design Scope Summary

A. Existing Building Conditions

a. Original 3200 sf building is a Pre-Engineered Metal Building (PEMB).
b. Corrugated metal panel exterior cladding.
c. Exterior roof insulation is VR-R blanket insulation with white vapor retarder installed continuous over purlins.
d. Exterior wall insulation is unfaced batt insulation between horizontal z structure with vapor barrier scrim taped over the interior face of z's. There is no air barrier in the assembly.
e. Roofing is white single-ply membrane(likely EPDM), recently installed 2023.
f. Light-frame wood 280 sf addition at NE corner housing current restroom and office.
g. The original PEMB is currently separated into two spaces by a floor to structure CMU partition (non-rated).

B. Demolition

a. Remove all interior non-load bearing walls within light-frame wood addition.
b. CMU wall at Grid-B to remain.
c. Slab demo as required for new underslab plumbing connections and new footings.
d. Electrical: Complete lighting, controls, low voltage and power outlet demo within project area back to (e) electrical panels. Exception: lighting, power, low voltage for existing jet propulsion lab.
e. Plumbing: Demo existing restroom.
f. Mechanical: Demo HVAC serving project area. Exception: (e) HVAC serving jet propulsion lab.
g. Site: As required for civil modifications. See Civil.

C. Structure

a. Provide structural steel framed interior mechanical mezzanine per plan. Structure includes, but is not limited to, steel beams, composite steel deck with 3” conc., HSS steel columns, associated concrete footings. Assume (8) column locations with 4x4x2ft footings.
b. Provide strengthening for existing wood framed roof structure to support additional exterior hvac equipment and mechanical screen. Assume significant perimeter wood blocking, and several (e) joists sistered with new engineered wood members. Also assume additional wood framing added into existing walls to carry and distribute these loads to the existing slab.
c. Seismic strengthening of the PEMB is not assumed to be necessary. However, the project design will need to minimize or eliminate any new loads to that system.

D. Mezzanine

a. Guardrails: Steel with 2” wire mesh panels at locations shown. Removable section of guardrail at south mezzanine storage area for material access.

E. Stairs/Misc. Steel

a. Provide steel ships ladder to mechanical mezzanine as drawn. Assume formed metal treads, 2” wire mesh guardrail panels, powder coated construction, handrails and guardrails.
b. Provide exterior roof access ladder for service of new mechanical equipment. Custom fabricated, steel, hot-dip galvanized.
c. Provide catwalk access to large vacuum chambers from mezzanine level. *(Alternate 1)* This structure is to be pre-engineered by the manufacturer. Steel structure and guardrail fabrication with removable fiberglass grating walk surface.
d. Basis of Design: https://mezzaninesbydesign.com/

F. Exterior Envelope

a. Repaint the exterior of the building to match the west facade (OSU black). *(Alternate 2)*
b. Replace existing gutters and downspouts. Custom sheet metal, commercial grade.
c. Retain (e) batt insulation and vapor barrier at walls and roof. Repair/tape vapor barrier where necessary.

G. Roof

a. Provide new curb/platform at low roof for new exterior hvac equipment. Patch (e) roof as required.
b. Provide mechanical screen as indicated on drawings. Basis of Design: RoofScreen (roofscreen.com), ribbed panels. Provide complete support/bracing system by manufacturer. Flash support structure to roofing as required.

c. Patch and repair existing membrane roof to accommodate HVAC, Plumbing, Electrical.

H. Interior Partitions

a. Interior walls to be 4” metal studs with acoustical batt insulation and 1 layer of ⅝” gypsum board each side, U.N.O.
    i. Provide furred 4” metal stud wall with 1 layer of ⅝” GWB to 10’-0” AFF at perimeter PEMB walls of main lab. Each stud secured with tab to PEMB horizontals.
b. Interior storefront system – Kawneer VG 450. ½” Single-glazing typical, vertical butt glazing except at perimeter.

I. Openings

a. Interior Doors – flush wood doors with hollow metal frames. Exception: Utility, mechanical, storage rooms are to be steel doors with HM frames.
b. (E) exterior doors to remain.

J. Flooring

a. Polished concrete floors throughout the main project area.
b. MDF, custodial, storage, utility rooms and mezzanine to be sealed concrete without polish.
c. (E) Jet Propulsion Lab is to remain as is (sealed concrete).

K. Ceilings

a. Exposed to structure is typical U.N.O.
b. Office: Suspended 2x4 acoustical ceiling.
c. East wood-framed addition: GWB hard lid tight to framing.
d. Electrical and Storage Rms: Framed GWB hard lid.

L. Other Finishes

a. Interior paint at all GWB partitions/ceilings, steel doors, HM frames, guard rails, ships ladder. Do not paint (E) PEMB structure, CMU, steel window frames.
b. Rubber base throughout at GWB assemblies, U.N.O.
c. Porcelain tile to 4ft AFF in restroom and custodial. Epoxy paint above 4ft in these rooms.

M. Specialty Equipment

a. Laboratory OFOI/OFCI equipment. Final OFCI equipment list to be coordinated during DD. Provide allowance for following scope of laboratory research equipment:
    i. Insertion into building from delivery drop off location (on site).
    ii. Final placement of equipment at owner’s direction.
    iii. Securing equipment in place as required, i.e. bolting to floor, walls or strapping.

iv. Connection of equipment requiring ventilation, power, data, piped utilities.
v. Owner to provide final calibration, testing, or specialized component installation requiring vendor assistance or instrument specific technical expertise.

N. Mechanical

a. See Mechanical/Plumbing Basis of Design attached.

O. Electrical

a. See Electrical Basis of Design attached.
b. Also: Include (8) exterior LED lighting sconces at the perimeter of the building.

P. Fire Alarm Systems

a. See Electrical Basis of Design attached.

Q. Access Control

a. Provide access control at bldg entries, suite entries and MDF. Assume (5) total locations for access control.

R. Low Voltage

a. Provide pathways (MDF -> conduit -> cable tray -> conduit -> device) for standard office distribution, and laboratory equipment connections.
b. Distribution in open lab space is to be an overhead cable tray array. 4” minimum width to each equipment location.

S. Plumbing

a. See Mechanical/Plumbing Basis of Design attached.

T. Fire Sprinklers

a. The building is to remain non-sprinklered.

U. Site Improvements

a. See Civil Site Plan markup.
b. Provide improved perimeter drainage, including french drains on south side of building, trench drains on north side, and new area drains on east and west sides.
c. Improve ADA pedestrian access from 30th St. with new 6’ concrete sidewalk and provide drainage collection as needed.
d. Update existing gravel parking area near building as needed to adjust for new sidewalk.

MECHANICAL SYSTEMS

Outdoor Design Conditions

		Dry Bulb Temperature (°F)	Wet Bulb Temperature (°F)
Summer	System Design	**92**	**67**
	Cooling Coil/Design	**88**	**69**
Winter	System Design	**23**	**22**

Indoor Temperature Criteria

Space Criteria							
Room	**Temperature (°F) (1)**		**Humidity (%RH) (3)**		**Minimum Ventilation (ACH) (4)**		**Pressure Relationship**
	Min.	**Max.**	**Min.**	**Max.**	**Occ.**	**Unoc.**	
Office,	68	75	15	60	(6)		Neutral
MDF	68	72	**(2)**	60			
Restroom/EVS (3)					10	10	Negative
Laboratory	70	75	**(2)**	60	6	6	Neutral

(1) Minimum – Winter Heating

Maximum – Summer Cooling.

(2) No active humidification will be provided. The resultant space relative humidity may be <15% during design winter conditions.

(3) Restroom/EVS and Mechanical equipment spaces will be exhausted only and will be conditioned by transfer air.

Seismic Criteria

Seismic bracing will not be provided for project's mechanical systems.

HVAC AND PROCESS PIPING SYSTEMS DESCRIPTIONS

This section includes general descriptions for HVAC and process piping systems. Refer to Pipe Distribution Criteria for more detail.

Process Cooling System

Process cooling water system will consist of a 5-ton air-cooled chiller and associated distribution equipment and piping. The chiller unit will be located indoors with a remote condenser located on the east equipment platform.

The indoor chiller will have integral pump and tank package with makeup water, expansion tank and filtration. The tank package will provide for the minimum volume and temperature stability.

The piping system will be closed loop with Type L copper piping distribution piping insulated to code for 42F chilled water piping. Design temperature will be flexible from 45F to 60F.

HVAC Systems

Supply Air Systems

Main Laboratory HVAC consists of a packaged indoor air-handler and matched heat pump condenser unit with multi-stage direct-expansion cooling and modulating stainless steel condensing gas furnace.

Air handler will consist of a variable volume fan, direct expansion draw thru coil, MERV 13 inlet filters, modulating gas-furnace section. Airhandler will be capable of 100% economizer operation in conjunction with a relief fan. Ventilation will be designed for minimum 50% OSA operation.

Ventilation intakes will be through roof vent on the north edge of the building and the relief vents will be located on the south side of the building.

Air handling unit will operate 24 hours per day, 365 days per year.

Office HVAC system and MDF will be served by individual mini-split heat pump systems with zone thermostats. Office ventilation will be by natural ventilation.

General Exhaust Systems

Laboratory General Exhaust

System will consist a single utility set exhaust located on a mechanical platform within the building.

The exhaust system will be constant volume balanced with variable frequency drive. The installed system and ductwork will be designed with 200% future capacity.

Discharge ductwork will exit the roof over the platform to clear 6’ over the existing PEMB roof. No high velocity nozzle will be installed.

Laboratory general exhaust will be ducted with G90 galvanized spiral ductwork in the main laboratory space arranged with flexible drops for future hose connections.

The laboratory general exhaust system will serve the laboratory mechanical room cryovac equipment and general exhaust for conditioning the space.

East General exhaust

A small centrifugal downblast exhaust fan will be installed on the east mechanical platform to serve the new restroom and EVS closet.

Ductwork Systems

Ductwork will be constructed in accordance with SMACNA Standards for appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not exceeding 1% of the design flow rate for high pressure ductwork and 2% for low pressure ductwork.

Supply and Return/Exhaust System

System	Construction	Design Criteria	Insulation
Return/Exhaust Ductwork Sizing	Galvanized Steel ±2" Pressure class	(2)	None

(1) Maximum pressure drop of 0.1"/100 ft when ≤ 8,000 cfm
Maximum velocity of 1,600 fpm when > 8,000 cfm

Building Automation Systems

New direct digital controls systems will be provided for air handler, mini-split AC units, process chiller, and all exhaust fan equipment. Controls will integrate to campuswide LAN through owner switch at the MDF.

PLUMBING SYSTEMS

Storm and Clearwater Drainage

Connect existing downspouts to new storm systems (see Civil).

Waste and Vent Systems

Contractor to scope existing underground sewer piping prior to work.

Reconfigure cast iron waste and vent piping for new EVS and Restroom. All piping will be service weight no-hub cast iron pipe and will gravity drain at ¼" per foot minimum slope to the existing drain infrastructure at the east end of the building.

Domestic Water Systems

Existing backflow preventer will be reused for project.

Connect new Type L copper for HW/CW supplies in existing restroom.

Plumbing Fixtures

Water Closet- ADA height floor mount pressure tank 1gpf

Wall mounted vitreous china with manual operated ADA f

60 gallon electric water heater

Mop Sink – Floor mounted precast. Wall mounted faucet with vacuum breaker.

Floor drains - 4" cast iron floor drains in mech mezzanine level and laboratory mechanical room.

Compressed Air Piping

Connect new Type L copper CFOS Tube with brazed joints to existing relocated air compressor. Provide 20-25PSI filter regulators at outlet stations.

Natural Gas Piping

Connect to existing meter and route new 2 psig natural gas to multistage furnace with 7-15" Wg point of use regulator. Piping Std weight threaded black steel piping with flexible connections at equipment connection.

V. ELECTRICAL SYSTEMS

EXECUTIVE SUMMARY

The Nancy Squires Aerospace Laboratory Building (NSAL) is a remodel of an existing building that is approximately 3,500 gsf. The remodeled building will house a new Aerospace Lab with support space.

BASE DESIGN CRITERIA

Design Voltages

Type	Voltage
Normal Building Service	208Y/120V, 3 phase,4 wire + ground
Motors; ½ HP and larger	208, 3 phase, 3 wire
Motors; less than ½ HP	120 or 208 Volts, 1 phase, 2 wire + ground
Lighting (≥7′ A.F.F)	120 Volts, 1 phase, 2 wire + ground
Lighting (≤7′ A.F.F)	120 Volts, 1 phase, 2 wire + ground
Specific Equipment	208 Volts, 3 phase, 3 wire + ground
Lab Support and Specialty Equipment	208Y/120V, 3 phase, 4 wire
Receptacles	120V, 1 phase, 2 wire + ground

Equipment Sizing Criteria

Demand Factors Criteria

Demand factors will follow all the requirements as specified in the National Electrical Code and local state codes.

Load Calculation Criteria

Functional Area Load Density Criteria – Peak Connected

Functional Area	Service Load Density (VA/sq ft)	EM Load Density (VA/sq ft)
Office Receptacle	4.5	0.5
Lighting	0.9	0.1
Lab and Lab Support	75	0
General Receptacle	2	0
Public Space	1	0
Building Support	2.5	0

Equipment Load Density Criteria - Peak Connected

Equipment System	Service Load Density Total kVA	EM Load Density Total kVA
Mechanical & Plumbing Systems	50	0

Load Tables

System Capacity and Calculated Demand Load

Building Load Summary		
	Normal Power	Standby [Essential] Power
kVA	561	0

SYSTEMS DESCRIPTIONS

Electrical Service

System Description

The new 12,47kV primary service, from PacfiCorp (PP&L), will originate from an existing PP&L utility pole on the Oceanography building site. PP&L will set a new power pole for the NSAL building on the Oceanography building site. Power from the new power pole will route underground to the NSAL site to a utility owned pad mounted transformer.

Secondary service from the pad mounted transformer will then be routed to an exterior EUSERC cabinet next to the building. The secondary service from the transformer will be 208/120V, 4 Phase, 4Wire. Secondary feeders from the EUSERC cabinet will be routed to the Main Distribution Switchboard (MDP) located in the inside Electrical Room. The MDP distribution will the power to the lighting and appliance panelboard located around the building.

This existing electrical service to the NSAL building will be removed.

Design Criteria

Surge protection shall be provided at the main switchgear.

Emergency/Standby Power System

System Description

An emergency/standby generator will not be provided.

Emergency power source for the facility will be provided by lighting inverter system serving exit signs and egress lighting.

Fire alarm system will be provided with battery systems.

System	Associated Loads
Emergency Systems	Egress Lighting
	Exit Signs
	Fire Alarm Detection and Annunciation Systems

Electrical Distribution

System Description

Normal Power Distribution

The normal distribution system shall include electrical distribution equipment from the serving utility service point to the branch distribution outlet devices.

Secondary service at 208/120V will terminate at the Main Distribution Panel (MDP) located in the support space. Conduit and wire feeders will route overhead from MDP to distribution equipment in building.

Emergency/Standby Power Distribution

As required by Code, branch circuit wiring to emergency loads (lighting, fire alarm, etc.) will be in dedicated raceway

Design Criteria

Building service and distribution equipment sizes will be based on estimated demand plus known or anticipated future loads.

Power distribution equipment will be sized to support 20% spare capacity (amperes) to accommodate functional changes over the life of the building.

Power distribution equipment will be sized to include 20% spare circuit breakers plus spaces for future circuit breakers.

Equipment and Components

Equipment	Description of Components
Switchboards	UL 891 construction Front and rear access NEMA 1 enclosure Copper Bus Main Circuit Breaker Bolt-on feeder circuit breakers Electronic trip circuit breakers with field-adjustable and field-changeable trip units will be used for all circuit breakers 150 amps and greater and for smaller sizes if special circumstances exist. Circuit breakers 800 amps and greater will be UL listed for applications at 100% of their continuous ampere rating in their intended enclosure

Equipment	Description of Components
Distribution Panelboards	UL 891 listed, Front access NEMA 1 enclosure switchboards Copper Bus Main Circuit Breaker Fixed mount circuit breakers Electronic trip circuit breakers with field-adjustable and field-changeable trip units will be used for all circuit breakers 150 amps and greater and for smaller sizes if special circumstances exist.
Branch Panelboards	UL 67 listed 42 Pole, NEMA 1 enclosure, recessed and/or surface mounted Copper Bus Main Circuit Breaker Molded case with non-adjustable trip units to be used for all circuit breakers 150 amps and smaller All circuit breakers will be bolt-on style Panelboard covers will be hinged trim with door-in-door construction.

Arc Energy Reduction

Where the highest continuous trip rating or setting of an adjustable circuit breaker is 1200 amps or higher, provide one of the following:

- Energy-reducing maintenance switch with local status indicator

Grounding System

System Description

A complete low-impedance grounding electrode system will be provided for this facility. The grounding electrode system will include the main water service line and, structural steel. The building structure is existing and a Ufer ground will not be provided if one does not already exist. An Equipment grounding system will extend from the building service entrance equipment to the branch circuit.

Bonding jumpers will be provided as required across pipe connections to water meters, dielectric couplings in a metallic cold-water system, and across expansion/deflection couplings in conduit and piping systems.

Feeders and branch circuits will be provided with an equipment ground conductor. Under no circumstances will the raceway system be used as an equipment grounding conductor.

Design Criteria

The grounding electrode system will be designed in accordance with NEC article 250.

System resistance to ground will be 5.0 ohms or less.

Conductors will be installed in steel conduit unless installed below grade or in concrete.

Equipment and Components

Wall-mounted copper ground bus will be located in the main electrical room, floor electrical rooms, and voice/data rooms.

Distribution

A separate, insulated ground wire will be provided from the main electrical room ground bus to smaller electrical room ground buses, underground incoming water service line ahead of meter, and underground gas line at the building entrance.

The main service entrance neutral will be bonded to the system ground bar within the switchboard by a removable bus bar link.

A code-sized, unbroken bond leader will be connecting the electrical room ground bar to the XO terminal of the local transformers.

A #1 AWG, bare copper, grounding electrode conductor will be extended to all voice/data rooms, so that those systems can be properly bonded.

A separate ground wire will be provided for all circuits.

Lightning Protection System

Per the NFPA 780 analysis, lightning protection system is optional. As such, this project shall not be installing a lightning protection system.

Lighting Systems

System Description

A complete lighting system for all indoor and outdoor illumination will be provided.

In general, indoor lighting controls will consist of low-voltage switches controlled by low-voltage lighting control system, room occupancy sensors, line voltage switches, centralized time clock and sentry switches. Outdoor lighting controls will be controlled by centralized time clock.

Emergency/egress lighting will be fed from a lighting inverter system. Exit signs and emergency egress lighting will be provided throughout the facility to illuminate egress corridors, stairwells, lobbies, etc. Exit and egress lighting circuits will originate from emergency system branch panels. Emergency/night lighting will be controlled as required by Oregon Energy Code, with occupancy sensor override in "after-hours" mode.

EXIT signs will be LED type, approved by the local Authority Having Jurisdiction and located in all paths of egress.

Lighting Control

Photocells and occupancy sensors will be utilized in select spaces to minimize energy consumption. Occupancy sensors will be passive infrared or dual technology.

Dimmers will be provided in where manual control is required. Corridor lighting will be controlled by time of day thru input from Lighting Control System. After hours, there will be occupancy sensors provided to override time of day scheduling as needed.

A programmable, Lighting Control System will be provided. It will consist of low-voltage switching and relays and will control all lighting excluding interstitial, mechanical, and janitorial spaces. The system

will be software based and will provide flexible control of automatic and manual on/off, recording, and reporting functions.

Distribution

Lighting circuit wiring will be in conduit and routed concealed within walls, partitions, or ceiling spaces. Surface-mounted conduit will be minimized and used only in non-finished spaces.

The ampacity of lighting circuits will be sized for 20% additional lighting load on each circuit.

ELECTRICAL SYSTEM STANDARDS

Feeder and Branch Circuits

Secondary distribution and branch circuit system design will be based on a maximum of 5% voltage drop from the transformer to the utilization equipment

Feeder and branch circuit sizes will be based on the load supplied and adjusted for voltage drop.

Feeder and branch circuit ampacity will not be smaller than the upstream overcurrent device or downstream equipment bus.

Circuit Voltage Length	Wire Size
208Y/120 volt circuits over 60' in length	Increase wire size one size for each 60' of length

Receptacles

Receptacles in offices, general support rooms and similar locations, (depending upon room layout) will be provided with a minimum of (4) outlets total or (1) outlet on each wall.

Common areas will be provided with at least (1) duplex receptacle per wall. Typically, receptacles to be spaced on 25 foot centers.

Building Support (Equipment rooms, storage rooms) will be provided with (1) duplex receptacle per wall or (1) per every 150 square feet, whichever is greater

Duplex receptacles in office areas, lounges, lobbies, etc., shall be circuited with an average of (6) duplex receptacle's per 20A, single pole circuit.

Receptacles designated to serve desk top computer loads shall be circuited with an average of (4) duplex receptacle's per 20A, single pole circuit.

Ground fault protection will be provided for outlets as required by NEC 210.8.B. 120V Electrical outlets will be individually ground fault interrupted (GFCI) protected (not at the circuit breaker or first outlet on the circuit)

Overcurrent Protective Device Coordination

Overcurrent protective devices supporting normal power systems will be selectively coordinated with supply side overcurrent protection to the greatest extent possible given the material capabilities of breaker types selected with the exception of the instantaneous region devices in keeping with industry practice.

Overcurrent protective device will be selectively coordinated with supply side overcurrent protective devices as follows:

System	Seconds
Normal Power System	0.10

Arc Flash

The electrical distribution system will be configured to allow equipment to be worked on energized using reasonable PPE (category 3 or less). Arc flash calculations for Arc Flash Incident Energy (AFIE) levels and flash protection boundary distances will be by the contractor based on the actual equipment supplied using an independent Registered Profession Engineer licensed within the jurisdiction of this project and using SKM System Analysis tools.

Fault Current Ratings

Preliminary short circuit withstand and interrupting ratings will be provided for electrical distribution equipment, feeder conductors, etc. based upon the actual available fault current and system motor contribution.

The preliminary available fault current will be determined design of the project and will be verified by 3rd party calculations provided in contractor submittals.

Equipment will have ratings not less than the calculated symmetrical short circuit value at each point in the distribution system.

Equipment will be fully rated for the calculated available short circuit. Series ratings will not be allowed.

Short Circuit Rating
208Y/120V
10 kAIC where fed via 75kVA and smaller transformers
22 KAIC where fed via 112.5 kVA transformer
22 KAIC where fed via 150 kVA transformer
42 KAIC where fed via 225 kVA transformer
42 KAIC where fed via 300 kVA transformer
65 KAIC where fed via 500 kVA transformer and larger

Conduit and Raceway

Conduit Types and Application	
Conduit Type	**Application**
Electrical Metallic Tubing (EMT)	Low voltage feeders and branch circuit wiring where installed above 10' AFF, when exposed in unfinished spaces.

Conduit Types and Application	
Conduit Type	**Application**
Galvanized Rigid Steel (GRS)	Low voltage feeders and branch circuit wiring where exposed below 10' AFF. Exterior locations, Under slab, Areas subject to physical abuse
Intermediate Metal Conduit (IMC)	Low voltage feeders and branch circuit wiring where exposed below 10' AFF.
Schedule 80 PVC	Concrete encased ductbanks and direct buried under slab

Conduit will be run concealed, unless installed in mechanical, electrical, telecom, and other similar unfinished spaces.

Minimum conduit size for power circuits will be 3/4"

Conduits will be independently supported.

All conduit stub-ups from below floor or in floor (where specifically allowed) will be galvanized rigid steel.

Conduits may be installed below floor slabs on grade.

Raceways for 2-hour rated systems shall be installed in either: UL listed assemblies for 2-hour fire rated applications or in 2-hour rated enclosures.

For lighting conduit homeruns, a j-box will be located above light fixture in an accessible location to allow for future expansion.

No home run will terminate in a wall mounted device box. A separate J-box will be provided above device box above ceiling in an accessible location.

Wire and Cable

Cable Types		
Voltage Class	**Insulation**	**Notes**
15 kV		Provided by Utility
600 V	THHN; THWN-2	Conductors #10 and smaller will be solid or stranded copper. Conductors larger than #10 will be stranded copper

Feeder conductors to be 98% conductivity copper

Branch wiring conductors will be 98% conductivity copper.

Minimum wire size #12 AWG,

Multi-wire branch circuits will be provided with dedicated neutral conductors for each phase, common neutral circuits will not be permitted.

Wiring Devices

Wiring devices will be specification grade, complete with all accessories.

Receptacles, switches, etc., will have faceplates with labeling indicating system panel and circuit identification.

Grounding and Bonding

A separate, insulated equipment grounding conductor, sized per the National Electrical Code, will be provided within each raceway and cable tray, with each end terminated on a suitable lug, bus, enclosure, or bushing.

A grounding system with ground bar located in each electrical room will be interconnected using 4/0 copper conductor.

Surge Protection

Surge Protective Devices (SPD) will be used as design dictates. A single SPD device will be installed on the load side of each main service disconnect.

Electrical Rooms

Adequate space will be provided for maintenance of electrical equipment and equipment removal.

Pipes and other equipment foreign to the electrical equipment will not be located in, enter, or pass through such spaces or rooms.

Mechanical rooms will be utilized for electrical equipment and panelboard placement where applicable for optimization of space.

Feed through, sub-fed and double section panelboards will not be used unless required to comply with selective coordination requirements

Prohibited Materials and Construction Practices

Use of wood strips and wood screws to support lighting fixtures.

Extra-flexible non-labeled conduit

Conduit installation in concrete slabs

Conduit less than 3/4" diameter will not be used except for switch legs, fixture whips and door controls

Use of wire ties to support conduit

Suspension systems for conduits, fixtures, etc. connected to other utility equipment is prohibited. Any suspension system with multiple levels must be hung from trapeze suspension systems

Use of Incompatible Materials: Aluminum fittings and boxes will not be used with steel conduit. All materials in a raceway system will be compatible

Direct burial electrical cable

Power Distribution Acceptance Testing

An independent testing firm will be employed to assure all electrical equipment, both contractor and Owner supplied, is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.

Testing firm will be a corporately and financially independent testing organization that can function as an unbiased testing authority, professionally independent of the manufacturer, supplier, and installers of equipment or system evaluated by the testing firm. The testing firm's on-site technical person will

be currently certified by the International Electrical Testing Association in electrical power distribution system testing. Items to be tested and inspected are as follows:

Acceptance Tests	
600V Conductors and Cables	
Electrical Metering	Grounding Systems
Switchboards	Thermographic Survey
Low-Voltage Insulated-Case/Molded-Case Circuit Breakers	Lighting and Appliance Panelboards
Low-Voltage Disconnect Switches	Distribution Panelboards
Enclosed Circuit Breakers	Surge Protective Devices

Fire Alarm System

System Description

The fire alarm system will be a stand-alone centrally monitored, fully addressable system comprised of smoke detectors, heat detectors, duct detectors, manual pull stations, visual signaling and audio signaling devices for voice evacuation.

Design Criteria

The fire alarm system will comply with requirements of NFPA 72 for a protected premise signaling system.

A main fire alarm control panel will be located in support spaces.

A fire alarm annunciator panel will be mounted at the main building entrance.

Audio/visual devices will be installed in all areas of the building in accordance with the NFPA and the ADA Guidelines.

Smoke detectors shall be installed as required by the National Fire Protection Association. Smoke detectors will be installed in, the following locations: air handling units

Heat detectors will be installed in areas that are not feasible for smoke detectors.

Manual Pull Stations will be installed adjacent to exit doors.

Equipment and Material

The fire alarm system will be an electronically multiplexed voice communication system.

Remote transponder panels will be used to provide supervised amplifiers and signal circuits for audio/visual devices and magnetic door holders.

The system will utilize individual, addressable photoelectric smoke detectors; heat detectors; addressable manual pull stations; and addressable monitor and control modules. The system will monitor all sprinkler supervisory and water flow switches and will interface with elevators, HVAC, and smoke fire dampers.

Distribution

Initiating and signaling devices will operate at 24VDC and will be installed in accordance with manufacturer's specifications.

Wiring will be installed in conduit. Minimum conduit size will be 3/4".

END OF BOD

05/30/2023

Nancy Squires Collaborative Aerospace Research Center

Mechanical System Selection

The Collaborative Aerospace Research Center project will renovate the existing Aero Lab to incorporate new research activities. The current system serving the renovation space is not capable of the cooling required for the lab equipment. It also cannot adequately be modified to serve additional program spaces (office, restroom, lab mechanical, idf, etc.) that are to be incorporated into the project.

Building and Equipment Load:
The building will require 16 tons of cooling. This is primarily driven by the laboratory equipment specifications for the new Plasma Lab. Please note that the laboratory will include advanced cooling systems that will siphon off heat from the testing stations. These systems remove heat from the experiments, but ultimately that heat still needs to be expelled from the building via the building's mechanical systems.

Building Constraints:
The developed square footage in this sector of campus is at its maximum. No additional square feet will be allowed as part of this project. This includes outdoor pads for mechanical equipment. This will constrain the system selection to those with equipment options that can be interior to the footprint and or are of limited weight and scale so that they can be accommodated on the roof without triggering a seismic upgrade.

The existing structure is a Pre-Engineered Metal Building (PEMB) built in the 1950's. No documentation on the original structure is available. PEMB's are typically designed with little to no additional weight capacity. As such, any equipment located on the roof will require structural modifications. A small addition to the east of the original PEMB was constructed with light wood framing. This structure can more likely accommodate rooftop equipment if the scale of that equipment is kept at a minimum.

Heating and Cooling Sources:
The project will require a targeted system that can move away from natural gas (OSU fossil fuel reduction request) and at the same time require minimal electricity. The building has a limited electrical service and power will need to be conserved for the high lab equipment demands.

Affiliated Engineering Inc (AEI) has taken the above into consideration while developing a system strategy for the project. AEI's proposed system selection and rejected alternatives are outlined below.

Mechanical System Selection:

---

1. **(Proposed) VRF**: Affiliated Engineers recommends a Variable Refrigerant Flow (VRF) system for this project. It is the only available system that is tuned to provide laboratory conditions for this building given the parameters and constraints of the project.

    - VRF equipment is modular and can be more easily accommodated within the footprint of the building and/or the small eastern rooftop.
    - VRF equipment is superior for temperature control as the controllers and both indoor and outdoor fans are variable -
    - VRF system selection is more forgiving in cold weather conditions. We may include air-to-air heat recovery in the proposed layout either way for energy efficiency once a minimum ventilation standard can be agreed upon.
    - VRF systems generally contain a higher refrigerant charge, have extensive piping networks, and are usually only serviceable by VRF technicians.

2. **Split System Heat Pump:**
    - Conventional heat pump equipment cannot provide cooling for a process chilled water loop that is required for the project. A stand-alone process chiller could be provided at an added cost and creating more specialty lab equipment to maintain.
    - Conventional heat pump equipment cannot offer heating at low outdoor temperatures and must have supplemental electric resistance heat which depletes our limited electrical power. The building is currently underserved by the electrical service.
    - Split system heat pump equipment will be at best two stage on/off control and cannot tolerate variable air volumes. Temperature fluctuations in the space are worse with conventional heat pump equipment.
    - Conventional heat pump equipment is incompatible with 100% OSA systems and would require electric resistance preheat or air-to-air heat recovery.
    - Conventional heat pump equipment has on/off fans on the outdoor unit that may lead to objectionable noise.

3. **VAV System**:

- VAV systems include an air handling system with hydronic heating and cooling that would be supplied by an air-cooled chiller and potentially a gas-fired boiler. While this equipment is available, the project size (small) and loads are not an easy match and involve additional expense and complexity.
- Limitations to the building structure and prohibition to install outdoor ground mounted equipment cannot support the extensive equipment space and footprint requirements.
- Gas fired equipment does not comply with the University goals for carbon reduction.

4. **Modified Split System AC:**
    - A gas furnace, split system AC combination would include new modulating gas furnace equipment with variable speed air-cooled condenser units.
    - This compact layout may work in the same location as the existing gas furnaces.
    - This equipment is light commercial/residential in nature and is easy to maintain and readily available, but not durable.
    - Gas-fired equipment does not comply with the University goals for carbon reduction.
    - Split system AC units may not be used on 100% OSA systems and may require an air-to-air heat exchanger.
    - Modifications are needed to provide high efficiency filtration.
    - Temperature control is less precise than VRF or VAV, but more precise than split system heat pumps equipment.

05/30/2023

Nancy Squires Collaborative Aerospace Research Center

Electrical Service and Loading Narrative

In evaluating the nature of the existing service load to the building, its existing load usage, and the intended future load use, multiple paths forward are outlined below. All values are rounded to the nearest whole. The service being discussed is 208V, 3 Phase.

Existing Conditions Summary

1. To the northwest of the building, there are (2) PP&L poles with banks of transformers owned by PP&L. One bank is 480V services that feeds the Oceanography building. The other bank is 208V service that feeds the Aero Lab and the Oceanography building.

2. OSU is responsible for the wire from the secondary taps of the transformers to the buildings. The 208V service runs from the transformer bank to another PP&L pole that is at the NW corner of the Aero Lab. Here there is a parallel set of 3/0 conductors going down the service mast to the Aero lab, feeding (2) separate panels for a total of **400 amps, 3 phase, existing service.**

3. The existing load usage of the building is related to current HVAC draws and the usage of the Propulsion Lab. This load does not have current metering data, so engineering must assign a code minimum value of **50 kVa/139 amps** existing load for design and permitting calculations for any building improvements.

Intended Loading Requirements

1. As part of the intended build out, the building will have to be brought into building code compliance in its power, lighting, and HVAC equipment needs. The code minimum calculated for additional anticipated mechanical and building usage loading is **36 kVa/100 amps.**

2. The user for the Plasma Lab portion of the Aero Lab, has submitted their full equipment list for evaluation. Since there is no metering data for the listed equipment, the listed amperage must be used in the loading calculations.. The total Plasma Lab Equipment load that must be used for permitting is **469 kVa/1303 amps.**

3. There is also a design contingency assigned to the entire loading condition, both existing and planned, of 10%

Service/Loading Summary

amps are based on 208V, 3 Phase	**kVA**	**Amps**	
Existing Lab & Building Loads	50	139	*need metering data to prove lower usage*
Anticipated Add'l Mech Loads	36	100	
Total Existing Lab & Bldg Loads	86	**239**	
Existing Building Service		400	
Available Power For New Plasma Lab Equip		**161**	*balance available without service upgrade*

Paths Forward

With the discrepancy in existing service against required load for the planned renovation, there are multiple paths forward.

Option 1. Provide no increase to the electrical service at this time. The design for the Plasma Lab will be limited to circuits and devices that do not exceed the available 161 amps. This is only enough to supply power for one or two of the 10 testing stations within the lab.

The actual usage of the installed testing stations can be metered over time. If metering determines that additional spare capacity is available then additional modifications to the circuiting may be designed and permitted at that time to facilitate the connection of additional equipment. Please note that although metering may allow for additional equipment connection it is still unlikely that more than just a few testing stations can be ultimately accommodated.

a. **Additional Considerations:** If the existing panels are altered/touched in any way, they will have to be isolated due to their location in the Propulsion Lab and non-compliance with current National Electrical Code Article 500, Hazardous Locations. The adjacency is assumed to be a

Class 1, Div 2, due to the presence of flammable gas types piped into the room for use in closed systems. Class 1, Div 2 requires isolation of the service equipment and all devices to be listed. Some areas may be de-classified based on ventilation.

Option 2. Option 1 may be improved by providing metering to the existing propulsion lab and building during active use for 30 days + seasonally dormant loads + 25% to calculate loads that will be accepted per code. These actual loads can be used for design and permitting and have the potential to increase the balance of available amps for the planned build out. This has an unknown schedule impact on the project. Even if the metering determines a lower actual existing load, the existing service will still fall short of satisfying the total design load for the project.

Option 3. Provide an upgraded electrical service to allow full operation of the Plasma Lab upon move-in, with no metering required. This is an additional +/- **1296 amps**, including design contingency of 10%.

a. **Service Side Impact:** An additional transformer will be required. This is likely to be service pad mounted, and preferred to be located close to the service poles by the Oceanography building. This provides elevated ground clearance, as the Aero Lab building had known flooding issues at grade. Utility pad size is roughly 72” x 51”.

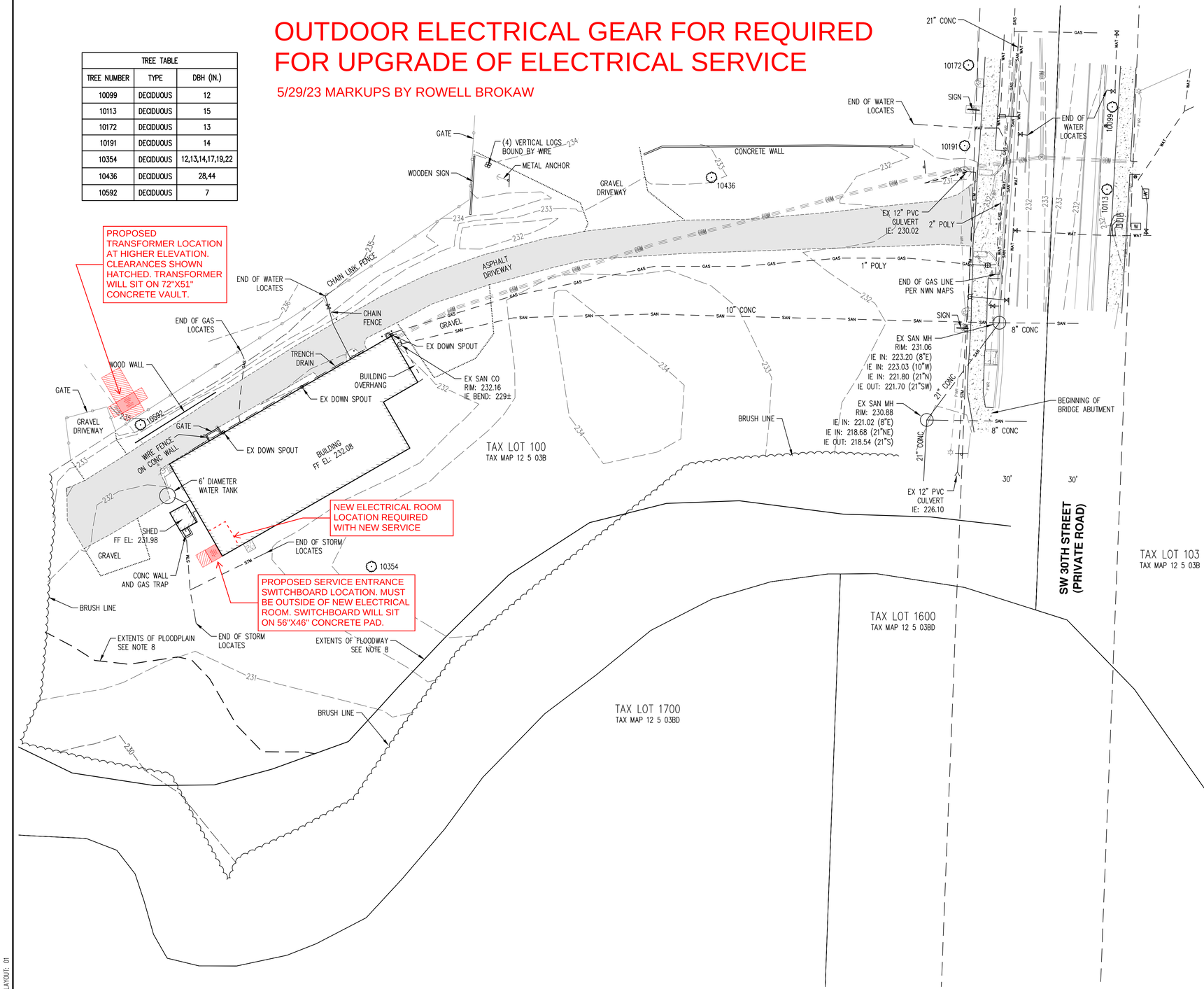
b. **Service Entrance to Aero Lab**: Dedicated service entrance switchboard equipment must be located on the exterior of the building. This will require a utility pad that is roughly 56” x 46” to be at grade.

c. **A dedicated electrical room:** To meet the above hazardous locations isolation requirements and code required clearances, an electrical room that is roughly 8’ - 0” x 7- 6” will be required to be built out inside of the existing propulsion lab. The ideal location has been identified as the SW corner of the building.

OUTDOOR ELECTRICAL GEAR FOR REQUIRED FOR UPGRADE OF ELECTRICAL SERVICE

5/29/23 MARKUPS BY ROWELL BROKAW

TREE TABLE		
TREE NUMBER	TYPE	DBH (IN.)
10099	DECIDUOUS	12
10113	DECIDUOUS	15
10172	DECIDUOUS	13
10191	DECIDUOUS	14
10354	DECIDUOUS	12,13,14,17,19,22
10436	DECIDUOUS	28,44
10592	DECIDUOUS	7



LEGEND

EXISTING		EXISTING
DECIDUOUS TREE	STORM DRAIN CLEAN OUT	
CONIFEROUS TREE	STORM DRAIN CATCH BASIN	
FIRE HYDRANT	STORM DRAIN AREA DRAIN	
WATER METER	STORM DRAIN MANHOLE	
WATER VALVE	GAS METER	
SANITARY SEWER CLEAN OUT	GAS VALVE	
SANITARY SEWER MANHOLE	GUY WIRE ANCHOR	
SIGN	UTILITY POLE	
	STREET LIGHT	

EXISTING	
RIGHT-OF-WAY LINE	
PROPERTY LINE	
CENTERLINE	
DITCH	
CURB	
EDGE OF PAVEMENT	
EASEMENT	
FENCE LINE	
GRAVEL EDGE	
OVERHEAD WIRE	OHW
COMMUNICATIONS LINE	COM
GAS LINE	GAS
STORM DRAIN LINE	STM
SANITARY SEWER LINE	SAN
WATER LINE	WAT

N

SCALE: 1"=20 FEET

20 0 4 10 20

ORIGINAL PAGE SIZE: 22" x 34"

NOTES:

1. UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBER 23084961. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.
2. FIELD WORK WAS CONDUCTED APRIL 6, 2023.
3. VERTICAL DATUM: ELEVATIONS ARE BASED ON NATIONAL GEODETIC SURVEY BENCHMARK PID QE0627. LOCATED IN CORVALLIS, AT THE INTERSECTION OF SOUTHWEST WESTERN BOULEVARD AND SOUTHWEST GROVE STREET, IN THE NORTHEAST CORNER OF THE NORTH WALKWAY OF A BRIDGE SPANNING OAK CREEK, 375.0 FEET EAST OF THE CENTERLINE OF THE STREET, 17.4 FEET NORTH OF THE CENTERLINE OF THE BOULEVARD, 0.7 FEET WEST OF THE EAST EDGE OF THE WALKWAY, AND 0.3 FEET SOUTH OF THE NORTH GUARDRAIL OF THE BRIDGE. THE MARK IS 0.7 FEET ABOVE THE BOULEVARD. ELEVATION = 228.56 FEET (NAVD 88).
4. THIS IS NOT A PROPERTY BOUNDARY SURVEY TO BE RECORDED WITH THE COUNTY SURVEYOR. BOUNDARIES MAY BE PRELIMINARY AND SHOULD BE CONFIRMED WITH THE STAMPING SURVEYOR PRIOR TO RELYING ON FOR DETAILED DESIGN OR CONSTRUCTION.
5. BUILDING FOOTPRINTS ARE MEASURED TO SIDING UNLESS NOTED OTHERWISE. CONTACT SURVEYOR WITH QUESTIONS REGARDING BUILDING TIES.
6. CONTOUR INTERVAL IS 1 FOOT.
7. TREES WITH DIAMETER OF 6" AND GREATER ARE SHOWN. TREE DIAMETERS WERE MEASURED UTILIZING A DIAMETER TAPE AT BREAST HEIGHT. TREE INFORMATION IS SUBJECT TO CHANGE UPON ARBORIST INSPECTION.
8. FLOODWAY SHOWN PER GRAPHICAL OVERLAY OF FEMA FIRM 41003C0191F WITH AN EFFECTIVE DATE OF JUNE 2, 2011. FLOODPLAIN LINE SHOWN BY MAPPING THE BASE FLOOD ELEVATION (BFE) ACROSS THE EXISTING CONTOURS. BFE WAS DETERMINED PER BENTON COUNTY FLOOD INSURANCE STUDY WITH AN EFFECTIVE DATE OF DECEMBER 8, 2016.

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151
WWW.AKS-ENG.COM

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

OSU AERO LAB

OREGON
BENTON COUNTY TAX MAP 12 5 03B

CORVALLIS
TAX LOT 100

EXISTING CONDITIONS PLAN

DESIGNED BY:	
DRAWN BY:	CC
MANAGED BY:	BH
CHECKED BY:	BH
DATE:	4/21/2023

REVISIONS

JOB NUMBER 9673

SHEET 01

AKS DRAWING FILE: 9673EXCOND.DWG | LAYOUT: 01