Eastern Washington
University

Interdisciplinary Science Center

Cheney, WA

Project No. 15047-01

SCHEMATIC DESIGN

Systems and Materials
Narrative Report

DATE: May 27, 2016

LMN Architecture Urban Design Interiors

TABLE OF CONTENTS

EWU Interdisciplinary Science Center — Schematic Design
Cheney, Washington — May 27, 2016

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Cheney, Washington

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May 27, 2016

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END OF SECTION

BACKGROUND

Between 2009 and 2014, predesign studies were completed for Eastern Washington University's Science I (Physics and Chemistry) and Science II (Biology and Geology) facilities, which were originally envisioned as replacements for the existing 53-year old Science Building. To make the upgrade of science facilities more feasible, the space programs from the predesign studies evolved into a single Interdisciplinary Science Center that will be attached by enclosed walkways to the existing building. The existing building will be renovated in a future project.

PROJECT GOALS

Goals for the Interdisciplinary Science Center were established by the steering committee in November 2015. The new building should:

- Improve the quality and safety of science teaching facilities at EWU,
- Work together as a single unit with the Science Building,
- Promote interaction between its users,
- Be low maintenance,
- Provide laboratories that are safe and flexible,
- Fulfill as many needs as possible, and
- Be designed in a way that will help EWU acquire funding for construction.

BUILDING SITE

The building will be located on the EWU campus in Cheney, to the northeast of and adjoining the existing Science Building. The building will parallel Science and be spaced roughly equally between Science and the neighboring Pence Union Building. This site was originally identified in the 2010 Science I predesign site selection. The Reed School site which was the favored site option in that study, is not a feasible site for the Interdisciplinary Science Center (ISC) due to the inability to physically connect a new building to the existing Science Building. The site selected for the ISC prevailed over several other candidate locations that could also have fulfilled the connection requirement.

The ISC will be connected to Science via bridges that serve as pedestrian corridors. The east bridge will connect Levels 1 and 2 to Science, and the west bridge will connect Level 2 to Science.

BUILDING PROGRAM

The new Interdisciplinary Science will house teaching laboratories, lab support facilities, student study areas, offices and a 100-seat classroom. Each of EWU's four science disciplines will have teaching laboratories in the new building.

The following table compares the programmed areas to the measured area in the schematic design documents. A subtle but significant difference in the measurement of areas should be noted – the programmed areas for all the laboratories include the spaces for the door alcoves that are actually outside the laboratories. The actual measured areas count the alcoves as part of the corridor.

ID	Space Name	Occu-pants	Program Area (ASF)	SD Measured Area (ASF)	Difference (ASF)
CHEMISTRY/ BIOCHEMISTRY					
TEACHING LABORATORY					
1.01	General Chemistry 1	24	1,280	1,195	(85)
1.01	General Chemistry 2	24	1,280	1,195	(85)
1.01	General Chemistry 3	24	1,280	1,195	(85)
1.01	General Chemistry 4	24	1,280	1,195	(85)
1.02	Organic Chemistry 1	20	1,600	1,519	(81)
1.02	Organic Chemistry 2	20	1,600	1,507	(93)
1.03	Biochemistry/Forensics	24	1,280	1,221	(59)
Subtotal Teaching Laboratories			**9,600**	**9,027**	**(573)**
LAB SUPPORT					
1.11	Organic Chem Prep		320	300	(20)
1.12	Stock: Glassware/Consumables		680	573	(107)
1.13	Stock: Chemical Storage		460	392	(68)
1.14	Stock: Prep Room		320	357	37
1.15	Microscopy		320	300	(20)
1.16	NMR Room		160	300	140
Subtotal Lab Support			**2,260**	**2,222**	**(38)**
OFFICE					
1.21	Technician Office	2	120	121	1
1.22	Faculty Office	1	140	140	0
Subtotal Office			**260**	**261**	**1**
	Total Chemistry/Biochemistry Area		**12,120**	**11,510**	**(610)**
PHYSICS					
TEACHING LABORATORY					
2.01	Mechanics Lab	24	1,280	1,196	(84)
2.02	Instrumentation/ Heat & Optics Lab	24	1,280	1,188	(92)
2.03	General Physics Lab	56	1,600	1,519	(81)
2.04	Advanced Physics Lab	12	960	906	(54)
Subtotal Teaching Laboratories			**5,120**	**4,809**	**(311)**
LAB SUPPORT					
2.11	Physics Prep Room		640	591	(49)
2.12	Radioisotope Room		80	78	(2)
2.13	Dark Equipment Room		240	218	(22)
2.14	Advanced Lab Stock Room		320	300	(20)
2.15	General Physics Prep Room		320	297	(23)
Subtotal Lab Support			**1,600**	**1,484**	**(116)**
OFFICE					
2.21	Technician Office	1	120	119	(1)
Subtotal Office			**120**	**119**	**(1)**
	Total Physics Area		**6,840**	**6,412**	**(428)**

ID	Space Name	Occu-pants	Program Area (ASF)	SD Measured Area (ASF)	Difference (ASF)
BIOLOGY					
TEACHING LABORATORY					
3.01	Intro/General Biology 1	24	1,280	1,195	(85)
3.01	Intro/General Biology 2	24	1,280	1,195	(85)
3.01	Intro/General Biology 3	24	1,280	1,195	(85)
3.01	Intro/General Biology 4	24	1,280	1,195	(85)
3.02	Anatomy & Physiology 1	24	1,280	1,197	(83)
3.02	Anatomy & Physiology 2	24	1,280	1,225	(55)
3.03	Physiology	24	1,280	1,197	(83)
3.04	Molecular Biology	24	1,280	1,197	(83)
3.05	Microbiology	24	1,280	1,182	(98)
3.06	Cell Biology/Embryology	24	1,280	1,197	(83)
Subtotal Teaching Laboratories			**12,800**	**11,975**	**(825)**
LABORATORY SUPPORT					
3.11	Cadaver Room		960	930	(30)
3.12	Physiology Prep		320	345	25
3.13	Tissue Culture		320	300	(20)
3.14	Media Prep		960	937	(23)
3.15	Biology Stock Room		960	925	(35)
Subtotal Lab Support			**3,520**	**3,437**	**(83)**
OFFICE					
3.21	Technician Office 1	1	120	130	10
3.21	Technician Office 2	1	120	120	0
Subtotal Office			**240**	**250**	**10**
Total Biology Area			**16,560**	**15,662**	**(898)**
GEOLOGY					
TEACHING LABORATORY					
4.01	Historical Geology/ Paleontology	24	1,280	1,197	(83)
4.02	Sedimentology & Stratigraphy	24	1,280	1,238	(42)
4.03	Structures/ Tectonics	32	1,600	1,513	(87)
4.04	Geotech Engineering	24	1,280	1,190	(90)
4.05	Earth Materials	32	1,600	1,513	(87)
4.06	Geochemistry	16	1,000	1,053	53
Subtotal Teaching Laboratories			**8,040**	**7,704**	**(336)**
LAB SUPPORT					
4.11	Geo Prep		320	270	(50)
4.12	Geotech Prep		480	437	(43)
4.13	Geotech Project Room		160	135	(25)
4.14	Earth Materials Prep		320	343	23
4.15	Geochemistry Alcove		160	157	-
4.16	Geochemistry Balance		120	80	-
4.17	Geochemistry Instrument Room		640	526	-
4.18	Geochemistry Prep Room		320	270	-
Subtotal Lab Support			**2,520**	**2,218**	**(95)**
OFFICE					
4.21	Technician Office	1	120	129	9
Subtotal Office			**120**	**129**	**9**
Total Geology Area			**10,680**	**10,051**	**(422)**

ID	Space Name	Occu-pants	Program Area (ASF)	SD Measured Area (ASF)	Difference (ASF)
SHARED FACILITIES					
CLASSROOM					
5.01	100-seat Classroom	100	2,200	2,449	249
5.02	Storage for Classroom		160	147	(13)
5.03	Prefunction for Classroom		0	708	708
Subtotal Classrooms			**2,360**	**3,304**	**944**
OPEN FACILITIES					
5.11	Collection Display Cases		500	500	0
5.12	Seismograph Display		60	60	0
5.13	Student Lounge	32	800	848	48
5.14	Student Study	100	2,500	4,105	1605
Subtotal Open Facilities			**3,860**	**5,513**	**1,653**
OTHER SERVICE FACILITIES					
5.21	General Storage 1 (ground level))		320	329	9
5.21	General Storage 2 (level 3)		320	316	(4)
5.22	Hazardous Waste Holding		120	135	15
5.23	Cylinder Holding		120	93	(27)
5.24	Custodial Bulk Storage		150	81	(69)
Subtotal Other Facilities			**1,030**	**954**	**(76)**
	Total Shared Facilities Area		**7,250**	**9,771**	**2,521**

Total Assignable Area		**53,450**	**53,406**	**(44)**
Net/Gross Ratio (Estimated & Actual)		55.0%	54.4%	
Gross Bldg Area (Estimated & Actual)	**(GSF)**	**97,182**	**98,198**	**1,016**
Gross Area of Bridges	(GSF)		2,166	
Renovation Area in Science Building	(GSF)		2,005	
Total Project Area	**(GSF)**		**102,369**	

DESIGN CONCEPT

The new Interdisciplinary Science Center is to function as a highly connected extension of the existing Science Building. The building's site presents an opportunity for the Science Department to have a front door on the university's central public space, the "Quad". The design of the site and building respond to these opportunities by creating a contextual yet unique new addition to this significant campus space. The new science complex will also serve to augment and frame a reimagined pedestrian corridor connection (the "Mall") between the main campus and the athletics facilities across Washington Street.

Recognizing these goals, the new building will present itself as a contextually sensitive brick form whose scale and fenestration is compatible with its neighboring buildings. To create a welcoming environment between the existing and new buildings, the two will be attached with highly transparent glass bridge structures which will unite their internal program elements. The primary entries, social spaces, and study areas of the new building will be expressed in transparent crystalline glass enclosures, giving these important functional spaces additional daylight and allowing visual and social interaction between inside and outside. To more effectively capture this intent, these enclosures will be uniquely detailed elements that emphasize their non-orthogonal geometry which aims to create a distinctive character to each space.

Internally the building will be anchored by its main entries at the east and west ends, where the glassy entry conditions allow for views beyond the building from within its long central corridor. The building's main vertical circulation elements and the connecting glass bridges are also located near the building ends, creating an intuitively connected science complex. The 4 floor stack of double-loaded corridors framed by these end elements allows for maximum connectivity of the lab and classroom components within. Significant gathering spaces included in the building include a large entry lobby area at ground level and level 1, a 100 seat lecture hall with pre-function space at ground level, and a department common and outdoor patio space on level 3.

PROJECT OVERVIEW

Project Address EWU ISC Building

The Eastern Washington University Integrated Science Center will be located north of the existing Science Building, near the Pence Union Building (PUB) and the tower residence halls. Vehicular access to the site will be from the PUB loading dock, and through the existing science building. The new building will be 3-floors over a partial ground floor; pedestrian bridges will connect to the existing science building.
The site is currently developed with landscape and pedestrian pavements between adjacent buildings. Existing campus and City of Cheney utilities are under the site.

Earthwork –
Site soils consist of fills over bedrock. The site is over an old street right of way that was filled in early on the campus history. Abandoned utilities may be found under the site.
Existing soils will be excavated to depth for the building and foundation construction, the geotech recommends an additional 2-foot over excavation, backfill and compaction with structural soils below the new building slab-on-grade floors.
Assume export and disposal of all soils, limited space on the site to store soils.
Mass excavation, over excavation and layback of soils, 9,537-CY, export
Backfill and replacement of building excavation 2,477-CY, export
Site grading 2,366-CY cut

Site Paving –
Site paving to be defined by landscape, will consist of concrete walks and stairs. The east side will need to coordinate with the Campus standard pre-cast pavers.

Storm Drainage –
This project will be required to provide flow control for the increase in impervious surfaces created by the new building and paving. The geotechnical engineer has recommended not infiltrating into the surrounding soils, a detention system under the building will provide mitigation for the collected storm water. A 3,000-CF concrete vault and control structure under the west end of the building, beyond the ground floor, and under the Level 1 floor is proposed. This system will be connected with a pipe to the City storm system in Elm Street. Approximately 450-LF of 8-inch pipe through the PUB service drive will be needed.
An alternate detention tank could be constructed from 244-LF of 4-foot diameter concrete pipe, installed under the building. The tank could be in 4-parallel runs of 65-foot each. Manholes for access and cleaning will need to be provided into the floor above. This area will be coordinated with the trash/maintenance room on level 1 of the building.
In the current project scope, storm water quality treatment is not required, but if vehicle use pavements over 5,000-SF are proposed, a water quality treatment system will be needed for water collected off those surfaces.

Water Service –
Water for domestic and fire protection uses is available from a campus owned main near the west end of the proposed building. The existing main may support the dorms and the existing science building. Part of this main will need to be re-constructed out from under the new building.
At this time, a 4-inch domestic and a 6-inch fire service are proposed for the new building. Meters and backflow prevention devices will be installed inside the building mechanical space. A Fire Department Connection to the building fire sprinkler will need to be mounted out on Elm Street with a long run of dry pipe to the building. All water pipe shall be C900 PVC with iron fittings. The iron portions of this system will need to be polyethylene wrapped for protection from the corrosive soils.
Water mains and systems in this area are University owned, maintained and operated.

Sanitary Sewer Service –
A City sewer main under the west end of the new building will need to be relocated and existing side sewers re-connected. This existing sewer may serve the dorms to the west.
New connections from the west end of the building could be made to this sewer, but it is shallow, and could only take waste from upper floors of the new building.
Primary sewer connection from the building is expected to be to a city sewer system to the east of the new building, with an 8-inch side sewer from the building to the existing manhole. The manhole will need to be re-channeled for the new pipe. Pretreatment of lab wastes will be inside the building.
Connection to this existing manhole will allow a minimum sewer connection of 6-feet below the ground floor level.
The sewer mains are part of the City of Cheney system.

Dry Utilities–
A new utility tunnel under a separate project will extend power, steam and communications to the new building.
Existing direct buried power and telecom conduits under the existing landscape will need to be re-routed around this building or through the tunnel to maintain services to the rest of the campus.

DIVISION, 31

- 31 00 00 Earthwork: Excavate, export , backfill with soils per plan and specifications, import structural fill to replace over excavated soils. Place and compact per geotechnical recommendations, specs and plans.
- 31 25 00 Temporary Erosion and Sediment Control: Control water and soils on site during construction so as to keep site workable, and not allow loose soils off site. Use silt fences, inlet protection and other measures as needed to control water and soils. Project will require Construction Storm water coverage under DOE permit.

DIVISION, 32

- 32 12 00 Asphalt Concrete: Per City and State standards pave with asphalt concrete where indicated. 3 to 6-inch depth, over 4-inches crushed base
- 32 13 00 Site Concrete: Sidewalks and plazas 6-inch reinforced walks and 8-inch reinforced drives with class 3000 concrete placed over 6-inches of crushed base.

Install per University, City and State standards. Finish details; colors, patterns, per landscape.

DIVISION, 33

- 33 10 00 Water System: Install new water mains and service from campus water system to building. Pipe Material C900 PVC, with ductile iron fittings and valves. Water system is owned, operated and maintained by University. Installation per City and State standards for water systems. Test and purify completed installations per City and State standards.
- 33 30 00 Sanitary Sewer System: Install new sewer mains and side sewers from City sewer system to building. Pipe Material ASTM 3034 PVC, with matching fittings. Sewer mains are owned, operated and maintained by City of Cheney. Installation per City and State standards for Sewer systems.
- 33 40 00 Storm System: Install storm detention, piping and structures per City and state standards. ASTM 3034 PVC pipe and fittings, concrete manholes and inlets.

PROJECT OVERVIEW

Project Address: Eastern Washington University Campus, Cheney, WA

The existing Interdisciplinary Science Center (ISC) building fronts a significant campus mall that connects the east and west campus, extending northwest from 7th and F Street to Washington Street and the stadium. The proposed building site borders the existing ISC to the southeast, the Pence Union Building (PUB) and parking lot to the north, two dormitory buildings to the northwest, the JFK library to the south and quad to the east.

The proposed landscape will depart from the existing campus character to introduce drought tolerant and xeriscape planting as the primary planting type on the project. The current campus standard of primarily lawn and over story trees will be restored at the edges of the site.

The primary circulation routes will be ADA accessible. The project site involves steep grades that will require some ramps and stairs to connect all routes, but sloped walkways with grades of 5% or less can be achieved in most areas.

DIVISION 01: General Conditions

015639 – Temporary Tree and Plant Protection

General: Northwest of the existing science building, the design seeks to protect four of the existing six trees that form an alley at the upper slope leading to the adjacent dormitory. There are several mature existing trees along the perimeter of the site that will be retained. As a result of regrading and building construction it will be necessary to remove the majority of existing trees within the new landscape corridor, these trees will be replaced with a new landscape scheme and in compliance with campus standards.

Products: All trees to be protected with chain link fencing to be installed for the duration of construction.

DIVISION 02: Existing Conditions

024132 – Tree Removal, Site Clearing, Stripping and Grubbing

General: Site clearing to be limited to the limit of work defined on the project documents. Significant regrading of the existing site will impact existing soils and require removal of most existing plant material. Reuse of existing site soils is preferred if soils can meet the specification requirements.

Products: As needed to provide the services listed above.

DIVISION 04: Masonry

044301 – Landscape Stone Masonry

General: Project includes battered site retaining walls with natural stone veneer. Contractor to provide shop drawings and samples for review prior to fabrication.

Products: Work Includes

- Natural stone retaining walls (4-6 distinct stone types to reflect geologic forms of Washington State)

- Natural stone seating wall features

DIVISION 05: Metals

055510 – Landscape Metal Work

General: Site handrails and guardrails along circulation pathways. Contractor to provide shop drawings and samples for review prior to fabrication.

Products: Custom fabricated, stainless steel railing system.

DIVISION 12: Furnishings

129300 – Site Furnishings

General: Site furnishings to include campus standards and custom furnishings, including but not limited to bike racks and waste receptacles. Contractor to provide shop drawings and finish samples for review prior to fabrication.

Products: Prefabricated site furnishings

DIVISION 32: Exterior Improvements

321316 – Exterior Landscape Concrete

General: The project will include construction of CIP concrete stairs, ramps, retaining walls, planters, and seat walls. Concrete shall be of architectural quality with controlled specification of concrete color, cement and aggregate mix. Formwork shall be architectural quality with smooth surfaces. Concrete flatwork to have sandblast or acid etched finish as well as custom pattern of score joints and expansion joints. Heat coils to be installed below select pedestrian routes per mechanical.

In addition to reinforcing the connection from east campus to the west campus stadium, pedestrian circulation has been designed to connect the new ISC building with the adjacent buildings and create equal accessibility.

The campus mall that passes through the site will be graded to accommodate an accessible ramp that follows a meandering path. In two areas tangent to the accessible path, ramps and handrails will help delineate gathering areas and expose the stone work of the canted wall features.

Overall, the site and associated hardscape areas are designed to be durable, easily maintained, respond to the existing topography and aim to enhance and make the pedestrian realm as friendly as possible.

321413 – Unit Paving

General: Areas of specialty paving to occur at new building entrances. Paving to consist of natural stone pavers.

Products: Materials include, but are not limited to the following:

- Natural stone pavers, slip-resistant finish. Stone type and sizes to be determined.
- Precast linear concrete paver. Large Scale Narrow Modular Pavers, 1’x4’. Stepstoneinc.com.

328400 –Irrigation

General: The intent is for all new planting areas to require minimal irrigation or xeriscaping. The limited irrigation that may be required will utilize high efficiency controllers, weather monitoring station and soil sensors to reduce potable water use. Equipment types and models desired by maintenance staff to be provided and is compatible with equipment used elsewhere on campus.

Products: Materials include, but are not limited to the following:

- Main line and lateral line piping.
- Irrigation controller with weather data, rain sensor and soil sensors.
- Drip Irrigation tubing.
- Bubblers.
- Valves and valve boxes.
- Low voltage control wires.
- Quick couplers.

329300 – Soil Preparation and Planting

General: The proposed planting will consist of a combination of drought tolerant evergreen and deciduous trees, shrubs and groundcover that utilizes the principals of xeriscaping, requiring minimal irrigation. The proposed planting palette will be native vegetation with an emphasis on plant associations that coincide with local geological features.

As a result of the construction and regrading it will be necessary to provide new topsoil for all disturbed areas and proposed planting areas.

Products: Materials include, but are not limited to the following:

- Amendment materials for import and site soil.
- Import bioretention soil mixes for bioretention planters.
- Importing planting soils if enough soil has not been stockpiled on site or if it is determined that existing soil after construction is unsuitable as a growing medium.
- Procuring and installing trees, shrubs and ground cover.
- Arborist mulch or river rock mulches.
- Staking or guying of trees.

END OF OUTLINE LANDSCAPE SPECIFICATIONS

PROJECT OVERVIEW – EWU Interdisciplinary Science Center

Project Location: Cheney, WA

The project is located on the Eastern Washington University campus between the existing science building and the Pence Union building. The structure is a four story building that will be used for teaching and research labs for the science disciplines at EWU. The structural design will be performed in accordance with the 2015 International Building Code.

DESIGN CRITERIA

2015 IBC Risk Category

Risk Category III

Floor and Roof Live Loads

Design Loads for the floor and roof systems are as follows:

Use	Live Load
Labs/Classrooms/Offices	125 psf (reducible at columns only)
Corridors/Stairs	100 psf (reducible)
Mechanical Rooms and Penthouse	60 psf (non-reducible)
Typical Roofs	30 psf snow + drift surcharge

Seismic Design Criteria

Special Reinforced Concrete Shear Walls Currently Assumed
Seismic Design Category B
Seismic Soil Site Class C
I_E = 1.25
S_s = 0.32
S_1 = 0.11
SD_S = 0.25
SD_1 = 0.13
R = 5.0
Ω_0 = 2.5
C_d = 5.0

Wind Design Criteria

115 mph Wind Speed
Exposure Category C

MAIN STRUCTURE

The primary structure throughout the occupied floors will consist of conventionally reinforced concrete slabs, beams, and columns. Post-tensioned concrete transfer beams will likely be used in isolated locations. The lateral force resisting system is planned to consist of reinforced concrete shear walls to resist seismic and wind lateral forces, although a moment resisting frame system may also be considered. The majority of the columns will be laid out on a standard lab module and the typical concrete beams will

be designed with extra width to allow for future vertical penetrations for future flexibility.

The floor structure throughout the lab space will meet the VC-A vibration criteria as recommended by the lab consultant. This corresponds to a maximum floor velocity of 2000 micro-in/sec based on a design walking speed of 100 steps per minute at the main east-west central corridor and 75 steps per minute at the remainder of the building.

The main roof structure will also consist of conventionally reinforced concrete slabs and beams supporting a steel framed mechanical penthouse.

The building will be connected to the existing science building by a two-story bridge at the east end and one-story bridge at the west end. The bridges will be steel framed with metal deck and concrete toppings floors and untopped metal deck roofs. The bridge structures will be hard connected to the new ISC building and seismically isolated from the existing building. The new bridge connection will result in increased corridor loading on the existing building. Strengthening of the existing building for this increased loading will be required.

Foundation design will be based on the geotechnical report by GeoEngineers dated April 7, 2016. Ground floor slabs will be supported by compacted structural fill. Columns and walls will be supported by conventional spread and strip footings bearing on rammed aggregate piers. The depth of aggregate piers will vary from approximately 2 feet to 16 feet below finished grade.

SUSTAINABLE DESIGN

Sustainable strategies include the use of materials with high recycled content, such as concrete reinforcing steel, and reducing the building's carbon footprint through the use of flyash or other cement replacement materials in the concrete mix designs.

STRUCTURAL OUTLINE SPECIFICATION

DIVISION 3 – CONCRETE

033000 – Cast-In-Place Concrete

General: Section includes requirements for cast-in-place structural and architectural concrete including foundations, columns, walls, and slabs.

Product: Materials that may be incorporated into the Work include but are not limited to the following:

Concrete: Compressive strength shall be as noted on the structural drawings

Reinforcement: Reinforcing shall comply with ASTM A615 grade 60

033800 – Post-Tensioned Concrete

General: Section includes requirements for post-tensioned concrete required for construction of select beams. Post-tensioned tendons will be ASM A416, Grade 270, 0.5-inch diameter, 7-wire strand, fpu = 270 ksi.

DIVISION 5 – STEEL

051200 – Structural Steel

General: Section includes requirements for structural steel fabrication and erection for beams, columns, braces, and trusses.

Product: Materials that may be incorporated into the Work include but are not limited to the following:

- Wide Flange: ASTM A992 Grade 50, Fy = 50 ksi
- HSS Sections: ASTM A500 Grade B, Fy = 46 ksi
- Pipe Sections: ASTM A53, Type E or S, Fy = 35 ksi
- Angles, Channels, and Plates: ASTM A36, Fy = 36 ksi

053000 – Steel Deck

General: Section included requirements for metal decking for floor and roofs.

BUILDING SYSTEMS

Roofing:

☐ Built-up Bituminous Roofing System main roof
- Top coat Double-Duty Aluminum Coating by Tremco
- Built-up 3-ply cold applied bituminous roofing system
- 1/2-inch thick cover board
- 8-inch thick rigid insulation (R-40) min 25 psi compressive strength mechanically fastened.
- Vapor barrier
- Concrete slab roof deck

☐ Built-up Bituminous Roofing System in mechanical roof.
- Top coat Double-Duty Aluminum Coating by Tremco
- Built-up 3-ply cold applied bituminous roofing system
- 1/2-inch thick cover board
- 8-inch thick rigid insulation (R-40) min 25 psi compressive strength mechanically fastened.
- Vapor barrier
- 5/8-inch thick thermal protection board (glass- mat. water resistant gypsum)
- 3-inch deep metal deck.

☐ Roof Anchors
- 3-inch diameter XXS pipe, hot dip galvanized, with 3/4-inch diameter U-bar hook welded to pipe and 16-inches x 16-inches x 3/4-inch base plate anchored to concrete slab or welded to steel beam at roof metal deck location.

Floors:

☐ Slab on Grade *(Refer to structural narrative)*
- Concrete slab
- Vapor Barrier

☐ Elevated floor slab *(Refer to structural narrative)*
- reinforced concrete floor slab

Exterior Walls:

☐ Precast Brick Wall Panels: **Prefabrication Option One**
- 5/8-inch x 2-1/4-inch x 7-5/8-inch thin-brick
- Brick cast into 6-inch thick concrete panel
- Pattern: Running Bond
- 2-inches rigid insulation
- Water and Air barrier
- 6-inch Metal studs with thermal blanket insulation in stud cavity (R-19)
- Provide finished metal frame system around panels
- Continuous Vapor barrier sheet
- 5/8” Gypsum Board

☐ Thin Brick Wall Panels: **Prefabrication Option two**
- Grout joints with latex admix
- 5/8-inch x 2-1/4-inch x 7-5/8-inch thin-brick
- Thin set latex mortar
- Waterproof membrane (Water and Air barrier)
- 1/2-inch thick cement backer board
- 2-inches rigid insulation
- Metal framing
- 5/8-inch gypsum sheathing
- 6-inch Steel studs with thermal blanket insulation in stud cavity (R-19)
- Provide finished metal frame system around panels
- Continuous Vapor barrier sheet
- 5/8" Gypsum Board

☐ Curtain Wall– at Entry Lobby,
- 2-1/2-inch x 2-1/2-inch Aluminum curtain wall frame with thermally Isolated cap, attached to face of structural steel "T" vertical, horizontal and out of plane supports (Faceted steel support frame work)
- 1-inch insulated glass unit
- Spandrel glass unit where noted (**alternate:** Composite metal panels)
- Fire safing at floor edges as required

☐ Curtain Wall– at Study Areas and Bridge connectors
- 2-1/2-inch x 2-1/2-inch Aluminum curtain wall frame with thermally Isolated cap, attached to face of structural steel "T" vertical and horizontal supports
- 1-inch insulated glass unit (provide colored or opaque glass units on bridge connectors and study areas percentages TBD
- Spandrel glass unit where noted (**alternate:** Composite metal panels)
- Fire safing at floor edges as required

☐ Windows at punched openings
- 2-1/2-inch x 6-inch Aluminum curtain wall frame with thermally Isolated cap
- 1-inch insulated glass unit
- Spandrel glass unit where noted (**alternate:** Composite metal panels)

☐ Metal Panel Wall –Penthouse
- Nominal 2-inch deep formed flat metal panel
- 3-inch deep z-girts
- 2-inch semi-rigid mineral fiber insulation (R-8.6)
- Water and Air barrier
- 5/8" Gypsum Sheathing
- 6" Metal studs w thermal blanket insulation in stud cavity (R-19)
- Continuous vapor barrier sheet
- 5/8" Gypsum board painted

☐ Metal Panel Screen wall
- Nominal 2-inch deep formed flat perforated metal panel
- 4-inch deep z-girts

- Galvanized structure steel (tubes, girts channels and angles)

☐ Metal Panel for Soffits, Fascia and Entrance Alcoves and bridge connectors
- Nominal 2-inch deep formed flat metal panel
- 6-inch metal stud framing.
- R-30 with rigid polyiscyanurate faced insulation impaled to underside of floor deck
- **Alternate:**
  - ▷ 8 mm thick aluminum composite thermoplastic core wall panel
  - ▷ 2-inch deep attachment system with 1/2-inch x 3/4-inch deep reveal

☐ Below grade concrete wall
- Molded sheet drainage panel geotextile faced.
- 2-inch thick extruded polystyrene Insulation (R-10) Min 2'-0" below finish grade
- Hot fluid applied waterproofing
- Vertical Concrete wall

☐ Exposed concrete Wall
- Concrete wall with corbels
- 2-inches of rigid insulation
- 6-inch concrete wall set on concrete corbels below
- Finish as noted on Drawings

☐ Drainable Exterior Louver
- Fixed, extruded aluminum louvers with demountable bird screen on the back

☐ Expansion Joints
- Seismic joints at roof, exterior and interior walls, exterior and interior floors at bridge to new building.

Glass and Glazing:

☐ Exterior

Low-Emission Coating: Low-emissivity coated glass produced by sputter coating technology applied in a vacuum chamber. Coating shall be applied to the #2 surface. Low-emissivity coated glass shall meet the following performance values; values listed have been based on Viracon "VRE1-59 (clear outboard and inboard glass) as indicated below. Other manufacturers will be considered in accordance with requirements of Section 016000 as determined by Architect's approval, meeting both performance and aesthetic values.

Make-up: Nominal 1 inch thick unit with 1/4 inch thick panels and 1/2-inch air space filled with argon.

	Viracon
	VRE1-59
Shading Coefficient:	.38
Daylight Transmittance:	53%
Solar Transmittance:	28%
Daylight Reflectance (out):	30%
Daylight Reflectance (in):	19%

Solar Heat Gain Coefficient (SHGC)	0.33
Winter Night-Time U value:	0.30
Summer Day-Time U value:	0.27

☐ Interior
- Door viewports and relights: 1/4” clear tempered glass
- Relights Fire rated glass
- Windows: 1/4" clear tempered glass
- Guardrails: 1/4-inch clear tempered laminated to 1/4-inch clear tempered glass

Exterior Doors:

☐ Entrance
- Aluminum: 1-3/4” thick by 5” wide top rail and vertical stile with 10” H bottom rail, 1” insulated glass panel with weather stripping
- Hollow Metal Doors: 1-3/4” thick, service or secondary exterior doors w/weather stripping.
- Overhead Coiling Doors: Insulated Overhead Coiling Doors @ loading dock

Interior Doors:

☐ Interior openings:
- Hollow Metal: 1-3/4” thick, back of house doors and frame
- Hollow Metal: Fire rated frame size TBD
- Flush Wood Veneer 1-3/4” thick, solid core door stained, in hollow metal frames
- Aluminum 1-3/4” thick by 5” wide top rail and vertical stile with 10” H bottom rail, laminated safety glass panel
- Aluminum sliding glass door: 1-3/4-inch thick by width 1-inch insulated glass panel with weather stripping
- Integrated metal door Fire and smoke rated door system at new building on bridge.
- Overhead Coiling Fire Counter Door: Stainless steel slats, motorized- 6’-0” H by 6’-0” W housing recess In soffit

Interior Walls:

☐ CMU
- Concrete Masonry Unit: 8-inch thick, fully grouted and reinforced

☐ Gypsum Board on metal studs
- Gypsum Board: 5/8” thick layers on each side of 3-5/8” and 6” metal studs as required to meet fire rating and span. Provide acoustical insulation at walls requiring STC rating.

Interior Floors: Refer to **Part 06 Interior Finishes** for more finish details

☐ Exposed Concrete
- Finish: Polished concrete

☐ Teaching Labs and lab spaces – except as noted below
- Finish: Rubber flooring

☐ Teaching labs and lab support spaces - Micro, Molecular, Cellular, Biochem
- Finish: Welded sheet vinyl with integral coved base

☐ Study Areas
- Finish: Carpet Tile

☐ Tiered Classrooms
- Finish: Carpet Flooring

☐ Offices
- Finish: Carpet Tile

Interior Ceilings:

☐ Corridors, study areas and entry lobby:
- Type: Perforated metal pan ceiling

☐ Laboratories:
- Type: Gypsum soffits, suspended acoustical panel ceilings and opening to structure- painted

☐ Back of House:
- Type: Open to structure

Elevators:

☐ Passenger Elevator:

☐ Passenger and Freight:

Architectural Outline Specifications

DIVISION 01 – GENERAL REQUIREMENTS

011000 – Summary
This section provides description of the project by summarizing the Work required by the Contract Documents. It includes a building type, size, materials and building systems.

012300 - Alternates
This section identifies and describes the alternates that are to be bid on as part of the project. It includes administrative and procedural requirements for alternate bids or proposals include submission and acceptance procedures.

012500 Product Substitution Procedures
This section includes administrative and procedural requirements for consideration of request for substitution during the procurement and construction stages of the project. This will include a "Substitution Request Form"

012600 - Contract Modification Procedures
This section provides for administrative and procedural requirements for making clarifications and proposals for change and modifications to the contract documents. The following are modification forms that are to be provided or are described as part of this section: Request for Interpretation (RFI), Architectural Supplemental Instructions (ASI), Construction Change Directives (CCD), Requests for Proposal (RFP), Change Order Requests (COR), and Change Order (CO).

012900 - Payment Procedures
This section includes administrative and procedural requirements for processing of Schedule of Values, Progress payments and Final Payments. Section will include examples of payment forms and processes to be used.

013100 - Project Management and Coordination
This section includes administrative and procedural requirements for the management and coordination of subcontractors and coordination with other contractors and owner. Section will also provide the description and schedule for meetings and conferences. This would include the content, schedule and process for Preconstruction meetings, Pre-installation and Progress meetings.

013200 - Construction Progress Documentation
This section includes administrative and procedural requirements for scheduling, recording and reporting progress. Also included are construction progress schedules, work plans, submittal schedule, field engineering and final site survey.

013233 – Construction Photographs
This section includes administrative and procedural requirements for employing photographer, media, taking and recording images for existing conditions, construction progress and special events.

013300 - Submittal Procedures
This section provides administrative and procedural requirements for processing of submittals during the construction of the project. The items identified for material or system submittals would include Certificates, Design Data, Field Testing reports, Shop drawings, Product data, Samples

and Sustainable data. Included as part of this section are the following: submittal, construction waste diversion and recycled content of materials forms.

014000 - Quality Requirements

This section includes information for conformance to regulatory requirements, such as building, mechanical, and electrical codes, zoning and other regulations applicable to the project as established by federal, state and local agencies. A list of reference standards applicable to the project abbreviations acronyms and definitions used in construction documents are provided.

014339 - Mock-Ups

This section includes administrative and procedural requirements to provide full size assemblies that incorporate several materials or elements of construction, erected for the Architect's and Owner review and approval of exterior and interior visual features and workmanship. The mock-ups represent quality of materials and workmanship required for the project.

014500 - Quality Control

This section provides administrative and procedural requirements for reactive activities to evaluate completed activities and elements for conformance with the requirements. This includes Field Quality Control Procedures, Testing and Inspection Services for non-structural elements and Testing Laboratory Services.

014510 - Structural Testing, Inspection and Quality Assurance

This section provides administrative and procedural requirements for inspection and testing laboratory services for material, product and construction methods for structural elements of the project. (*Refer To Structural Narrative)*

015000 - Temporary Facilities and Controls *(EWU Standard Specification)*

This section includes requirements for installation, maintenance, and removal of temporary utilities, controls, facilities and construction aids during construction.

015730 - Sustainable Job Site Operations

This section includes requirements for providing a Site protection plan, that eliminates unnecessary site disturbance, minimizes impact on the site's natural (soil and water) functions and eliminates water pollution and water quality degradation

015800 - Project Identification Sign

This section includes requirements for a temporary on-site project identification signs prior to building site clearing. Signs to be erected on site at locations of high public visibility.

016500 - Product Delivery Requirements

This section includes procedures and requirements for the selection of materials, packing, shipping, delivery, storage and handling of products or materials for use on the project.

017123 - Field Engineering

This section includes administrative and procedural requirements for field engineering services including, but not limited to: Survey and field engineering; Verification of information shown on property survey provided by Owner; Submission of property survey showing actual dimensions, locations of foundations; and Certification of Record Drawings.

017300 - Execution Requirements

This section includes general procedural requirements governing execution of the Work including but not limited to preparing, installing and protecting the Work.

017329 - Cutting and Patching

This section includes responsibilities of the Contractor for all cutting, fitting and patching required to accomplish the Work during the construction of the project.

017400 - Cleaning

This section includes requirements for maintaining the site in clean and neat condition during construction of the project. It also includes requirements for final cleaning prior to turning the project over to the Owner.

017419 - Construction Waste Management and Disposal

This section includes requirements that the project shall salvage and/or recycle at least 75 percent (by weight of volume) of all construction, demolition and land clearing waste generated. Requires the contractor to develop a Waste Management Plan for the project.

017500 - Starting and Adjusting

This section includes requirements for the following operations in order prior to requesting Substantial Completion and turning the project over to the Owner. The operations are as follows:

1. Starting of systems
2. Testing, Adjusting and Balancing (Commissioning)
3. Demonstration of Systems
4. Instruction of Owner's designated personnel

017700 - Closeout Procedures *(EWU Standard Specification)*

This section includes administrative and procedural requirements for project closeout. The requirements of this section are in addition to those stated in the General Conditions. This section includes, but is not limited to: Substantial Completion requirements; Final Completion and acceptance requirements; Release of retainage; and Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16

017800 - Closeout Documents *(EWU Standard Specification)*

This section includes administrative and procedural requirements for the processing of submittals at the completion of the project. Submittals including but not limited to: Sustainable design reports; Operation and Maintenance manuals (O&M); project record documents; as-built drawings; as-built specifications; warranties; guaranties; attic stock; extra stock, final survey and maintenance contracts.

018113 –Sustainable Design Requirements

This includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Gold certification based on USGBC's "LEED 2012 for Core and Shell Development." This section to include LEED Scorecard.

018119 - Indoor Air Quality (IAQ) Management Plan

This section includes administrative and procedural requirements to set the following indoor air quality (IAQ) goals for jobsite operations on the project, within the limits of the construction schedule, contract sum, and available materials, equipment, products and services. Setting goals to protect workers on the site from undue health risks during construction and reduce indoor air quality problems to occupants in the completed building before occupancy.

018316 - Building Envelope Design Requirements

This section includes information, data and design requirements that apply to exterior design-build building systems and fabricated assemblies identified in individual specification sections.

019113 - General Commissioning Requirements

This section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies or components created by Commissioning Agent.

DIVISION 02 – EXISTING CONDITIONS

024113 – Selective Site Demolition *(Refer to Civil Narrative)*

DIVISION 03 – CONCRETE

030150 – Floor Repair

General: Section includes floor underlayment, including cleaning, grinding, sanding and other requirements needed for the application of new flooring or over existing flooring finishes to remain in place exceeding finish floor tolerances or new flooring over existing structure

031000 – Concrete Formwork and Accessories *(Refer to Structural Narrative)*

032000 – Concrete Reinforcement *(Refer to Structural Narrative)*

033000 – Cast-in-Place Concrete *(Refer to Structural Narrative)*

033350 – Interior Floor Slab Requirements

General: Section includes Construction and testing requirements for interior floor slabs and supplements requirements of Section 033000 - Cast-in-Place Concrete and the Structural Drawings for the following:

- Concrete materials
- Slab finish
- Curing of slabs
- Moisture and pH testing
- Moisture and pH control(remediation as required)

Floor slab surfaces are to be suitable for installation of floor covering materials. No contract adjustments are allowed, since the Contractor controls construction schedule, concrete work, timing of building enclosure, and temporary facilities such as construction drying. Finishing requirements for interior floor slabs to receive floor covering or polishing

033543 – Polished Concrete Finish

General: Section includes special concrete floor finish through the process of grinding concrete floor slabs, applying Sealer and Hardener, and polishing concrete to specified finish level.

033910 - Concrete Floor Cure and Sealer

General: Section includes requirements and products for colorless, odorless VOC compliant curing and sealer compounds for exposed exterior and interior concrete slabs with steel trowel finishes.

DIVISION 04 – MASONRY

042113 – Precast Concrete Veneer Brick Wall Panel

General: This section includes thin face brick 5/8-inch thick made from clay cast in to 6-inch thick concrete panels.

Alternate: 042500 - Unit Masonry Panels

General: This section includes thin face brick 5/8-inch thick made from clay applied to cement backer board with waterproofing attached to steel studs panel system.

042200 – Concrete Unit Masonry

General: Section includes single wythe concrete masonry units for non-load-bearing interior applications. Section includes 8-inch thick concrete masonry units, standard grey smooth face finish, mortar and grout materials, and reinforcing steel.

DIVISION 05 – METALS

050513 - Fluoropolymer Coatings for Metals (PVDF)

General: Section includes requirements for factory applied and baked high performance organic coating formulated under license, containing minimum 70 percent polyvinylidene fluoride (PVDF) by weight in resin system to aluminum window frames.

051200 – Structural Steel Framing *(Refer to Structural Narrative)*

053100 – Steel Deck *(Refer to Structural Narrative)*

054100 – Cold Formed Metal Framing

General: Section includes cold formed steel framing for exterior non-loading-bearing wall framing, for framing behind exterior cladding assemblies. Includes steel studs: Manufacturer's standard C-shaped steel studs, punched, with stiffened flanges for exterior wall framing.

055000 – Metal Fabrication

General: Section includes products made from shapes, plates, bars, tubes, pipe, iron, stainless steel, and nonferrous metals. These products include miscellaneous steel framing for support for overhead coiling fire counter door, ceiling-hung toilet compartments, countertops and various equipment; loose steel items such as lintels, bearing plates, and weld plates required for other work; miscellaneous steel trim. Items included are metal ladders, suspended grid and gratings.

055100 – Metal Stairs *(Pre-Engineered)*

General: Section includes Trade Contractor engineered and installed standard metal stair systems, including railings assemblies, anchors, supports and other accessories as indicated. Precast concrete treads on metal treads with perforated risers and perforated metal guard rails. Locations: East and west interior exit stairs

055110 – Architectural Metal Stairs

General: Section includes engineered and installed custom metal stair systems, including railings assemblies, anchors, supports, and other accessories as indicated. Treads to be able to accommodate precast concrete with perforated metal risers. Provide 2-inch wide nosing. Location: Interior lobby stair

055200 – Metal Railings

General: Section includes custom fabricated pipe and tube handrails and guardrails meeting all the code requirements for exterior and interior installations that are constructed and installed on back of house stairs and landings. Railing assemblies, wall rails, guardrails and attachments are to resist lateral force of 200 lbs. at any point without damage or permanent deflection.
Handrails to include stainless steel where exposed to public and painted pipe handrails back of house areas.
Guardrail to include perforated metal panels exposed to public and painted pipe at interior exit stairs.
Provide glass guard rails on architectural stair.

055813 - Column Covers

General: Section includes interior square aluminum column covers in entry lobby with factory applied coating.

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

061053 – Miscellaneous Rough Carpentry

General: Section includes wood blocking, nailers, furring, wood sleepers, plywood backing panels and carpentry work which is generally not exposed. The section also includes preservative-treated wood and fire-retardant-treated wood.

062000 – Finish Carpentry

General: Section includes stained wood species painted wood and MDF trim members including wood base, applied wood trim, chair rails and shelving as indicated on drawings.

064100 – Architectural Wood Casework

General: Section includes shop fabricated custom wood veneer casework, plastic laminate casework, and solid surface material for countertops and corridor benches. Also included is cabinet hardware which consists of hinges, pulls, locks, drawer slides, catches, shelf clips and adjustable shelf standards,

064200 – Wood Veneer Paneling

General: Section includes wood veneer panels, wood cabinet panels, wood furring, blocking, shims for installation of panels. Panels to include smooth flush wood wall panels and texture wood veneer wall panels

066100 – Solid Surfacing Materials

General: Section includes solid surfacing, to mimic natural stone, countertops for vanities in toilet rooms and corridor benches. Solid surfacing shall be furnished and installed as part of Work under Section 064100

068316 – Fiberglass Reinforced Wall Paneling

General: Section includes fiberglass reinforced plastic wall panels, moldings for top and bottom of panels, at inside and outside corners and division bar where panels intersect.
Locations: Walls behind mop sinks at janitor closets

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

071413 – Hot Fluid Applied Waterproofing

General: Section includes hot asphalt waterproofing membrane over vertical concrete building surfaces below grade and at top and side surfaces of utility tunnel. Includes rigid insulation filter fabric and molded sheet drainage panels

071813 – Pedestrian Traffic Coating

General: This section includes cold liquid-applied, elastomeric, seamless, waterproof-barrier coatings with integral wearing surface for building areas subject to pedestrian and vehicular traffic, including areas that house equipment such as mechanical, electrical rooms and penthouses over occupied spaces.

071916 – Water Repellents and Graffiti Protection

General: Section includes surface preparation and application clear water repellent treatments and clear graffiti protection of exterior exposed surfaces.

072100 – Thermal Insulation

General: Section includes types of building insulations that reduce heat transfer that conserves energy for both winter heating and summer cooling. The insulation types are ridged extruded polystyrene, fiber glass batt, polyiscyanurate, semi rigid and acoustical batt

072600 – Vapor Retarders, Underslab

General: Section includes vapor retarders, seam tape, pipe boots and detail strips for installation underslab on grade, and indicated on drawings

072700 – Water and Air Barrier

General: Section includes a system of mechanically attached or adhered sheets and fluid applied coatings to stop passage of air at soffits, through wall penetrations, window openings, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

074213– Formed Metal Wall Panels

General: Section includes factory fabricated and formed flat metal soffit and wall panels applied over open framing. Panels are preformed and prefinished factory fabricated using factory-installed, roll-forming machines or are field fabricated using portable roll-formers

074243 –Composite Metal Wall Panels

General: Section includes factory-formed and assembled, aluminum metal composite wall panels fabricated from two aluminum metal facings that are bonded to a solid, extruded fire-

retardant thermoplastic core UV stable; formed into profile for installation method indicated. Include concealed attachment assembly system components, panel stiffeners, and accessories.

075116 Built-up 3-Ply Bituminous Roofing

General: Section includes a built-up 3-ply bituminous membrane roofing systems with a double duty aluminum applied coating including roof insulation, base flashings, vapor retarders, substrate and cover boards, walkways, and auxiliary roofing materials.

076200 – Sheet Metal Flashing and Trim

General: Section includes pre-finished sheet metal flashing assemblies required for roof assembly, roof penetrations, cap flashings, and counterflashing.

077200 – Roof Accessories

General: Section includes pre-manufactured roof curbs, equipment supports and splash blocks.

078400 –Firestopping and Smoke Seals

General: Section includes penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items

079299 – Joint Sealants

General: Section includes elastomeric, latex, and butyl-rubber-based joint sealants for a variety of applications and locations including exterior and interior.

079500 - Seismic Joint Cover Assemblies for Buildings

General: Section includes manufactured expansion and contraction joints and accessories, covers design at exterior and interior to control building expansion and to resist moisture and weather to building locations.
Locations: Intersection of bridges and existing Science Building.

DIVISION 08 – OPENINGS

081113 – Hollow Metal Doors and Frames

General: Section includes fire rated and non-fire rated hollow-metal doors and frames fabricated from steel. It also includes frames for flush wood doors, sidelight, transom, borrowed-light frames and insulated assemblies for exterior doors.

081400 – Flush Wood Doors

General: Section includes fire-rated and non-fire-rated flush wood doors. Solid-core doors are covered, including those with faces of wood veneer

083100 – Access Doors and Panels

General: Section includes wall access doors in interior partition and ceiling assemblies for access to HVAC, plumbing, and fire protection equipment. Doors and frames fabricated from prime-painted steel sheet, metallic-coated steel sheet, and stainless-steel sheet panels and installed in concrete, gypsum board, ceramic tile, and acoustical tile surfaces. Access door and frame assemblies are fire rated or non-fire rated.

083213 – Sliding Aluminum Framed Glass Doors

General: Section includes manually operated, interior sliding aluminum framed glass door system including panel, seals, suspension system, recessed floor track, and accessories with 1-inch insulated glass unit.

083323 Overhead Coiling Counter Doors

General: Section includes power operated overhead coiling doors complete with guides, counterbalance mechanism, operators and controls, and installation accessories actuated by fire alarm system. Overhead coiling a 1-hour rated, non-insulated OHCCD at counter opening

084113 – Aluminum Entrance Doors

General: Section includes aluminum double and single swing doors at entrances and lobbies, both exterior and interior openings, complete with thermal insulated glazing thermally broken door frames at exterior openings. Entrance systems include manual-swing aluminum doors, glass and glazing, door frames, and door hardware.

084413 – Glazed Aluminum Curtain Wall

General: Section includes 2 types of glazed thermally broken aluminum curtain wall for building envelope. All curtain walls will have 1-inch insulated glass with low e-coating and be PVDF coated. 2 types of curtain wall systems include a typical 2-1/2-inch by 6-inch frame for punched openings and the other is a 2-1/2- inch by 2-1/2-inch frame attached to a steel “T” framing support

087100 – Door Hardware *(EWU Standard Specification)*

General: Section includes Finish Hardware required for all doors, hollow metal, wood, and aluminum entrance doors. Minimum Hardware Grade: Comply with "Grade 1", or highest available grade in respective ANSI BHMA 156.xx standards.
Card key readers typical on all doors
Finish: Satin stainless steel (US26D) or (US32D) where noted.

087113 - Power (Low Energy) Door Operators *(EWU Standard Specification)*

General: Section includes work for ADA, low-energy force, floor concealed power door operator for single and double entrance doors. Provide on two pair of doors each of the three at the entry vestibules.

087170 Door and Hardware Installation

General: Section includes additional information as to the hanging of swing doors, installation of hardware and adjustment and lubrication of hardware.

088100 – Glass and Glazing

General: Section includes glazing for curtain wall systems, vision lights and other glazed assemblies. Sealed glass insulated units with Low-e coatings along with setting and glazing materials and accessories. Silvered flat glass mirrors: Typical unit mirrors in restrooms. Materials: ASTM C 1503 mirror glazing quality.

089100 – Louvers

General: Section includes aluminum, fixed, stationary, horizontal storm resistant architectural louvers for wall locations with free area of 50%

DIVISION 09 – Finishes

092216 – Non-Structural Metal Framing Assemblies

General: Section includes non-load-bearing steel framing used to support interior partitions and suspended ceilings finished with, gypsum board, and similar products. It also includes metal furring applied to interior surfaces of concrete and masonry walls.

092350 – Glass Fiber Reinforced Gypsum

General: Section includes glass fiber reinforced sculptured gypsum panels for interior wall application. Wall panels in 3 dimension forms combined into custom form liners to create panels without exposed fasteners or supports.

092900 – Gypsum Board

General: Section includes interior gypsum board, exterior gypsum board for ceilings and soffits, tile backing boards, trim, shaft wall assemblies (including related framing), and drywall finishing to receive applied finishes indicated. Sound attenuation insulation installed within gypsum board partitions

093000 – Tiling

General: Section includes tile for floor, and base wall applications, with stone threshold, ceramic and metal trim, setting materials that include mortar, epoxy grout all areas, uncoupling, crack isolation and waterproof membrane.

095113 – Acoustical Panel Ceilings

General: Section includes acoustical ceiling systems composed of acoustical panels and metal suspension systems.

095460 –Metal Ceiling Panels (LMC-1)

General: Section includes suspended metal grid ceiling system and perimeter trim, formed perforated metal ceiling panels for interior installation.

096500 – Resilient Flooring and Accessories

General: Section includes resilient vinyl sheet flooring with welded seams and integral cove base, rubber flooring, rubber base and transition strips from different type of flooring material.

096813 – Carpet Tile

General: Section includes carpet tiles and accessories where scheduled. Four color and types of carpet tiles shall be installed using full spread pressure sensitive (releasable) adhesive.

096813 – Broadloom (Sheet) Carpet

General: Section includes requirements and products defined as tufted carpet, woven carpet, and carpet cushion for commercial installations and accessories.

097723 – Fabric Wrapped Wall Panels

General: Section includes requirements and products for fabric wrapped acoustical panels with installations and accessories for attaching to wall surfaces.

098430 - Acoustical Wood Wall Panels

General: Section includes acoustical wood wall and ceiling panel systems composed of wood veneer panels. Acoustical wood veneer panels to be installed in a ceiling and a wall system.

099000 – Painting and Coating

General: Section includes Preparation of surfaces both exterior and interior. Painting and finishing of all exposed-to-view interior and exterior surfaces. All exposed to view surfaces

099600 – High Performance Coatings

General: Section includes special field applied paint coating system for exposed structural and metal elements.

DIVISION 10 – SPECIALTIES

101100 – Visual Display Units

General: Section includes dry erase fixed Egan full wall white marker board and vertical sliding units in tiered classroom and tackable wall surfacing.

101400 – Code Signage

General: Section includes Code signage as required by the current International Building Code or the ICC/ANSI 117.1. Provide accessible entrance and exit signs, exit stair signage, accessible parking stall signage, signage for egress doors with locks, maximum room occupancy signage, and other signage required by code.

102113 – Toilet Compartments

General: Section includes ceiling hung and wall braced phenolic toilet compartments and wall hung urinals screens.

102116 – Prefabricated Shower Unit

General: Section includes a prefabricated shower unit to include walls, floor pan with drain. Location: Bicycle shower room.

102813 – Toilet Accessories

General: Section includes toilet accessories for restrooms. Accessories shall be designed for recessed wall mounting or surface mounting where on toilet partitions.

102600 – Wall and Corner Guards

General: Section includes wall protection and corner guard protection for areas of high abuse. Corner protection to consist of stainless steel; width of wings shall be 3-1/2 inches

102813 – Toilet Accessories

General: Section includes toilet accessories for restrooms. Accessories shall be designed for recessed wall mounting or surface mounting where on toilet partitions.
Toilet paper dispensers, paper towel dispensers, soap dispensers and waste receptacles to be furnished and installed by Owner.

104116 – Emergency Key Cabinets

General: Section includes Fire Department (FD) 'Lockbox' for exterior and interior locations. Style: Knox 3200 Series; recess type with either swing or lift off cover acceptable to the Fire Department (FD) Fire extinguishers shall be 10 lbs ABC type provided by Owner

104000 – Fire Protection Specialties

General: Section includes fire-protection cabinets for fire extinguishers. Fire extinguishers shall be 10 lbs ABC type provided by Owner

105113 Metal Lockers

General: Section includes double tier lockers, 12 inches wide by 18 inches deep by 36 inches high and 72 inches overall high, to be located in corridor outside bicycle locker room.

DIVISION 11 – EQUIPMENT

112429 – Facility Fall Protection

General: Section includes stainless steel roof safety anchors for fall protection without 42-inch high parapets compliance with WAC 296.

DIVISION 12 – FURNISHINGS

122413 – Roller Window Shades

General: Section includes requirements for window darkening and blackout shades.
Locations: Manual operated darkening roller shades at exterior windows in classrooms and laboratories and selective relight windows. Motorized darkening roller shade at south facing study areas. Manual blackout shades at two laboratories

125633 – Fixed Classroom Tables

General: Section includes custom fixed height tables with perforated metal modesty panels and podium systems.

128413 – Entrance Mats and Frames

General: Section includes recessed roll-type walk off mats at entrance lobbies and vestibules.

DIVISION 14 – Conveying Equipment

142123 – Electric Traction Elevator

General: Section includes requirements and products for a machine room less elevators (MRL)

WEST ELEV Passenger Elevator

- Capacity: 2,500 lbs.
- Class loading: Passenger; Class A
- Contract speed: 200 Fpm
- Machine: Gearless
- Machine Location: Overhead in hoist way
- Stops and Openings: 4 stops/front & rear openings
- Travel distance: 32’-0”
- Platform Size: 6’-8 1/2” W x 4’-3 1/4” D minimum
- Entrance Size: 3’-6” W x 8’-0” H
- Entrance Type: Single speed, center opening
- Car enclosure: Steel shell, interior custom finishes

EAST ELEV Passenger & Service Elevator

- Capacity: 4,500 lbs.
- Class loading: Passenger and Service; Class A
- Contract speed: 350 Fpm
- Machine: Gearless
- Machine Location: Overhead in hoist way
- Stops and Openings: 4 stops/front opening
- Travel distance: 47’-0”
- Platform Size: 5’- 8” W x 8’- 0” D minimum
- Entrance Size: 4’-0” W x 7’-0” H
- Entrance Type: Single speed, center opening
- Car enclosure: Steel shell, interior custom finishes

END OF SECTION

Interior Finish Schedule

BASEMENT

TUNNEL CONNECTION

Floor:	CONC-S6	Sealed Concrete
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on Concrete
Ceiling:	OTS	Open to Structure
Equipment:	N/A	
Furniture:	N/A	
Other:	N/A	

MACHINE ROOM

Floor:	RSF-1	Resilient Sheet Flooring, Rubber
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB & Concrete
Ceiling:	OTS	Open to Structure
Equipment:		Fixed Data Racks
Furniture:		Shelving (FF&E)
		Worktables (FF&E)
Other:	N/A	

MACHINE ROOM AHU

Floor:	CONC-S6	Sealed Concrete
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB & Concrete
Ceiling:	OTS	Open to Structure
Equipment:		AHU
Furniture:	N/A	
Other:	N/A	

BIKE STORAGE, 50 BIKES

Floor:	CONC-S6	Sealed Concrete
Base:	RB-2	Resilient Base at GWB walls
Wall:	PNT-1	Paint on GWB & Concrete
Ceiling:	OTS	Open to Structure
Equipment:		Dero Wall Mounted Bike Racks (FF&E)
		Dero Bike Workstation (FF&E)
		Dero Double Floor Mounted Rack (FF&E)
Furniture:	N/A	
Other:	N/A	

ENTRY VESTIBULE

Floor:	WOM-1	Walk-Off Mat
Base:	PTB-1	Porcelain Tile Base
Wall:	PNT-1	Paint on GWB
Ceiling:	AWCP-1	Acoustic Wood Ceiling Panels
Equipment:	N/A	
Furniture:	N/A	
Other:	N/A	

HALLWAY

Floor:	CPTT-1	Carpet Tile
Base:	RB-2	Resilient Base
Wall:	PNT-1	Paint on GWB
Ceiling:	AWCP-1	Acoustic Wood Ceiling Panels
Equipment:	N/A	
Furniture:	N/A	
Other:	N/A	

GROUND FLOOR

PREFUNCTION LOBBY

Floor:	PTF-1	Porcelain Tile
Base:	PTB-1	Porcelain Tile Base
	MTL BASE-1	Metal Base, 6”
Wall:	PNT-1	Paint on GWB
	WWP-2	Wood Wall Panel System at Stair
	DECO MTL-1	Metal Wall Panels
	DECO MTL-1A	Metal Wall Panels, Perforated
	ACIP	Architectural Concrete at Elevator Core
Ceiling:	AWCP-1	Acoustic Wood ceiling panels
Other:	SHD-1	Motorized Roller Window Shades, Sun Control

LECTURE HALL, 240 PERSON TIERED

Floor:	CPT-1	Broadloom carpet
Base:	MDF BASE-1	MDF Base, Painted
Wall:	PNT-1	Paint on GWB
	AFWWP-1	Acoustic Wall Panels, Front 1/3 of Room
	SFWPS-1	Stretched Fabric Wall Panel System, 2” Thick Absorptive Material, 2/3 of Side and Rear Walls
Ceiling:	AWCP-1	Acoustic Wood Ceiling Panel, Front 1/3 Sound Reflective, Back 2/3 Sound Absorptive
		Recess for Projector Screen
Equipment:	MKR BD-1	Fixed Marker Boards, 15x20, Qty. TBD
		Projection Screen
		Ceiling Mounted Projector
Furniture:	CHR-1	Fixed Theater Seat, Qty. 240
		Lectern with UW Standard Classroom Equipment
Other:	CLOCK	Wall clock (FF&E)
	SHD-3	Motorized Roller Window Shade, Dual Sun Control and Blackout

LECTURE HALL CONTROL ROOM

Floor:	CPT-1	Broadloom Carpet
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB
Ceiling:	APC-3	Acoustic Panel Ceiling
Equipment:		AV Equipment Rack
Furniture:		Chairs (FF&E)
Other:	CAB-3B	Fixed Work Counter

LECTURE HALL SOUND LOCKS

Floor:	CPT-1	Broadloom Carpet
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB
	SFWPS-1	Stretched Fabric Wall Panel System, 2” Thick, Covering 2/3 Walls
Ceiling:	APC-1	Acoustic Panel Ceiling
Other:	N/A	

CLASSROOM, 100 PERSON FLAT

Floor:	CPTT-1	Carpet Tile
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB
	SFWPS-1	Stretched Fabric Wall Panel System, 2” thick Absorptive Material on Two Perpendicular Walls
Ceiling:	APC-1	Acoustic Panel Ceiling Cloud (+/- 2’-0” gap at perimeter) Recesses for Projector Screens
Equipment:	MKR BD-1	Fixed Marker Boards, Qty. TBD Dual Projectors and Screens Lectern with UW Standard Classroom Equipment (FF&E)
Furniture:		Mobile Tables and Chairs (FF&E)
Other:	CLOCK	Wall Clock (FF&E)
	SHD-3	Motorized Roller Window Shade, Dual Sun Control and Blackout

CLASSROOM STORAGE

Floor:	CONC-S4	Sealed Concrete
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB
Ceiling:	APC-1	Acoustic Panel Ceiling
Equipment:	N/A	
Furniture:		Shelving (FF&E)
Other:	N/A	

CLASSROOM AV

Floor:	CONC-S4	Sealed Concrete
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB
Ceiling:	APC-1	Acoustic panel ceiling
Equipment:		
Furniture:		
Other:	N/A	

RESEARCH / MEETING, 40 PERSON FLAT

Floor:	CPTT-1	Carpet Tile
Base:	RB-1	Resilient Base
Wall:	PNT-1	Paint on GWB
	SFWPS-1	Stretched Fabric Wall Panel System, 2” Thick Absorptive Material on Two Perpendicular Walls
Ceiling:	OTS	Open to Structure
	INSUL-12	Bonded Acoustical Cotton Unistrut Grid Recesses for Projector Screen
Equipment:	MKR BD-1	Fixed Marker Boards, Qty. TBD Projector and Screen
Furniture:		Lectern with UW Standard Classroom Equipment (FF&E)

		Mobile Tables and Chairs (FF&E)
		Soft Seating (FF&E)
Other:	CLOCK	Wall Clock (FF&E)
	SHD-1	Motorized Roller Window Shade, Sun Control

LABORATORY NARRATIVE

Laboratory Planning

The design and organization of the laboratories and support spaces is derived from functional priorities and systems flexibility. A laboratory planning module has been integrated into the building to optimize area utilization, flexibility, ergonomics, safety and accessibility in the research and support laboratories. The schematic building design incorporates this laboratory planning module for the design of building structure, mechanical, plumbing and electrical system distribution as well as laboratory room and bench layouts.

Flexibility & Adaptability

A range of teaching types have been accommodated in the laboratories with the development of fixed, adaptable and flexible components. Distributed utilities will anticipate changes in projects over the life of the building. Flexibility and transparency has been provided within and between laboratory spaces.

Laboratory Safety

Laboratory safety has been introduced within the ergonomics and clearances of the selected planning module, proposed fume hood locations and combined safety shower & eye wash unit locations. Additional safety features including hazardous materials protocols, ventilation rates and service paths that have been designated and will be developed in subsequent design phases.

Accessibility

Accessibility to and within laboratories has been addressed with clearances and accommodations in each space. It is recommended to develop an accessible work area made up of a sink, fume hood and section of bench in each open research laboratory wing. Further articulation of bench heights, knee clearances and fitting reach will be shown in further developed designs.

Support Laboratories

Support laboratories have been developed for common isolated support needs including Geotech Prep/Storage, General Chemistry Stock Room, General Biology Stock Room, Cadaver Room, BMB Prep, Media Pouring, Cold Room, BSL-2 Tissue Culture, Physio Prep, Organic Prep, Microscopy, Earth Materials Prep, Geochemistry Instrument Room, Physics Prep, NMR, Dark Equip. Room, Rad Room, Advanced Lab Stock Room and Geology Prep.

Laboratory Plumbing

Laboratory piped systems distributed throughout the building include: domestic potable water, industrial non-potable water, laboratory waste and vent, purified water, compressed air, vacuum, natural gas and specialty gases. The need for process cooling water for laboratory equipment will be determined in subsequent design phases.

Laboratory piped systems will be flexible and adaptable to changes. The location of the point of connections should be consistent throughout the building for simple identification and maintenance access. Each laboratory space should have dedicated shut-off valves for all piping services. The point of connection isolation valves will be readily accessible. The design of the laboratory piping systems will include appropriate diversities and capacity allowance for future expansion.

Laboratory Electrical

Power from the secondary distribution switchboards should be distributed to laboratory spaces via dedicated panelboards mounted outside individual laboratory spaces. A minimum of 20% spare capacity will be provided in laboratory panelboard space by floor. Lighting and non-laboratory area electrical loads should be served by panelboards that do not supply laboratory loads.

Laboratory spaces will be provided with standby power as appropriate, which typically includes critical equipment, refrigerators, freezers, vacuum pumps, monitoring equipment, and select room ventilation systems.

DIVISION 11 – LABORATORY FURNISHINGS & EQUIPMENT

115310 – Laboratory Casework and Other Furnishings

Wood Laboratory Casework

- Manufacturers:
  - CiF Lab Solutions
  - Diversified Woodcrafts, Inc.
  - Kewaunee Scientific Corporation
  - Mott Manufacturing Limited
  - Approved Substitution.
  - Certified Wood: All wood products used in the fabrication shall comply with the FSC's (Forest Stewardship Council's) Principles and Criteria as required to contribute towards USGBC LEED 2.2 Credit MR7.
  - Low-Emitting Materials – Composite Wood and Agrifiber Products: Composite wood and agrifiber products used in casework products shall contain no added urea-formaldehyde resins, as required to meet USGBC LEED 2.2 Credit EQ4.4.
  - Wood products as listed below shall contain recycled content to contribute towards achievement of the USGBC LEED Green Building Rating System MR Credits 4.1 and/or 4.2.
    - Particleboard plywood cores for door and drawer fronts.
- Wood casework shall be flush overlay design.
- Pulls on doors shall be mounted vertically and on drawers horizontally.
- Lumber shall be plain sawn maple; veneer shall be plain sliced maple.
- Exposed and semi-exposed lumber shall be NHLA Grade FAS; exposed veneer shall be AWI Grade AA; semi-exposed veneer shall be AWI Grade B.
- Grain pattern on door and drawer fronts shall be vertical, matched.
- Materials:
  - Cabinet Cases, Bases, Exposed Backs, and Semi-Exposed Backs: 7-Ply hardwood veneer plywood with hardwood face veneers as specified above.
  - Concealed Cabinet Backs: Dry process S2S hardboard.
  - Drawer Bodies: 9-Ply Finnish or Baltic Birch plywood.
  - Drawer Bottoms: 7-Ply or 9-Ply Finnish or Baltic birch veneer plywood.
  - Drawer and Door Fronts: ANSI A208.1 M3 grade industrial particleboard core plywood with hardwood face veneers as specified above.
- Edgebanding thickness to be 1/8" (3mm).

- Glass in framed doors in tall cases shall be 7/32" (5.5 mm) tempered glass, and in wall and upper cases shall be 1/8 inch (3mm) to 7/32 inch (5.5 mm) nominal tempered glass.
- Chemical resistant acrylic urethane finish applied to unstained surface or over stain of selected color.
- Rail between doors and drawers to be removable (KEKU fasteners).
- Cupboard shelves shall be 1" (25 mm) thick full-depth, 9-ply veneer core plywood.
- Hardware shall be furnished and installed complete including: ¼" (6 mm) diameter stainless steel wire drawer and door pulls, stainless steel 5-knuckle institutional type hinges, zinc-coated steel full-extension ball-bearing drawer slides, adjustable pin-type shelf supports, black rubber or vinyl leg shoes, label holders, adjustable-type spring-actuated nylon roller or magnetic door catches, and spring elbow catches.
- Provide locks on all file cabinet drawers. Provide locks at other cabinet locations as indicated on the drawings.

Metal Laboratory Casework

- Manufacturers:
  - Air Master Systems.
  - Bedcolab Ltd.
  - CiF Lab Solutions
  - Jamestown Metal Products, Inc.
  - Kewaunee Scientific Corporation
  - Mott Manufacturing Limited
  - Approved substitution.
- Environmental Compliance:
  - All steel used in the product fabrication shall comply with the recycled steel content requirements to contribute towards achievement of the USGBC LEED Green Building Rating System MR Credits 4.1 and/or 4.2.
- Metal casework shall be of modern design and shall be constructed in accordance with the recommended practices of the Scientific Equipment and Furniture Association.
- All units shall be of flush front inset construction with intersection of vertical and horizontal case members, such as end panels, top rails, bottoms and vertical posts in same plane without overlap.
- Metal shall be generally 18 gauge (1.3 mm thick) mild steel sheet, except as follows:
  - Corner gussets for leveling bolts and apron corner braces shall be 12 gauge (2.8 mm thick).
  - Hinge reinforcements, case and drawer suspension channels shall be 14 gauge (2.0 mm thick).
  - Top and intermediate front horizontal rails, table aprons and reinforcement gussets shall be 16 gauge (1.6 mm thick).
  - Drawer assemblies, door assemblies and adjustable shelves, shall be 20 gauge (1.0 mm thick).

- Base cabinets shall be constructed to support a uniformly distributed load of 200 lbs. per square foot (9.5 kPa) minimum of cabinet top area (total maximum of 2000 lbs. (8.90 kN)), including working surface without objectionable distortion or interference with door and drawer operation.
- Each adjustable and fixed shelf 4 feet (1219 mm) or shorter in length shall support an evenly distributed load of 40 lbs. per square foot (1.9 kPa), up to a maximum of 200 lbs. (0.89 kN), with nominal temporary deflection, but no permanent set.
- Hardware shall be furnished and installed complete including: ¼" (6 mm) diameter stainless steel wire drawer and door pulls, stainless steel 5-knuckle institutional type hinges, zinc-coated steel full-extension ball-bearing drawer slides, adjustable pin-type shelf supports, black rubber or vinyl leg shoes, label holders, adjustable-type spring-actuated nylon roller or magnetic door catches, and spring elbow catches.
- Finish shall be chemical resistant, high grade laboratory furniture quality electrostatically applied powder coat of selected color, baked to a smooth, hard satin finish.
- Concealed interior parts shall receive corrosion-resistant treatment.
- Fume Hood Cabinets: Purpose-designed metal cabinet with fixed panel above door to conceal cup sink and plumbing
- Corrosives Storage Cabinets: Vented cabinet with corrosion resistant liner designed and labeled specifically for the storage of acids and other corrosive substances, to meet code requirements.
- Flammable Liquid / Solvent Storage Cabinets: Metal cabinet designed and labeled specifically for the storage of flammable liquids and other volatile substances, to meet code requirements.
- Vacuum Pump Cabinets: Vented metal cabinet designed specifically to house small vacuum pumps. Cabinet to be fully lined with sound absorbing material.

Map Storage File

- Manufactured by Mayline, Thermo Fisher Scientific, or approved substitution.
- Stackable steel files for storing maps up to 30 inches x 42 inches (762 x 1067 mm).

Work Surfaces

- 1" (25 mm) thick chemically resistant modified epoxy resin molded work surfaces.
    - All epoxy resin used in the product fabrication shall have a minimum of 10% post-consumer recycled content by weight, as defined by ISO 14021-1999, to contribute towards achievement of the USGBC LEED Green Building Rating System MR Credits 4.1 and/or 4.2.
- Stainless Steel: see Stainless Steel Fabrications section of this specification.
- 1" (25 mm) Solid Laminated Wood: Edge grain maple with edge grain exposed.

Wood Framed Laboratory Tables

- Rails: 3/4 inch x 4-5/16 inches (19 x 110 mm) solid hardwood as specified in wood casework article above, with attached steel corner braces, grooved and screwed into both rails.

- Reinforcing Cross Rails: Solid hardwood, glued into front and back rail grooves and pinned at intervals of not more than 33 inches (838 mm) on center in tables without drawers. Cross rails reinforced with glue blocks.
- Legs: Solid hardwood as specified in wood casework article above, 2 inches x 2 inches (50 x 50 mm) with leg shoe.
- Glides: Adjustable floor glides at each table leg, except at tables with casters.
- Casters: Where indicated on floor plans, provide four heavy duty swivel brake casters per table.
- Tops: as described above.

Steel Framed Laboratory Tables

- Table Frames: 4-1/2 inches (114 mm) high "C" channel front and back aprons, end rails and cross rails.
- Table Drawers: Provide front and back rails; drawer unit, hardware and suspension same as specified for base unit drawers.
- Legs: 2 inches x 2 inches (50 x 50 mm) steel tube with welded leg bracket. Attach legs with two bolts to front and back aprons and weld to end rails. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.
- Adjustable Height Tables: Designed to be user-adjustable through work surface heights of 27” to 40” (686 to 1016 mm).
- Glides: Adjustable floor glides at each table leg, except at tables with casters.
- Casters: Where indicated on floor plans, provide four heavy duty swivel brake casters per table.
- Tops: as described above.

Electronics Bench

- Manufacturers:
    - Edsal Manufacturing Company, Inc.
    - Production Basics, Inc.
    - Tennsco
    - Approved substitution.
- Heavy duty, steel frame bench with upper shelf, integrated electrical receptacles, on-off switch, and power cord.
- Table structure constructed of minimum 16 gauge steel with electrostatically applied epoxy powder coating.
- Work Surface and upper shelf: 1-1/4 inch-thick, electro-static-dissipative (ESD) plastic laminate on industrial-grade particleboard core.

Wall Hung Bench

- Stainless steel wall support and bracket angles.
- Work surface as elsewhere described.

Reagent Shelves: Fixed

- 1 inch (25 mm) thick, 9-ply shop sanded exterior grade veneer plywood shelving with K+ face veneers with chemical resistant plastic laminate on all surfaces.
- Shelf supports shall be Type 304 stainless steel tubing, ASTM A312, 1 inch (25 mm) outside diameter.
- 2 inch (50 mm) high 1/8 inch (3 mm) thick PVC safety edge band applied to face of reagent shelves (four sides) with hot melt glue.

Reagent Shelves: Adjustable

- 3/4 inch (18 mm) thick, 7-ply shop sanded exterior grade veneer plywood shelving with K+ face veneers with chemical resistant plastic laminate on all surfaces.
- 2 inches x 2 inches (50 x 50 mm) fully welded square steel tube support frame with epoxy paint finish, punched to receive shelving brackets.
- 16 gauge (1.6mm thick) profiled shelf bookend brackets with epoxy paint finish.
- ¼ inch (6 mm) diameter stainless steel retainer rail at front and rear edges.

Adjustable Wall Shelves

- 3/4 inch (18 mm) thick, 7-ply shop sanded exterior grade veneer plywood shelving with K+ face veneers with chemical resistant plastic laminate on all surfaces.
- Slotted standards with epoxy paint finish.
- 16 gauge (1.6mm thick) profiled shelf bookend brackets with epoxy paint finish.
- ¼ inch (6 mm) diameter stainless steel retainer rail at front edge.

Heavy Duty Wall Shelves

- 1 inch (25 mm) thick, 7-ply hardwood plywood with chemical resistant plastic laminate on all surfaces and edges.
- 2 inch (50 mm) high 1/8 inch (3 mm) thick PVC safety edge band applied to face of shelves with hot melt glue where required on plans.
- ¼ inch (6 mm) diameter stainless steel retainer rail at front edge.
- Heavy duty shelf standards and brackets as manufactured by Unistrut or Powerstrut.

Stainless Steel Shelving System

- Super Erecta stainless steel shelf system, floor mounted post supported.
- Super Erecta stainless steel shelf system, wall mounted post supported.
- Super Erecta stainless steel shelf system, wall mounted, post supported, high-density configuration.

Open Industrial Metal Shelf Units

- Premium grade 20 gauge (1.0 mm thick) steel shelf units comprised of 5 shelves adjustable on 1” (25 mm) increments, 85” (2159 mm) high 14 gauge (2.0 mm thick) angle post supports, and side and rear cross-bracing as manufactured by Systemax Inc., List Industries, Hallowell, or equal.

Cylinder Restraint Assembly

- Safe-T-Rack Systems, Inc. cylinder rack assembly, or equivalent.

- Unistrut, Powerstrut or equal, No. P-1000 for wall brackets, rails, and legs. Front and rear angle supports shall be Unistrut, Powerstrut, or equal, No. P-1026 and P-1068, respectively.
- Unistrut, Powerstrut, or equal, No. P-1000 for wall bracket with two 2 inches x 2 inches, 11 gauge (50 x 50 x 3.2 mm thick) metal angle supports. Provide top and bottom restrainers of 5/16" (8 mm) diameter, zinc plated, Grade 30 proof coil steel chain fitted with spring or trigger snap shackles.
- Components to be prefinished epoxy paint.

Overhead Service Carriers

- Unistrut channels supported from structure above at 48" (1.2 m) on center maximum.
- 14 gauge (2.0 mm thick) metal channel at bottom for mounting of piped services and electrical raceways.

Overhead Support channel

- Suspended metal channel grid purpose designed to support 200 lb. (0.89 kN) point load at any position and 50 lb./ft. (0.73 kN/m) uniformly distributed load. All brackets, channels, etc. (galvanized metal).

Wall-Mounted Attachment Channel

- Unistrut P-1000, wall-mounted, as equipment attachment channel at locations shown on the Laboratory Furnishing drawings.

Pipe Drop Enclosure

- Typical: 18 gauge (1.3 mm thick) galvanized steel sheet enclosures with removable cover panels and epoxy paint finish.
- At scullery sinks and stainless steel counters, 18 gauge (1.3 mm thick), Type 304 stainless steel enclosures with removable cover panels with a #4 finish.

Drying Rack

- One piece epoxy body, black with white polypropylene pegs.
- 3/4 inch (19 mm) thick clear acrylic (Plexiglas) body with white polypropylene pegs.
- Stainless steel body with white polypropylene pegs and integral drain trough with welded stainless steel trough ends.

Bench-Mounted Support Rods

- 1/2" (12.7 mm) Diameter Stainless Steel Rods and Sockets.

Lattice Rod Assembly

- Rack assembly consisting of ½" (12.7 mm) diameter aluminum rods, rod clamps, and frame feet, as manufactured by Lab-Line Instruments, Inc., or equal.

Cable / Vacuum Line Through Port

- 3 inch (75 mm) diameter wire or cable access through ports of Type 304 stainless steel, #4 finish.

Grommets and Accessories

- Round Cable Grommets: 2-3/8 inch (60 mm) O.D. plastic grommets, Model No. TG-3, as manufactured by Doug Mockett and Co., Inc., or equal complete with removable slotted plastic cover.
- Utility Management Hook: 4 23/32 inch tall, 2 43/64 inch wide type 303 stainless steel hook with polished finish, Model No. 19075A12 as manufactured by McMaster Carr, or approved equal. Will be required at all powered movable tables.
- Air Intake Grilles: Perforated metal mesh grille with a metal frame, Model No. GT, Mesh 1, as manufactured by Doug Mockett and Co., Inc., or equal. Will be required at all AV cabinets and vacuum pump cabinets.

Stainless Steel Fabrications

- Unless otherwise noted stainless steel shall be Type 304, gauge as indicated on Drawings or specifications. All fabrications shall have exposed surfaces ground and polished to a Number 4 satin finish. All stainless steel nuts, screws, bolts, and rivets, etc., shall be of the same type stainless as in the sheet material and shall have a tumbled finish closely resembling that of a Number 4 finish.
- Stainless steel work surfaces shall be 16 gauge (1.6 mm thick), type 304, #4 finish with heavy mastic coating underside and perimeter timber fixing frame.
- Laboratory Sink: Integral one piece construction with stainless steel work surface. 18 gauge (1.3 mm thick) steel unless otherwise noted.
- Scullery Sink: 14 gauge (2.0 mm thick) stainless steel top with integral sink bowls. Provide backsplash, marine edge, drain boards, and leg frame as indicated in Laboratory.
- Canopy Hood: Provide stainless steel canopy with all hangers and miscellaneous hardware at locations and sizes as indicated on the Laboratory Furnishing drawings.

115313 – Fume Hoods and Other Air Containment Units

Chemical Fume Hoods

- Manufacturers:
  - Kewaunee Scientific
  - Labconco
  - Mott Manufacturing Limited
  - Approved substitution.
- Bench Mounted Chemical Fume Hoods:
  - Style: High Performance, General Purpose.
    - Subject to compliance with the requirements listed below, acceptable models include:
      - ◊ Protector XL Benchtop Fume Hood by Labconco Corporation.
      - ◊ RFV2 Bench Fume Hood by Mott Manufacturing Limited.
      - ◊ Supreme LV Bench Fume Hood by Kewaunee Scientific Corporation.

- Type:
  - Restricted bypass type / Variable air volume (VAV) extraction at 80 fpm face velocity.
- Standards: UL 1805 certified.
- Liner:
  - Homogenous polyester, 3/16" minimum thickness.
- Work Surface:
  - Epoxy, dished.
- Cup Sink:
  - Epoxy, raised rim.
- Alarm: Continuously operating fume hood alarm, fitted with remote alarm connections.
- Baffles: Each fume hood shall have an airflow control baffle, removable for cleaning and inspection
  - Fixed.
  - Adjustable with single point control.
- Sash Design:
  - Vertical rising sash, 7/32 inch (5.5 mm) thick laminated safety glass, frameless.
- Shut down Switch: Master switch to be provided to shut down all fume hoods when not in use. The switches would require a key or code to operate.
- Service fittings: Shall be mounted inside the hood and shall consist of valves controlled from exterior vertical posts.
- Testing: Each fume hood shall be tested in the field and shall pass ASHRAE Standard 110-1995 performance tests for flow visualization, face velocity, and tracer gas containment.

- Full-View Chemical Fume Hoods:
  - Style: Full-view. Superstructure shall be glazed on all sides to provide maximum visibility from the surrounding area.
    - Subject to compliance with the requirements listed below, acceptable models include:
      - TruView Fume Hood by Kewaunee Scientific Corporation.
      - Protector ClassMate Laboratory Hood by Labconco Corporation.
      - Observation Bench Fume Hood by Mott Manufacturing Limited.
  - Exterior Depth, Double-Sided: 64-5/8 inches (1641 mm), nominal.

- Design:
  - Restricted bypass fume hoods for variable air volume or constant volume exhaust systems with airfoil. Bypass shall be sufficient in size to allow 25% flow with sash closed. Bypass must be achieved through low resistance opening at top of front lintel panel. Bypass shall be designed to provide a smooth down flow effect.
  - Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.
    - ◊ Fume hoods shall be designed to operate safely at face velocities of 80 feet per minute (0.51 m/s) to 125 feet per minute (0.64 m/s).
  - Lower 34 inches (863 mm) of hood above the work surface shall be a minimum of 75 percent clear glass to maximize sightline.
  - Workstation shall be single-sided or double-sided, as indicated on the drawings. Base cabinets shall be as indicated on the drawings and specified in Section 11 53 10.
  - Design double-sided fume hood workstations with exhaust separation for individual exhaust on each side of the workstation. Provide each side with an independent fume exhaust collar for connection to the mechanical fume exhaust systems. The exhaust air system for each side of the workstation shall operate independently.
- Glazing Gaskets: PVC extrusion.
- Work Surface: 1 ¼ inch (32 mm) dished epoxy resin, in compliance with Section 11 53 10 requirements. Color: Black.
- Airfoil: The airfoil shall allow ample room for electrical hospital grade cords to fit beneath the airfoil. Sill must pivot forward to provide cord and trough access. Bottom horizontal foil shall provide nominal 1 inch (25.4 mm) bypass when sash is in the closed position. Bottom foil shall not be removable without use of special tools. Airfoil shall be steel with urethane or epoxy powder coating.
  - Sill shall consist of a half-round bullnose on front edge. Air foil and sill to be flush with the height of the work surface; airfoil sills that are not flush with the top plane of the work surface dish are not acceptable. A secondary containment trough shall be located in front of the work surface and extend below the airfoil sill.
- Fume hood sash (Vertical): Full-view, frameless type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections. Sash to have a 35 inch (890 mm), nominal, sight line.
  - Counter balance system: Single weight, counter balance system to prevent sash tilting and permit ease of operation at any point along full width pull. Maximum 7 pounds (3 kg) pull required to raise or lower sash throughout its full length of operating sash opening. Design system to hold sash at any position

without creep and to prevent sash drop in the event of suspension system failure.
- Sash Opening: Refer to the Laboratory Equipment Exhaust Schedule on the Laboratory Furnishings drawings for vertical access height clearance.
- Sash Stop: Sash shall automatically self-close to 18 inch (457 mm) position when left at any dimension above the 18 inch (457 mm) working height, except when locked full-open for set-up. A manual, non-exposed lock-open feature shall be actuated from the front post to retain sash in full-open position for set-up.

- Ventilation Slots: Provide vertical ventilation slots along both sides of the enclosure, and provide perimeter exhaust slots to improve airflow through the enclosure.
- End and Center Divider Panels:
  - Typical: Glass framed with glazing gaskets.
  - Opaque Panel Inserts: Provide glass-reinforced polyester resin in lieu of glass panels where backs and sides of fume hood abut opaque walls.

Laminar Flow Hoods

- Manufacturers / models:
  - The Baker Company / EdgeGARD, console type
  - Labconco / Purifier
  - NuAire / LabGard
  - Approved substitution.
- Cabinets shall be equipped with supply HEPA filter and reusable prefilter to maintain Class 100 standard at work area.
- Cabinet exterior shall be heavy gauge, cold rolled steel, baked enamel finish.
- Lipped work surface and side walls at work area shall be type 304 stainless steel.
- Illumination shall be not less than 200 foot-candles (2152 lx) at work surface level.
- Electrical Outlets shall be flush, externally mounted duplex receptacles.
- Provide optional germicidal (UV) light.
- Each cabinet shall be tested prior to delivery for performance and filter leakage and a copy of the results provided with the unit.

Fume Extractor Arms (Snorkels)

- Manufacturers:
  - Airflow Systems, Inc.
  - Alsident Systems A/S.
  - Enviroflex International Inc.
  - Nederman Inc.
  - Plymovent Corporation.
  - Approved substitution.
- Basis of Design:

- Enviroflex 3” (75 mm) diameter Movex.

- Connection to the fume exhaust duct system by Division 23 to provide 100 cfm (169 m³/h) per extractor.

Canopy Hoods

- Custom fabricated stainless steel canopy hoods: See Section 11 53 10, Stainless Steel Fabrications.

115343 – LABORATORY SERVICE FITTINGS AND FIXTURES

Laboratory Service Fittings

- All service fittings shall be white, epoxy coated (ColorTech, or approved equal) specifically designed for laboratory use. All service fittings shall be European design with black plastic handles.
- Replaceable seats, needle cones, valve disc screws and other accessories shall be Monel or stainless steel alloys.
- Operating parts such as valve stems, packing nuts and outlet nozzles shall be made from solid brass stock.
- Water valves shall include a renewable unit containing all the working parts which are subject to wear. All water fittings shall withstand test of 80 lbs per sq. in. (0.55 MPa) water pressure.
- High purity water valves shall be white, epoxy coated cast brass with polypropylene liner. Valve stem and bonnet shall be brass.
- All gas, air and vacuum control valves shall be needle point self-centering valves designed for a supply pressure of 150 lbs per sq. in (1.03 MPa).
- Fittings and fixtures designated to be accessible to persons with disabilities (ADA) with operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N), maximum.

Laboratory Emergency Plumbing Fixtures

- Safety station: Barrier-free safety station with emergency shower actuation valve in stainless steel cabinet for recess mounting and wall-mounted eyewash with stainless steel skirt (Ceiling-mounted exposed showerhead), Water Saver Model No. SSBF670-721, or equivalent.
- Hand held eye wash: Dual-purpose eye wash/drench hose, deck mounted, Water Saver Model No. EW1022-BP, or equivalent.
- Alarm horn: Water Saver Model No. AP280-230, or equivalent.

Sinks

- Cup Sink: Provide cup sinks at fume hoods as described in Section 11 53 13.
- Cup Sink: Epoxy, to be set flush with work surface.
- Epoxy laboratory sinks, for drop-in installation in work surfaces, as manufactured by Durcon Laboratory Tops, Inc., or approved equal.
- Stainless steel laboratory sinks: See Section 11 53 10, Stainless Steel Fabrications.
- Scullery sinks: See Section 11 53 10, Stainless Steel Fabrications.

115350 – Laboratory Equipment

Laboratory Glassware Washers: Base Cabinet Height

- Labconco Corporation, http://www.labconco.com.
  - Model: Flaskscrubber
- Lancer USA, http://www.lancer.com.
  - Model: 815LX
- Miele Professional, http://www.miele-pro.com.
  - Model: G7883
- Steelco, http://www.steelcospa.com.
  - Model: Lab500SCL

Laboratory Sterilizers (Autoclaves): Small

- Manufacturers:
  - Beta Star Life Science Equipment of R-V Industries, Inc., http://www.rvii.com.
  - Consolidated Sterilizer Systems, http://www.consteril.com.
  - Getinge USA, Inc., http://www.getingeusa.com.
  - Primus Sterilizer Co., Inc., http://www.primus-sterilizer.com.
  - Steris Corporation, http://www.steris.com.
- Process Cycle and Chamber Size:
  - Prevacuum, 16” x 16” x 26” (406 x 406 x 660 mm).
  - Prevacuum, 20” x 20” x 38” (508 x 508 x 965 mm).
- Steam source:
  - Electric steam.
- Doors / mounting:
  - Single door, cabinet enclosed unit.
- Loading cart.

115353 – Biological Safety Cabinets

Biological Safety Cabinets

- Manufacturers / Models:
  - The Baker Company / SterilGARD
  - Labconco / Purifier
  - NuAire / LabGard
  - Thermo Fisher Scientific

- Approved substitution.

- Class II, Type A2 Vertical Laminar Flow Biological Safety Cabinets:

  - Basis of Design: Baker SterilGARD series.
  - Cabinets shall be designed to operate with an intake air velocity of 100 fpm (0.5 m/s) and exhaust 30% of the air through the exhaust HEPA filter to the facility exhaust system and 70% through the supply HEPA filter into the work area.
  - Vertical sliding view screen with an 8" (203 mm) access opening and an audible alarm that sounds when view screen is in an unsafe position.
  - Cabinet exterior shall be heavy gauge, reinforced steel, baked enamel finish.
  - Work surface, side walls and front face at work area shall be 16 gauge, type 304 stainless steel with side walls slotted for high velocity air return.
  - Each cabinet component shall be welded, gasketed or assembled with hermetically sealed joints to provide a bubble tight seal when completely assembled.
  - Illumination shall be not less than 100 foot-candles (1076 lx) at work surface level.
  - Cabinet shall satisfy all microbiological aerosol test requirements of NSF/ANSI 49.
  - Each cabinet shall be tested prior to delivery to ensure compliance with Class II, Type A2 requirements and a copy of the results provided with the unit.

116150 – Controlled Environment Rooms

Controlled Environment Rooms

- Summary: Furnish and install laboratory controlled environment rooms complete with all necessary equipment, controls, accessories, and hardware. Coordinate with work with Electrical, Mechanical, Structural and Architectural disciplines to provide a complete and operational installation to perform intended function as specified herein and shown on the Laboratory Furnishings, Laboratory Plumbing, and Mechanical drawings.
- Submittals:

  - Manufacturer's Data.
  - Shop Drawings.
  - Samples.
  - Certification and Testing.
  - Operations Maintenance (O&M) Manuals.

- Quality Assurance: Single source responsibility. Manufacturers shall have a minimum of ten (10) years experience. Installer shall have a minimum of five (5) years experience in the installation of laboratory controlled environment rooms of the type specified herein.
- Warranty: The controlled environment room Contractor shall provide a written guarantee for the following warranties: Five (5) years for each compressor; Ten (10) years for modular panels; Five (5) years for all control panel components including labor; One (1) year parts warranty; One (1) year labor warranty.
- Manufacturers:

  - Bahnson Environmental Specialties, LLC, http://www.eschambers.com.
  - Controlled Environments Inc. (Conviron), http://www.conviron.com.

- Environmental Growth Chambers (EGC), http://www.egc.com.
- Harris Environmental Systems, http://www.harris-env.com.
- Insulated Structures, http://www.insulated-structures.com.
- R.W. Smith & Co., http://www.rwsmithco.com.

- Room Construction:

  - General: Controlled temperature rooms shall be of modular, "sandwich panel", construction. Each panel shall consist of interior and exterior metal skins with a solid core of insulation and shall incorporate an integral mechanical method of fastening and sealing the joints to provide a vapor tight seal. Construction shall allow disassembly for possible relocation or expansion at a later date. Each controlled environment room shall be complete with all necessary environmental conditioning controls, heating, refrigeration and air conditioning systems, lighting systems and all necessary mechanical and electrical components to provide the environmental conditions herein specified and as shown on the construction documents.
  - Door: Controlled temperature rooms shall be provided with a door equipped with and observation window and entrance ramp (where applicable).
  - Instrument and Control System: All instruments, controls and major electrical components shall be located in surface mount control console. Provide LCD color touchscreen microprocessor based temperature and humidity (where applicable) controller with real-time and archive trending. Each room shall be provided with reset type personnel emergency alarm with electrically powered audible and visual alarm system.
  - Lighting: LED lighting mounted above diffusion grating in ceiling plenum shall provide an average light intensity of 75 foot-candles (807 lx) at 36" (914 mm) above floor. LED lights and low temperature drivers to be enclosed in vapor-proof gasketed U.L. Listed fixtures for damp location.
  - Environmental Conditioning System:

    - General: Environmental conditioning system consisting of blower(s), evaporator coil(s), heaters, humidifier (as required), refrigeration piping system and drain pans, shall be housed in modular enclosure(s) suspended from the room ceiling and shall be factory prewired to the control cabinet.
    - Refrigerant: Utilize non-ozone depleting refrigerants R-134a, R-404A, or approved equal; CFC type refrigerant shall not be acceptable.
    - Operation: Each system shall be designed and furnished in such a manner as to allow the motor compressor to operate continuously with a modulating bypass system to maintain specified temperature ranges.
    - Defrost: System shall incorporate an automatic defrost system.
    - Refrigerant Piping: All refrigeration piping required shall be furnished and installed by the controlled temperature room contractor. Provide ACR type, hard drawn, cleaned and capped Type L copper tubing with silver brazed joints.
    - Compressor-Condensing Unit: Compressor-condensing unit to be complete in all respect including base and cabinet and all associated piping, components,

safeties and controls. Compressor shall be a hermetic or semi-hermetic unit designed for on-site maintenance with integral suction and discharge refrigerant service isolation valves. Condenser shall be top-of-room mounted water-cooled or remotely located air cooled as indicated in Controlled Environment Room equipment schedule in Laboratory Furnishings drawings.

- Humidification (where applicable): Provide atomized water spray or centrifugal atomizing unit with constant level water control, sized and controlled for the load conditions and operating specified parameters.
- Dehumidification (where applicable): Provide automatic, continuous duty, desiccant drying system.
- Ventilation: provide make-up air from the laboratory space at the rate of 0.25 CFM per square foot (4.57 m^3/h per square meter) unless otherwise indicated on the drawings. No ventilation air provisions shall be made for freezer rooms operating at or below 0°C.

- Electrical: Room shall be waterproof pre-wired with receptacles, lighting, 120vac, and low voltage control circuits installed. Electrical receptacles shall be NEMA 5-20 120V duplex with weather proof cover. The room shall require two power connections only: one for the condensing unit and one for the control cabinet. Electrical circuits shall be as indicated in Controlled Environment Room equipment schedule in Laboratory Furnishings drawings. Control wiring and conduit between the control cabinet and the condensing unit shall be by the contractor. Provide wall data outlet boxes with individual conduits inside the controlled environment rooms as shown on Laboratory Furnishing drawings.
- Plumbing: All plumbing work inside the controlled temperature room shall be provided by contractor including refrigeration and condensate drain systems.

- Performance:

  - Operating Temperature and Humidity: as specified in Controlled Environment Room equipment schedule in Laboratory Furnishings drawings.
  - Temperature Control: Room temperature shall be maintained within ±1.0°C of the room temperature setpoint. The sensitivity of the temperature control shall be ± 0.2°C or less.
  - Temperature Uniformity: Temperature uniformity shall be ±0.5°C.
  - Humidity Control (where applicable): Humidity shall be maintained at a level to avoid condensation on room surfaces under operating conditions Room relative humidity shall be maintained within ±5% of the room humidity setpoint. The sensitivity, display, setpoint, and response of the humidity controls shall be at 1.0% RH resolution or less.

222000 – Laboratory Plumbing

General Intent of Laboratory Plumbing Specification Section

- The intent of this section is to provide information which is supplemental to all other divisions and sections of the specifications, and in particular to Division 22 Plumbing work, which shall be specifically related to the plumbing construction within the areas defined under the Laboratory scope of work.

Work Included

- Provide complete plumbing systems from point of rough-in and final connections as described in these specifications and as shown on the Contract Drawings. Plumbing installations shall include all piping, valves, connectors and miscellaneous equipment to provide complete operable systems, in accordance with the best practices of the trade.

Products

Piping and Fittings

- Domestic and Industrial Cold, Hot, and Tepid Water:
  - Provide hard copper tube, Type L, seamless, solder joint.
- Process Cooling Water:
  - Provide Type L, hard-drawn, tempered, copper tubing. Fittings shall be wrought copper, solder joint.
- Purified Water:
  - Provide high purity homopolymer polypropylene (PP) pipe and fittings, with socket electrofusion joints.
- Vacuum:
  - Provide Type L, seamless, hard-drawn, tempered, copper tubing. Fittings shall be wrought copper, solder joint.
- Compressed Air:
  - Provide Type L, medical grade, hard-drawn, tempered, copper tubing. Fittings shall be wrought copper, brazed joints.
- Laboratory (Natural) Gas:
  - Provide Schedule 40 black steel pipe. Fittings shall be malleable iron, threaded ends.
- Laboratory Waste and Vent:
  - Provide Schedule 40 flame-retardant polypropylene (PP) single containment pipe with sanitary type fittings.
- General Purity Specialty Gases:
  - Piping: Provide hard-drawn, tempered, medical grade, copper tubing. Fittings shall be brazed or tube and adapter.

Valves

- Domestic and Industrial Cold, Hot, and Tepid Water:
  - Fixture Supply Stop Valves:
    - Provide angle pattern, ¼-turn ball, loose key with lockshield supply stop valve.
  - Shutoff Valves:
    - Provide three-piece, full-port, bronze ball valve with stainless-steel trim and soldered ends.
  - Check Valves:
    - Provide Class 125, bronze swing check valve with nonmetallic disc, horizontal flow, Y-pattern, bronze body, threaded ends.
  - Vacuum Breakers: Provide vacuum breakers on potable water services as accepted by local building Authority.
  - Back Flow Preventers: Provide reduced-pressure-principle backflow preventers on potable water services supplying laboratory equipment, as accepted by local building Authority.
  - Pressure regulators: Provide adjustable water pressure regulators service fitting connection size.
- Process Cooling Water:
  - Shutoff Valves:
    - Provide three-piece, full-port, bronze ball valve with stainless-steel trim and threaded ends.
  - Flow Control Valves: Provide adjustable automatic flow control valve, brass body, female NPT end connections, EPDM seals.
  - Recessed Valve Box:
    - Provide recessed valve wall box, stainless steel with No. 4 finish. Box to be fully enclosed and completely welded to frame to provide leak proof 5-sided enclosure.
    - Valve box to have one-piece outer flange frame welded to box to overlap adjacent wall board for installed finished appearance.
- Purified Water:
  - Control, Branch and Shut-off Valves:
    - Provide homopolymer polypropylene ball valves compatible with piping and fittings.
- Vacuum:

- Shutoff Valves:
  - Provide two-piece, full port, bronze ball valve with bronze trim and soldered ends.
- Check Valves: 150 psi SWP bronze check valve, 300 psi non-shock WOG with renewable bronze disc.

- Compressed Air:
  - Shutoff Valves:
    - Provide two-piece, full port, bronze ball valve with bronze trim and soldered ends.
  - Pressure Regulators: Provide pressure regulator with pressure gauge, adjustable from 10 to 120 psi.
- Laboratory (Natural) Gas:
  - Shutoff Valves:
    - Provide two-piece, full port, brass or bronze ball valve with brass trim and threaded ends.
  - Zone Shutoff Valve Box:
    - Provide recessed zone valve box assembly consisting of the following components: steel recessed valve box with white baked enamel finish, flush box door, continuous concealed door hinge, and vision panel. Provide recessed zone valve box assembly with flush paddle handle latch.
- General Purity Specialty Gases:
  - Valves: Provide three-piece, full-port, bronze ball valve with stainless-steel trim and soldered ends.

Protective Pipe Cover (At Exposed P-Trap Arms)

- Basis of Design: Truebro LAV GUARD undersink protective pipe cover.
- Description; Flexible, molded, antimicrobial, closed cell vinyl pipe cover and fittings for P-trap, angle valve, tailpiece, extension arm, supply tube, etc. components below sink.

Insulation

- Insulate laboratory piping as specified in Division 22 specifications for the respective systems.

Piping Hangers, Supports and Guide

- Provide hangers and supports as specified in Division 22 specifications.

266000 – Laboratory Electrical

Intent of this section is to supplement Division 26, Building Electrical.

Raceways

- Surface metal raceway shall be used for all laboratory work. Raceway shall be pre-assembled and prewired for not more than 3 receptacles per circuit. Extruded aluminum construction.
- Cable Tray: Ventilated, ladder type, steel.

Wire and Cable

- Insulated copper; solid #10 AWG and smaller, stranded for #8 and larger.
- Type TW wire and cable #4/0 AWG and smaller.
- Type RH wire and cable larger than #4/0 AWG in dry locations.
- Type RW wire and cable larger than #4/0 AWG size installed in damp locations or in concrete in contact with the ground.
- Minimum #12 AWG for lighting or receptacle circuits.
- Low voltage wiring may be #14 AWG.
- Provide separate ground conductor in all branch circuits.

Ground Systems

- Isolated Laboratory Ground:
- Ground zones for lab building.
- Each ground zone to be No. 4 green copper ground riser connected to 12" (305 mm) long x 1-1/2" (38 mm) wide x 1/8" (3 mm) thick copper ground bus at each level electrical closet.
- Each ground zone to be connected into earth and interconnected with No. 2 copper ground wire. Three driven ground rods per ground connection point.
- Run No. 12 ground from respective level ground bus to laboratory ground points.

EWU INTERDISCIPLINARY SCIENCES CENTER
CHENEY, WASHINGTON

NEW CONSTRUCTION REPORT

MAY 16, 2016

Prepared For:

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LB Project № 0100008301-001

LERCH BATES
Building Insight

TABLE OF CONTENTS

SECTION I -
EXECUTIVE SUMMARY

A. INTRODUCTION

Lerch Bates Inc. has been retained by LMN Architects to study the vertical transport requirements for the proposed EWU Interdisciplinary Sciences Center located in Cheney, Washington.

As Lerch Bates understands this building project, it consists of a five-level science center which will include classrooms, laboratories, prep rooms, stock and storage rooms, and office space. Current drawings, dated April 15, 2016, indicate the following:

1. Ground Level: Large tiered classroom, Geotech lab and prep/storage spaces, miscellaneous additional storage spaces.

2. Level 1: Chemistry and Biology lab spaces, Biology stock room, Chemistry stock room, and tech office space.

3. Level 2: Organic Chemistry prep and lab; Anatomy/Physiology lab spaces; Biology and Microbiology prep and lab spaces; and Biochemstry/Forensics lab spaces.

4. Level 3: Historical Geology/Paleontology prep, lab; Earth Materials and Geo-chemistry labs and preps; Physics labs and prep; and tech office spaces.

The evaluation of the vertical transportation requirements detailed in this report are based on the preliminary schematic drawings dated April 15, 2016, and the Room List/Space Tabulation details dated April 5, 2016, as supplied by the LMN design team. The Appendices of this report contain the Traffic Analyses generated.

This report provides a discussion and preliminary recommendations of the anticipated vertical transport system planned for EWU Interdisciplinary Sciences Center. All vertical transportation planning is based on providing “good” performance from an overall vertical transport system perspective. Two distinct criteria are used to measure the effectiveness of the vertical transport systems: average interval and handling capacity. All recommendations in this report are based on meeting these two criteria, as well as answering the functional needs of the proposed facility.

B. RECOMMENDATIONS

Based on the preliminary architectural schematics the design criteria assumed and the analysis performed by Lerch Bates, the following elevator configurations are recommended for the proposed EWU Interdisciplinary Sciences Center:

1. West Elevator: One machine-room-less (MRL) elevator serving Four stops. It will serve Floors 1, 2, 3 at front openings and Floor 1.5 at the rear opening. Elevator duty will be 2,500 lbs. at 200 fpm. Elevator will have 3’-6" wide by 7'-0" high single-speed center-opening doors.

2. East Elevator: Two machine-room-less (MRL) elevators serving four stops: G, 1, 2, 3, all front openings. Elevator duty will be 4,500 lbs. at 150 fpm. Elevator will have 4'-0" wide by 7'-0" high two-speed side-opening doors.

These systems in the configurations detailed will provide “Good” to “Excellent” service for students, staff, and visitors. Elevator speeds required are common to the industry utilizing well-proven designs and technology.

C. CRITERIA

We recommend the elevator system should be capable of performance meeting the following criteria:

1. Average Interval: ≤40 seconds during a five-minute two-way peak demand

2. Handling Capacity: At least 25% of the population during peak five minutes of two-way evening passenger traffic.

D. POPULATION ESTIMATES

Floor	Population
Roof	N/A
3	198 persons
2	209 persons
1	194 persons
GF	156 persons
Total population	757 persons

SECTION II -
VERTICAL TRANSPORT PLANNING CRITERIA

A. STATEMENT OF UNDERSTANDING

LMN Architects in Seattle, Washington, is currently planning a new lab and classroom building. Elevators are being planned to serve students, staff, and visitors. The project will include one new building that will have bridges connecting to an existing building on level one and level two. Elevator groups are planned to serve the general public, students, staff and the occasional movement of cadavers.

B. METHODOLOGY

All planning has been based on preliminary information and architectural drawings provided by LMN and Lerch Bates' knowledge of similar facilities. This information has been used as the basis of the analysis, planning, and design. All of the assumptions made by Lerch Bates for the required vertical transport analyses have been documented within this report.

To perform a reasonably accurate analysis of the vertical transport needs of the proposed EWU Interdisciplinary Sciences Center, Lerch Bates used information and architectural schematics provided by the LMN design team. Where information was not provided, Lerch Bates estimated traffic volumes and these are noted as such. Primary emphasis was placed on determining the appropriate number, size, and configuration of elevators required for the EWU Interdisciplinary Sciences Center.

C. ELEVATOR PERFORMANCE

The performance criteria used by Lerch Bates for this study will be based on the peak morning arrival of building tenants and their occupant projections provided by LMN. Lerch Bates based analysis on estimated projected building activity provided by the Architect. This estimate has been correlated with other industry and office elevatoring standards to establish valid criteria for this study.

Once elevator traffic loading requirements are established the proposed system can be evaluated by calculating its theoretical performance and then comparing this potential with the established criteria. Since some segments of the proposed building activity are still changing or undefined, Lerch Bates estimated the elevator activity based on conservative assumptions.

All vertical transport systems have been designed to provide "Good" or "Excellent" service. The definition of good service is established as: during a five-minute peak traffic period, the elevators must handle 25% of the expected "elevator populations" with an average interval not exceeding 40 seconds for the passenger cars.

D. DEFINITIONS

The criteria recommended for service hereafter assumes an understanding of several elevatoring terms and concepts. The adequacy of elevator service is related to the length of time passengers wait for service and the ability of the elevator system to handle people and "vehicles" as they require service. Coordination with materials handling needs is necessary to ensure all movements are covered with adequate, but not excessive, backup capabilities. Standards for the comparison and evaluation of these two basic measures of elevator service have been developed. They are termed average interval and handling capacity.

Average Interval	Average interval is the “quality” measure and is defined as the elapsed time in seconds between elevator departures from a terminal floor averaged over a specific time period. Average interval is not a direct measure of how long prospective passengers wait for service. However, it is a value which can be calculated relatively easily and the accuracy of such calculations has been verified by countless tests. Such tests indicate average system response time for service at a typical intermediate floor approximates 65% to 80% of the calculated average interval during heavy incoming traffic periods.
Handling Capacity	The “quantity” measure of elevator service is called handling capacity. This is defined as the number of persons and/or vehicles which can be transported by the elevator system in a given length of time. Average interval and handling capacity must be measured or calculated for the same designated time period to be meaningful. Lerch Bates uses five-minute peak periods for evaluation. This time period is long enough to provide meaningful, measurable information, but not so long as to allow peak activity to be disguised by average activity levels.
Traffic Pattern	Peak elevator traffic in a commercial office complex is usually heavy incoming, i.e. considerable traffic is being handled in the up direction, as passengers enter the cars at the lobby and are exiting the cars at various floors throughout the elevator up trip. This type of one-way peak is primarily “lobby-related” with minimal inter-floor traffic. One-way traffic peaks can be expected at predictable times.
Probable Stops	Round trip times are established by consideration of the capacity required, the passenger load each car must transport during peak activity, and the stops each car will make on a peak round trip. Probable stops are the number of stops we judge a car will make during a typical peak round trip. Probable stops can be determined mathematically by considering the number of persons in a loaded car and the number of stops possible above the lobby. The consultant must decide if the stops above have equal attraction, have similar populations, include unique activities or facilities, and determine a likely activity pattern for a peak trip. Restaurants or food serving facilities, bridge or horizontal pathways to adjacent buildings, migratory traffic through a studied building to another, and multiple lobbies are some of the conditions which must be considered in probable stops and round trip activity reviews. If all activities are not considered, projected performance will not be indicative of “real” activity when the building is operating.
Routing Efficiency	A person familiar with the facility will find the most efficient route to get to the desired destination. Therefore, people usually will not backtrack to use an elevator which is physically closer to the point of origin; they will generally use an elevator on the direct horizontal path toward the desired destination. Present plans suggest elevator locations will provide logical, efficient elevator use with good direct access from all areas of the plan.
Traffic Types	Generally, “passenger” and “vehicular” traffic are significant because traffic in these broad categories is best served by elevators of different configuration. Passengers are best served by elevators which are wide and shallow with center opening doors to allow passengers to stand near the doors for expeditious transfer at elevator stops. Vehicular traffic is best served by elevators which are narrow and deep. This shape provides the configuration required for cart loadings with space allowed for escort personnel beside the vehicle. The design proposed provides proper separation of passenger and service types.

E. KEY ASSUMPTIONS

The following assumptions have been made as part of this vertical transportation analysis. Any assumptions that do not accurately reflect the tenancy, use of the building or any other factors can result in actual results that do not match the analysis results:

1. We have assumed that stairs will be used by 90% of people traveling to level one, 80% of people traveling to level two, and 70% traveling to level three.

2. We have assumed that 70% of the elevator riding public will use the east elevators and 30% of the elevator riding public will use the west elevator.

3. At least one elevator in the east elevator group needs to be service-shaped in order to facilitate the movement of cadavers to the anatomy labs and to meet the building code requirement for stretchers.

F. ANALYSIS CRITERIA

1. Average Interval: The standards outlined below are used for the critique of the proposed elevator groups for the proposed EWU Interdisciplinary Sciences Center.

Average Interval Performance Standards Five Minutes of Heavy Two-Way Traffic	
Rating	Passenger/Visitor Elevators
Excellent	<40 seconds
Good	40 to 42 seconds
Average	>42 to 44 seconds
Poor	>44 to 45 seconds
Unacceptable	>45 seconds

2. Handling Capacity: Based on our experience with similar facilities, Lerch Bates recommends the elevators be capable of moving a minimum of 25% of the peak population in a five-minute two-way traffic period to achieve good service. Any excess above such minimum requirements determines the degree of excellence.

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Building Insight

East Elevator Mid-Day Two-Way Peak Analysis

	One Elevator at 150 fpm	One Elevator at 200 fpm	One Elevator at 350 fpm	Two-Car Group at 150 fpm
Floors Served	Ground, 1 - 3	Ground, 1 - 3	Ground, 1 - 3	Ground, 1 - 3
Population	86 persons	86 persons	86 persons	96 persons/group
Average Interval Required	40 seconds	40 seconds	40 seconds	40 seconds
Handling Capacity Required (persons/5 min.)	22 persons 25%	22 persons 25%	22 persons 25%	22 persons 25%
Elevators (capacity and speed)	One 4,500 lbs. at 150 fpm	One 4,500 lbs. at 200 fpm	One 4,500 lbs. at 350 fpm	Two 4,500 lbs. at 150 fpm
Average Interval	65.5 seconds	57.4 seconds	48.2 seconds	32.8 seconds
Five-Minute Handling Capacity (persons/5 min.)	13.7 persons 16.0%	15.7 persons 18.2%	18.7 persons 21.7%	27.5 persons 15.4%
Average Cab Loading	2 persons up, 1 person down	2 persons up, 1 person down	2 persons up, 1 person down	2 persons up, 1 person down
Performance Evaluation	Unacceptable	Unacceptable	Unacceptable	Excellent
Estimated System Cost	$260,000	$270,000	$310,000	$525,000

West Elevator Mid-Day Two-Way Peak Analysis

	One Elevator at 150 fpm	One Elevator at 200 fpm
Floors Served	1, 1.5, 2, 3	1, 1.5, 2, 3
Population	36 persons	36 persons
Average Interval Required	40 seconds	40 seconds
Handling Capacity Required (persons/5 min.)	9 persons 25%	9 persons 25%
Elevators (capacity and speed)	One 2,500 lbs. at 150 fpm	One 2,500 lbs. at 200 fpm
Average Interval	46.3 seconds	39.3 seconds
Five-Minute Handling Capacity (persons/5 min.)	12.9 persons 36%	15.2 persons 42.4%
Average Cab Loading	1 person up, 1 person down	1 person up, 1 person down
Performance Evaluation	Unacceptable	Excellent
Estimated System Cost	$240,000	$290,000

SECTION III -
ELEVATOR TRAFFIC ANALYSIS AND RECOMMENDATIONS

A. DISCUSSION AND RECOMMENDATIONS

Details of all the preliminary elevator performance projections are contained in the appendices of this report. The following narratives discuss the alternatives considered and the rationale for the recommendations

1. East Elevator: Current plans detail one service-shaped elevator to serve five levels of the building. One elevator, regardless of the type, size, door orientation, or elevator speed will not meet the expected criteria for this building during peak demand, as summarized in the analysis charts provided in the analysis criteria section. In designing satisfactory vertical transportation there are two main performance indicators that we calculate. Those two factors are the handling capacity and the average interval. Average interval is the elapsed time in seconds between elevator departures from a terminal floor averaged over a specific time period. This is not the time it would take someone to reach their designation, but rather the average time they will wait for the elevator to answer their call and dispatch from their landing. Handling capacity is defined as the number of persons which can be transported by the elevator system in a given length of time. The average amount of time considered in this study is five minutes. One elevator even at the fastest realistic travel speed of 350 fpm would provide an average interval of 48.2 seconds and a handling capacity of 21.7%. This is based on the assumption that 90% of the population will use the stairs from the ground to level one, 80% of the population of level two, and 70% of level three will use to stairs. These assumptions for stair travel are not conservative they are based on realistic traffic patterns in similar buildings. The elevator population will likely be comprised of people that are not able to use the stairs due to a physical mobility disability or ailment. During peak times this population would experience what we would consider as unsatisfactory vertical circulation based on extended wait times. They will be waiting on average 48.2 seconds for an elevator. We would consider an average interval of 44 seconds or less as satisfactory.

   Two elevators at 150 fpm provide an average interval of 32.8 seconds with a 32% handling capacity during a mid-day two-way five-minute heavy traffic period assuming the elevators reach maximum speed between the probable stops. Based on the location of the elevator group, we assume 70% of the elevator riding public will use this group of elevators.

   Because the building has four or more levels above grade, IBC 2012 3002.4 requires that at least one elevator that answers all occupied floors be 24” by 84” stretcher compliant. This requirements will be met with this group of elevators.

   Although the travel distance is within the capabilities of a hydraulic elevator, a hydraulic elevator will not provide the desired performance criteria. A machine-room-less (MRL) traction application is the standard and most cost-effective type of traction elevator available in the elevator industry. It was introduced to the US market in the late 1990s, and all major manufacturers have proven and reliable MRL traction elevator products. The application uses a gearless traction machine that is so compact it can be located inside the hoistway. This is the most energy-efficient type of elevator available, and will also be the most cost-effective type of traction elevator. It eliminates the need for a large machine room directly over the hoistway, which is required for traditional traction elevators, but will still require a dedicated space for a control room. That control room is typically located adjacent to the hoistway at the top landing served. However, it can also be located up to 100' of wire run away from the top landing.

Based on communication from LMN, at least one elevator needs to be service-shaped in order to facilitate the movement of cadavers throughout the building. Having two service-shaped elevators grouped together will provide redundancy should one elevator need to be taken out of service, and allows for either elevator responding to a hall call to be used for this function.

We recommend two 4,500 lbs. capacity MRL traction elevators with a 150 fpm travel speed, operating as a two-car group to serve the four classroom levels in the building. One two-car group will provide excellent overall service, meeting the expected performance criteria during peak mid-day two-way vertical circulation, assuming a population as identified in the charts in the previous section.

a. Capacity: 4,500 lbs.
b. Minimum Inside Cab Dimensions: 5'-8½ " wide X 8'-0" deep
c. Clear Hoistway Dimensions: 15'-4" wide X 9'-8" deep
d. Doors: 4'-0" Wide X 7'-0", high-speed, two-speed side-opening
e. Minimum Pit Depth: 5'-0", assuming no occupied pace below the pit floor
f. Minimum Clear Overhead: 13'-11"
g. Minimum Control Room Size = 8'-0" x 11'-0" x 9'-0" tall with a minimum 3'-0" wide x 7'-0" tall door
    1) A 4" wide divider beam between elevators in a common hoistway should be assumed when calculating the total clear hoistway width.
    2) The minimum clear overhead is measured from the top landing served to the underside of the top of the hoistway, and is based on an 8'-0" tall cab height.
    3) The dimensions provided above assume there are no rear openings.
    4) The control room size can be adjusted based on design constraints. Desired configuration and door location can be reviewed to confirm that it provides sufficient space to provide code-required electrical and maintenance clearances
    5) The dimensions are large enough to accommodate all of the major manufacturers' products, and dimensions can be reduced to meet a certain manufacturers' product upon award of that subcontract.

2. West Elevator: Current plans detail one service-shaped elevator to serve three front openings and one rear level of the building. One elevator at 200 fpm will provide an average interval of 39.3 seconds with a 42.4% handling capacity during a mid-day two-way five-minute heavy traffic time period, assuming 90% of the population of level one, 80% of the population of level two, 70% of level three will use the stairs, and the elevator reaches maximum speed between probable stops. Based on the location of the elevator, we assume 30% of the elevator riding public will use this elevator.

   Although the travel distance is within the capabilities of a hydraulic elevator, a hydraulic elevator will not provide the desired performance criteria. A machine-room-less (MRL) traction application is the standard and most cost-effective type of traction elevator available in the elevator industry. It was introduced to the US market in the late 1990s, and all major manufacturers have proven and reliable MRL traction elevator products. The application uses a gearless traction machine that is so compact it can be located inside the hoistway. This is the most energy-efficient type of elevator available, and will also be the most cost-effective type of traction elevator. It eliminates the need for a large machine room directly over the hoistway, which is required for traditional traction elevators, but will still require a dedicated space for a control room. That control room is typically located adjacent to the hoistway at the top landing served. However, it can also be located up to 100' of wire run away from the top landing.

   We recommend one 2,500 lbs. capacity MRL traction elevator with a 200 fpm travel speed, serving levels 1-3 at the front and 1.5 at the rear. One elevator will provide excellent overall

service, meeting the expected performance criteria during peak mid-day two-way vertical circulation, assuming a population as identified in the charts in the previous section.

a. Capacity: 2,500 lbs.
b. Minimum Inside Cab Dimensions: 6'-8½ " wide X 4'-3¼ " deep
c. Clear Hoistway Dimensions: 8'-5" wide X 5'-10" deep
d. Doors: 3'-6" Wide X 7'-0", high-speed, center-opening
e. Minimum Pit Depth: 5'-0", assuming no occupied pace below the pit floor
f. Minimum Clear Overhead: 13'-4"
g. Minimum Control Room Size = 7'-0" x 6'-0" x 9'-0" tall with a minimum 3'-0" wide x 7'-0" tall door
    1) The minimum clear overhead is measured from the top landing served to the underside of the top of the hoistway, and is based on an 8'-0" tall cab height.
    2) The control room size can be adjusted based on design constraints. Desired configuration and door location can be reviewed to confirm that it provides sufficient space to provide code-required electrical and maintenance clearances
    3) The dimensions are large enough to accommodate all of the major manufacturers' products, and dimensions can be reduced to meet a certain manufacturers' product upon award of that subcontract. An early bid package can be created during the Design Development phase if desire

MECHANICAL

The mechanical systems will be designed to conform, as a minimum, to the following codes and standards:

- Eastern Washington University, Facility Design Guidelines and Construction Standards
- International Building Code-2015
- International Mechanical Code-2015
- International Fire Code-2015
- Uniform Plumbing Code-2015
- Washington State Non-Residential Energy Code-2015
- Washington State Boiler and Unfired Pressure Vessel Code
- Americans with Disabilities Act (ADA)
- American Gas Association (AGA)
- American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures ASCE 7-02 (seismic)
- American Water Works Association (AWWA)
- The National Fire Protection Association (NFPA)
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- Underwriters Laboratories (UL)
- Applicable state and local ordinances

Climate

Conditions	Cooling Mode	Heating Mode
Outdoor	94 ˚F db, 64 ˚F wb	4 ˚F
Faculty/Student Areas-Occupied hours	75 ˚F	70 ˚F
Faculty/Student Areas-Unoccupied hours	80-85 ˚F	55 ˚F
Telecom Rooms	75 ˚F	68-70 ˚F
Equipment Rooms	85-90 ˚F	55 ˚F
Enclosed Bridges	78-80 ˚F	65-70 ˚F

Humidity Controls: At this time, no specific requirements for humidity controls have been identified. The existing programs do not currently have active humidity controls.

Wind: Wind directions are variable but blows predominantly from the southwest to the northeast.

Ventilation Requirements

Locate building fresh air intakes away from exhaust vents, plumbing vents, lab exhaust discharge, outdoor smoking areas and building loading areas. The exhaust stack discharge configuration (height and location and velocity) will be located in accordance with results from the wind modeling.

Provide outside air in accordance with the Washington State Energy Code and ASHRAE Standard 62.

Provide Minimum Exhaust Rates in the quantities noted below:

- 4 air changes per hour in the unoccupied mode for labs with chemical storage or chemical fume hoods. Some labs such as chemistry may drop below 4 air changes per hour when chemicals have been removed from the space at the teaching day.
- 6 air changes per hour in the occupied mode for labs with chemical use or process that is not suitable for recirculation.
- Process exhaust for chemical fume hoods, exhaust snorkels, large chemical storage cabinets, chemical storage within hoods and dust collection shall be provided as required. Toilets: 10-12 air changes per hour exhaust

Exhaust for the chemical fume hoods shall receive power from the normal power supply with a portion of the exhaust system receiving back-up power from the standby generator. In the event of a power outage, it is expected that the exhaust system would operate at a reduced airflow to allow occupants to safely exit the building.

Dust collection will be considered for rock processing and other areas that produce large quantities of dust.

Filtration

All systems with fresh air intakes shall have a minimum 85% (Merv 13) filtration. Central Air Handling Units shall additionally have have 30% (Merv 7) pre-filters. Areas dealing with potentially dust producing processes shall have filters installed on the exhaust grilles.

Lab Pressurization

Lab pressurization will be provided by a fixed offset between supply and exhaust airflow rates. Unless indicated on the plans as a “clean space”, labs that are exhaust shall be negatively pressurized with respect to the circulation areas. Clean spaces are expected to be identified in the lab planning process in the design development phase.

Serviceability

Provide easy access to all valves, traps, and strainers in the plumbing, hydronic and steam systems. Allow for coil removal and replacement in mechanical rooms. Provide access to all DDC system controllers, fans, filters, balancing dampers and other equipment requiring service. Each main restroom (men and women’s) shall have their own valves located on the same floor as the restroom.

Energy Conservation

The building envelope design and the mechanical systems shall meet all of the requirements of the Washington State Energy Code. An energy life cycle cost analysis shall be performed for this project in the design development phase to validate systems selected and identify features to provide enhanced energy performance. Thorough commissioning of the mechanical systems shall occur to ensure that systems are functioning properly at designed efficiency and the Owner’s facility staff is instructed in the proper operation of the systems.

At a minimum, mechanical energy conservation features should include:

- Recovery of heat from waste exhaust systems to preheat ventilation air
- Variable exhaust control systems in labs that vary exhaust based upon room occupancy and fume hood sash position

- High performance insulating systems in the building envelope
- Low flow lavatory faucets for conservation of hot water
- Reduced ventilation in labs using air quality sensing systems

- Additionally features to be studied in more detail for possible implementation include,
  - Use of heat recovery chillers for summer reheat.
  - Solar Photo Voltaic Power (or PV ready)
  - Solar Heating
  - Use of active chilled beams in cooling dominant spaces.

Acoustics

Systems will be designed and installed to meet the maximum noise criteria (NC) established for each building use. Special acoustical considerations of the mechanical systems will include locating of vacuum pumps and air compressors away from acoustically sensitive areas. Where this is not possible, acoustically treated walls will be required.

Additional acoustical considerations will include limitation of duct velocities through ductwork, terminal units and air inlets/outlets to achieve space NC, use of sound attenuators in the duct systems, and vibration isolation of mechanical equipment with spring isolators and flexible connections.

Steam and Chilled Water Site Utilities

Steam (6”, 100 psig), pumped condensate (3”) and chilled water supply and return (8”) will be delivered to the building in a below grade tunnel approximately 6.5’ wide by 8’ deep. The cooling peak load is estimated to be approximately 800 GPM with 45 degree supply water and 60 degree return water).

The estimated peak steam load is 10-11,000 lb/hr. Steam will be utilized for preheat at air handlers, heating hot water convertors for building air terminal unit heating, potable hot water, industrial hot water and snow melt.

Building Heating

Consistent with campus standards, high pressure (100 psig) campus steam will be reduced to low pressure steam in a 2 stage pressure reducing station. Steam will be delivered to the air handling unit steam coils and the steam convertor serving the heating hot water system that provides heat to the building heating terminal units. The heating hot water system will be closed loop with two pumps for redundancy.

Perimeter radiant heat will be provided in areas with large amounts of glass-south study area, east entry circulation areas and bridges connecting the existing science to the new interdisciplinary science center.

Building Cooling

Consistent with campus standards, building cooling shall be provided from campus chilled water. Each cooling coil will include a coil pump. Coils are drained seasonally by EWU personnel for freeze protection.

A heat recovery chiller will be considered in the ELCCA to provide for radiant cooling in the bridges connecting the Interdisciplinary Science Building to the existing Science building and allow the use of chilled beams year around during times when the central chilled water plant is

not in operation. Chiller will be sized to reject heat to the building heating loop through a hot water heat exchanger and will also supplement the domestic hot water heating system.

HVAC – Exhaust Air System

The primary building exhaust will manifold general and fume hood exhaust to a central exhaust system consisting of multiple fans with redundancy. Fans will exhaust air from lab general exhaust venturis, fume hood exhaust venturis, or general exhaust terminal units serving restrooms and other non-lab areas. The manifolded exhaust system will provide overall dilution of the chemicals from the fume hoods which will protect and extend the life of the duct system from potentially corrosive chemicals. A heat recovery exhaust coil will be located in the manifolded exhaust to capture waste heat from the building exhaust. Coils will be coated for chemical protection. The exhaust system is equipped with 5 fans for N+1 redundancy. The anticipated peak exhaust if 90,000 cfm.

Dedicated exhaust will be provided for the wet acid hood and possibly for the structures lab which has potential dust generating processes.

Chemical fume hoods will be provided within the lab furnishings package. Ducted exhaust from the hoods will be provided by the mechanical contractor. Fume hoods will have air regulated through pressure independent terminal units specifically manufactured for the chemicals used in the lab environment to maintain the hood face velocity at safe levels. The basis of design will be an air valve designed by Phoenix Controls.

HVAC –Supply Air System

Lab make-up air units will be central station, variable air volume type with outside air that tracks the lab exhaust fans minus an offset for building pressurization control. Units shall contain modular fan wall systems for redundancy, steam face and bypass coils, pre/final filters, heat recovery coils and chilled water cooling coils. The labs are serviced from two air handlers sized for a total of 90,000 cfm that are manifolded to allow for partial building airflow in the event that one unit is being serviced. The basis of design will be Huntair. Heat recovery options being considered in the Energy Life Cycle Cost Analysis are:

- Air-to-water coils in the exhaust and outside air streams that transfer energy between the exhaust and outside-air steams through a pumped glycol/water mix fluid.
- Heat pipe non pumped coils use refrigerant as a medium to transfer energy between exhaust and outside air streams.

Non-lab units will be similar except they will have return fans and mixing box to allow for air recirculation and will not have heat recovery coils. The non lab system is estimated at 25,000 cfm.

HVAC-Miscellaneous

Exit stairs will not be heated or cooled from the primary building air systems per the International Building Code. These spaces will have their environmental needs met by the local terminal units.

Telecom will be cooled from the dedicated ductless split air conditioning systems. The telecom cooling systems will be backed from back-up power source in accordance with University Standards. In the event that passive optical telecom systems are utilized for this project, then the telecom rooms would be serviced from the lab air systems which operate 24 hours a day.

Elevator shafts will be vented direct to the outdoors in accordance with the International Building Code.

The elevator machine rooms will have an independent stand-alone system per Washington Elevator Code requirements.

Existing Building Renovation

The existing science building has a snowmelt systems at its NE entry. This will need to be revised/modified with the new bridge connections and landscaping that is occurring as part of the Interdisciplinary Science Center.

The existing science center has a basement level transformer vault that has gravity ventilation to an area well near its NE entry. This project will cover the existing area well location. An allowance to add mechanical ventilation and louvers to exhaust this room to a new area well will be provided.

The bride connections between the existing Science and the Interdisciplinary Science Center could require modifications to the existing Science VAV zoning at the three points of connections between these two buildings.

Snowmelt

Hydronic snowmelt system will be provided at exterior walking pathways that cannot be serviced by mechanical snow removal equipment. Snowmelt system shall consist of a storage tank and coil that uses building steam condensate as the first stage of heat for snowmelt. The second stage of heat shall be provided from a steam to hot water convertor.

Building Automation System

The building Automation Controls shall be direct digital control using BACnet communication and shall in accordance with campus standards.

The following utilities will be monitored and trended: Water, steam condensate, chilled water, natural gas, building power, motor loads, light energy, lab waste (flow, pH) and domestic/industrial hot water.

Lab environmental and airflow controls will be equal to a venturi air valve system manufactured for quick response on airflow tracking in the hoods, room make up air, and the poor quality air exhausted from the hoods (equal to Phoenix, Siemens or possibly Price). Lab controls shall interface with the building automation system.

The building automation shall incorporate CO2 sensors and occupancy sensors in accordance with the newly adopted 2015 Washington Energy Code.

Labs shall use indoor air quality sensors that sample chemical levels within the air to reduce the exhaust levels below the prescriptive rates when the air quality is at acceptable levels.

Basic Plumbing

Water pressures on campus are generous (80-90 psi static pressure range). As customary on EWU campus buildings, pressure reducing stations have not historically been provided on the water service.

Water (4”) entering the building will have backflow prevention provided in accordance with the requirements of AWWA and the City of Cheney. The domestic water backflow preventors will consist of two double check backflow preventers with one sized for 1/3 of the peak water volume and other sized for 2/3 of the peak water volume. The industrial water system backflow

prevention system will consist of two reduced principle backflow preventers with one sized for 1/3 of the peak water volume and other sized for 2/3 of the peak water volume. All backflow preventers will be located in a grade level water service room accessible for inspection.

A domestic cold water distribution system will be provided throughout the building in addition to non-potable (industrial cold water) and tempered water systems.

A 120°F domestic hot water distribution system will be provided throughout the building in addition to non-potable hot water (industrial hot water) systems. Water heaters shall be semi-instantaneous steam fired water heaters. A hot water recirculation system will be provided within close proximity to fixture banks.

A new natural gas service, meter, pressure reducing valve, and manifold will be provided at the exterior of the building to provide natural gas in the labs. Gas service will be provided from Avista Utility. Gas shall be regulated to 4 to 7 inches of water pressure.

A propane tank will be in close proximity to the generator and will be dedicated to the generator.

A gravity sanitary drainage system will be provided to serve all plumbing fixtures and equipment. Sanitary waste lines will be routed to new connection points provided by the civil engineer within five feet of the building exterior. Preliminary finished floor elevations and site utility inverts do not require a sewage ejector.

Dewater System shall consist of foundation drains that are provided along the basement perimeter that terminate to a duplex grey water pump that pumps to the storm drain system.

Gravity primary and overflow storm drainage systems will be provided to serve the roof levels. The primary drain shall discharge to a rainwater harvesting system that will be utilized to flush toilets in the building. The harvesting system will be skid mounted with tank, controls, pumps, filters and treatment equipment. The overflow drains from the roof shall be piped separately outside the building at grade level in splash blocks.

Plumbing fixtures: commercial grade/vitreous china/sensor operated/wall hung flush valves in restrooms, stainless steel sinks in non-lab areas, and lab fixtures provided with casework. All fixtures shall be low flow for water conservation.

Lab Plumbing Systems

Industrial Hot Water System: A 120°F non-potable hot water distribution system will be provided throughout the building to designated equipment and lab faucets requiring hot water. The system will be isolated from the domestic hot water system with backflow preventers as previously described to prevent contamination of the potable water supply. Hot water heaters shall be semi-instantaneous, steam fired type. A recirculation system will be provided.

Industrial Cold Water System: A non-potable cold water distribution system will be provided throughout the building to designated equipment and lab faucets requiring cold water. The system will be isolated from the domestic water system with a backflow preventer as previously described to prevent contamination of the potable water supply.

Pure Water System: A central pure water system will be provided to deliver ASTM type II with minimum 1 meg ohm resistivity. System will consist of reverse osmosis unit, carbon filters, re-pressurization tanks, ultra-violet lights, resistivity/conductivity meter, pressure switches, distribution pumps, and monitor lights. When water with higher purity is required, the high

purity water will be generated from local point of use equipment connected to the central purified water system.

Each floor shall have its own supply/return system independent of other floors. Distribution shall be a continuous loop with undiminished pipe size routed to each service location.

Tempered Water System: Tempered water supplying drench hoses and safety shower/emergency eyewashes is potable water at tempered temperature that is distributed in a separate loop on each floor. The tempering mixing valves will be located at the connection of the potable water systems near the riser (in custodial closets).

Lab Waste and Vent System: Laboratory sinks in case work, chemical fume hood cup sinks and floor drains in chemical use areas that have the possibility of capturing chemicals from a spill will be piped through the building in a dedicated waste system that will allow for future monitoring by regulatory authorities for possible discharges. Outside the building, after the monitoring point, the lab waste system will combine with the building sanitary sewer. Waste and vent piping will be acid resistant. In accordance with EPA requirements and the local wastewater treatment facility, the lab waste system will not be used for discharge of toxic materials or chemicals that have not been treated locally by the University to the proper PH levels.

Compressed Air System: A central compressed air system with duplex compressors for redundancy, air drier and receiver storing 100 psig air will be provided to deliver oil free and dried ISO Class 2 compressed air to the laboratories. A regulator will be provided at each lab to regulate air pressure in the lab to 15-30 psig.

Lab Vacuum System: A central vacuum system will be provided to deliver vacuum air to the labs from a central dual vacuum pump (for redundancy) and receiver controlling to 24” mercury. The exhaust from the pump will route through a muffler system and discharge above the roof so as to minimize the noise pollution to the surrounding environment and recirculation of hazards from the vacuum system.

Lab Natural Gas System: Natural gas will be piped to the labs from the building gas service at low pressure (4-7” WC). Each lab space will be equipped with a local emergency gas shut-off valve accessible to the users.

Nitrogen Piping: Dedicated nitrogen gas piping from central tank farm to chemistry labs as indicated in room data sheets.

Localized Cylinder gases: Inert, O2 gas piping from local cylinders to outlets as indicated on the lab plans and room data sheets will be provided.

Equipment connections and lab sink connections shall be made to the non-potable water supply sections to eliminate the need for reduced pressure back-flow preventers throughout the building.

Zone valves will be located at each floor level and at each lab for servicing the systems.

Fire Protection System

The building will be sprinklered throughout with a wet pipe sprinkler system.

The building light hazard areas (office, lecture rooms, circulation spaces) will be sprinkled to light hazard requirements.

Electrical, mechanical and non-chemical use labs will be sprinklered to ordinary hazard group 1 requirements.

Chemical use labs and other higher hazard areas will be sprinklered to ordinary hazard group 2 requirements.

Standpipes will be required as the highest occupied level of the building will exceed 30 feet above grade. Standpipes will be located in each exit stairwell.

The fire system will be divided into multiple zones by floor for identification and annunciation at the central fire alarm panel. Control valve assemblies will be located in one of the stairwells and will be supplied by the standpipe system. Fire department connections, post indicator valve and backflow prevention shall be in accordance with the City of Cheney requirements.

Sprinklers in ceilings will generally be semi-recessed with white finish.

The fire system will be provided with its own double check backflow prevention assembly located in the mechanical room. The supply main to the building will be 6-inch. The available water supply information will be provided by a hydrant flow test performed by the fire department. The water supply in the area is known to be strong and will adequately supply the sprinkler system.

The hazardous materials holding room will be provided with a total flooding dry powder extinguishing system in lieu of the wet sprinkler system. This system will be a “pre-engineered” system and will be supervised by the fire alarm system.

MECHANICAL OUTLINE SPECIFICATIONS

DIVISION 20 – GENERAL MECHANICAL

201000 – Basic Mechanical Requirements

Furnish labor, materials, and equipment necessary for completion of work unless indicated or noted otherwise. Put all systems into full operation and adjust to specified conditions. Pay all permits and fees levied by utility companies and/or governing agencies.

201001 – Sustainable Building Construction Practices

LEED Objective: Provide requirements necessary to achieve identified LEED IEQ credit and documentation in accordance with LEED requirements. This shall include construction waste management, building flushout, use of low emitting field applied adhesives, sealants and paints.

201004 – Excavation and Backfill

This contractor shall include in the bid the complete excavation and backfill cost required to install his work as specified under Divisions 20 through 23 (Mechanical) of this specification. Contractor shall provide necessary excavation, shoring, and backfilling required for the proper installation of his work, inside building and premises, or outside as may be necessary.

201005 – Seismic Provisions

The structural engineer has confirmed in the schematic design phase that the Seismic Design Criteria (SDC) for the project is “B”. This lower seismic category will not require seismic restraints. This will be revisited in subsequent phases.

201006 – Project Finalization

Provide operation and maintenance manuals, owner instruction on training and maintenance, record drawings, and system/equipment guarantees.

201007 – Testing, Adjusting, and Balancing

Air, hydronic and domestic hot water distribution systems shall be balanced to conditions specified and indicated on the drawings by an AABC or NEBB Certified balancing agency.

201009 – Mechanical Commissioning Support

The equipment and systems referenced in the Related Work section are to be commissioned. The contractor has specific responsibilities for scheduling, coordination, startup, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority. The Commissioning Authority will work under direct contract with the Owner.

DIVISION 21 – FIRE PROTECTION

211313 – Fire Protection Systems

The building will be sprinklered throughout with a wet pipe sprinkler system. The light hazard areas (office, lecture rooms, circulation spaces) will be sprinkled to light hazard requirements. Electrical, mechanical and non-chemical use labs will be sprinklered to ordinary hazard group 1 requirements. Chemical use labs and other higher hazard areas will be sprinklered to ordinary hazard group 2 requirements. Standpipes will be required as the highest occupied level of the building will exceed 30 feet above grade. Standpipes will be located in each exit stairwell. The fire system will be divided into multiple zones by floor for identification and annunciation at the

central fire alarm panel. Control valve assemblies will be located in one of the stairwells and will be supplied by the standpipe system. Fire department connections, post indicator valve and backflow prevention shall be in accordance with the City of Cheney requirements. Sprinklers in ceilings will generally be semi-recessed with white finish. The fire system will be provided with its own double check backflow prevention assembly. The supply main to the building will be 6-inch.he available water supply information will be provided by a hydrant flow test performed by the fire department. The water supply in the area is known to be strong and will adequately supply the sprinkler system. The hazardous materials holding room will be provided with a total flooding dry powder extinguishing system in lieu of the wet sprinkler system. This system will be a “pre-engineered” system and will be supervised by the fire alarm system.

DIVISION 22 - PLUMBING

220503 – Plumbing Piping

This section applies to piping within the building and connection with outside utility lines 5 feet from the building where applicable.

- Domestic and Industrial Hot and Cold Water Piping and Tempered Water - Above Grade: Copper type L with solder or mechanical pro-press fittings. PEX should also be considered in the VE phase.
- Reclaimed water (Rainwater): Copper type L with solder or mechanical pro-press fittings. PEX should also be considered in the VE phase.
- Water pipe - Below Grade: PVC schedule 80 (large diameter), PEX (no fittings) (small diameter)
- Sanitary Waste Piping- Above Grade: Cast iron, no-hub with couplings
- Sanitary Vent Piping – Above Grade: Cast iron, PVC
- Sanitary Waste and Vent Piping - Below Grade: ABS, PVC
- Lab Waste Piping and Vent Piping – Above Grade: Polypropylene. CPVC should also be considered as an alternate material in the VE phase.
- Roof Drain Primary Drain - Above Grade: Service weight cast iron.
- Roof Drain Overflow Drain - Above Grade: Service weight cast iron, PVC
- Roof Drain Piping - Below Grade: PVC, ABS
- Indirect Waste Piping: Copper type L or M
- Natural Gas Piping - Above Grade: black steel, schedule 40
- Liquid Propane - Above Grade: black steel, schedule 80.
- The use of PVC, CPVC, and PEX will not be allowed in plenum areas. This project is expected to have very few areas with return air plenums.
- PEX piping applications are typically for small diameter pipe 1 ½” and smaller.

220513 – Motors

Electrically driven or electrically connected plumbing equipment shall be of a type which shall conform to any applicable standards of the National Bureau of Standards of the United States Department of Commerce or the standards of the Underwriters Laboratories or another nationally recognized testing laboratory. Equipment items shall bear the UL label or equivalent.

220515 – Gauges and Meters

Provide temperature and pressure gauges at plumbing equipment.

220516 – Piping Expansion Compensation

Provide expansion joints, alignment guides and anchors to allow for thermal expansion and contraction of plumbing piping systems.

220529 – Supports, Anchors, Curbs, Seals and Flashings

Provide pipe hangers, sleeves and plates, equipment stands, housekeeping pads, curbs, seals and caulking, and flashing for finished plumbing systems.

220548 – Vibration Isolation

Furnish and install vibration isolation mountings for all plumbing pumps, compressors, and any other motorized equipment installed under this contract.

220553 – Mechanical Identification

All plumbing valves, equipment, and access doors and panels shall be tagged for identification. Piping systems shall be labeled and color-coded with a color banding system.

220700 – Piping Insulation

Insulate domestic/industrial hot and cold water and rainwater piping systems including pipe fittings and roof drain sumps.

221500 – Lab Gases

Compressed Air System: Skid mounted duplex compressors for redundancy, air drier and receiver storing 100 psig air. Compressed Air Piping shall be Copper type L-solder or pro-press fittings.
Lab Vacuum System: Skid mounted duplex vacuum pumps for redundancy with receiver controlling to 24" mercury. Vacuum Piping shall be Copper type L. Solder fittings.
Nitrogen Piping: Copper type L. Solder or pro-press fittings.
Localized O2 and Inert Gases: Copper type L. Solder or pro-press fittings.

223000 – Plumbing Equipment

Provide floor cleanouts, wall cleanouts, trap primers, water hammer arrestors, floor drains, backflow preventers, steam fired water heaters, water heater storage tanks, and domestic water circulating pumps. Hose bibs shall be provided at each bank of lavatories and around the building perimeter.

224000 – Plumbing Fixtures

Fixtures shall be complete with fittings, trim, supplies, traps supports, and carriers to make a complete installation.

- Fixtures will be provided with chrome plated brass trim and stop valves.
- Water closets and urinals will be vitreous china, siphon jet pattern with low flow water conserving flush valves.
- Lavatories will be vitreous china with sensor operated faucets.
- Non-lab sinks will be 18 gauge stainless steel with single lever faucets.
- Water closets will be wall mounted.
- Appropriate "Barrier Free" fixtures will be provided in accordance with ADA requirements, for handicapped use. ADA fixtures shall be provided with electric powered infrared sensor operated flush valves and faucets.
- Drinking fountains shall be stainless steel, refrigerated and shall be constructed in accordance with ADA requirements and include bottle fillers.
- Safety stations within the labs will include safety showers and eyewash capabilities. These fixtures will be provided with the lab furnishing package with installation and rough-in provided by the plumbing contractor. Safety showers and eye wash stations will be serviced from a centralized tempered water system that delivers potable tepid water between 60 and 95 degrees to the safety stations. Floor drains will be provided at each safety shower station.
- Laboratory fixtures will be provided as part of the lab furnishing package.
- Water Conservation: The following items will be reviewed by the design team and EWU for Water Conservation and Long Term Campus Standardization /Maintenance considerations: Dual flush (1.6/1.0 GPF) water closets, ultra-low flow water closets

(1.28 GPF), pint flow urinals, and 1.5 GPM showers. Lavatory faucets will deliver 0.5 GPM. Additional water conservation efforts include implementation of a rain water harvesting system for use in flushing the building water closets. Other clean water such as RO/DI flush water will also be harvested.

227013 – Snowmelt

Snowmelt system consists of hydronic piping imbedded in slab in designated areas. Piping shall be cross linked Polyethylene (PEXa). System shall include manifolds with brass supply and return headers with up to 12 circuits, each with an isolation ball valve. In ground insulation shall be provided in division 7. Snow melt controls are provided in 23 09 23. Convertors provided in 23 22 16 and pumps provided in 23 21 23. Glycol feeder and chemical water treatment provided in section 23 25 00.

227013 – Pure Water Piping Systems

Pure Water System: System will consist of central skid mounted reverse osmosis unit complete with carbon filters, re-pressurization tanks, ultra-violet lights, resistivity/conductivity meter, pressure switches and monitor lights. Pure Water Piping shall be High purity polypropylene or PVDF (in return air plenums). Schedule 40 PVC should be considered in the VE phase.

DIVISION 23 – MECHANICAL

230503 – Hydronic Piping

Furnish and install complete heating, chilled water and heat recovery piping systems. Pipe: black steel schedule 40, copper type L (solder or pro-press fittings). Consider PEX piping systems in the VE phase for small diameter pipe.

230504 – Hydronic Specialties

Provide hydronic accessories for proper system operation including expansion tanks, air vents, air separators, pressure reducing valves, strainers, relief valves, balancing valves.

230513 – Motors

Electrically driven or electrically connected HVAC equipment shall be of a type which shall conform to any applicable standards of the National Bureau of Standards of the United States Department of Commerce or the standards of the Underwriters Laboratories or another nationally recognized testing laboratory. Equipment items shall bear the UL label or equivalent.

230515 – Gauges and Meters

Provide temperature and pressure gauges at heating and cooling coils and equipment.

230516 – Piping Expansion Compensation

Provide expansion joints, alignment guides and anchors to allow for thermal expansion and contraction of hydronic piping systems.

230529 – Supports, Anchors, Curbs, Seals and Flashings

Provide pipe hangers, sleeves and plates, equipment stands, housekeeping pads, curbs, seals and caulking, and flashing for finished HVAC systems.

230548 – Vibration Isolation

Furnish and install vibration isolation mountings for all fans, air handling units, pumps, compressors, and any other motorized HVAC equipment installed under this contract.

230553 – Mechanical Identification

All HVAC valves, equipment, and access doors and panels shall be tagged for identification. Piping systems shall be labeled and color-coded with a color banding system.

230700 – HVAC Insulation

HVAC Piping Insulation: Insulate chilled water supply and return pipe and fittings. Insulate refrigerant suction and hot gas piping and fittings. Insulate heating water supply and return pipe and fittings. Insulate steam and condensate pipe and fittings.
Equipment Insulation: Insulate heating and cooling equipment including valves, pumps, tanks, traps, converters, etc.
Duct Insulation: Insulate all supply air ducts. Insulate ducts with duct liner where indicated on the plans. Insulate all outside air ductwork

230923 – Energy Management and Control System

The Energy Management Systems shall communicate with the existing campus DDC systems (Alerton, Johnson, Delta) using native BacNet Platform and shall be fully compatible with the existing BacNet architecture and campus network. The heating and ventilation system will be controlled from an automated direct digital control (DDC) system. The system will start/stop and stage equipment based on occupancy of the building and individual room heating, cooling and ventilating requirements. All equipment controllers will be electronic and shall have complete standalone capabilities. Controller shall communicate all points of information to the Energy Management System operator's terminal. The campus Energy Management System has a central Operator's Terminal (personal computer) where the campus facility personnel. Snowmelt controls basis of design: Tekmar.

230924 – Laboratory Control System

A laboratory airflow control system shall be furnished and installed to control the airflow into and out of laboratory rooms. The exhaust flow rate of a laboratory fume hood shall be precisely controlled to maintain a constant average face velocity into the fume hood at a standard level based on an operator being present in front of the fume hood. The laboratory control system shall vary the amount of makeup/supply air into the room to operate the laboratories at the lowest possible airflow rates necessary to maintain temperature control, achieve minimum ventilation rates, and maintain laboratory pressurization in relation to adjacent spaces (positive or negative). The laboratory airflow control system shall be capable of operating as a stand-alone system, or as a system integrated with the Building Energy Management System (EMCS). Basis of Design: Phoenix.

230924 – Air Quality System

This project contains an Environmental Monitoring System for the purpose of improving lab safety while reducing overventilation and associated energy costs. The system operates by continuously collecting an array of building environmental data for real-time monitoring and adjustment of the lab ventilation systems. Air samples are gathered from individual spaces through a piped sampling system and multiplexed through a communication network to the central gas / particle sampler for analysis. This sampled data is transmitted to a web based knowledge center for archiving, review, and report generation. This information is also communicated to the Building Management System, which will then increase or decrease the air change rate (as required) to reduce energy costs and improve the Indoor Environmental Quality. Basis of Design: Aircuity

230933 – Variable Frequency Drives

Furnish and install microprocessor based Pulse Width Modulated adjustable frequency AC drives. Drives shall be UL labeled and accept inputs from the Energy Management Control system for control of speed for variable volume pumping and fan systems. Drives shall be complete with protection circuits.

232123 – HVAC Pumps

Provide circulating pumps for closed loop heating and cooling hydronic systems. Larger base mounted pumps shall be split coupled vertical in-line type.

232213 – Steam and Condensate Piping

Furnish and install complete steam and steam condensate piping systems.

- Low pressure steam and vent: Black steel schedule 40
- High pressure steam: Black steel schedule 80 (up to 2”), schedule 40 (2 ½” and larger)
- Steam Condensate (gravity and pumped): Black steel schedule 80
- High pressure Condensate: Black steel schedule 80.

232216 – Steam and Condensate Specialties

Provide specialties for complete and operational system including steam traps, reducing valves, safety relief valves, drip pan elbows, condensate receivers, flash tanks, strainers and converters/heat exchangers.

232333 – Refrigerant Piping and Specialties

Furnish and install refrigerant piping systems as indicated.

- Refrigerant pipe: Type ACR

232500 – Chemical Water Treatment

Provide equipment, chemicals, and service to treat closed hydronic systems for corrosion and freeze protection where system is subject to freezing. Snowmelt systems shall be freeze protected with poly propylene Dowfrost Glycol.

233100 – Ductwork

Supply, return and general exhaust sheet metal ductwork and shall be galvanized steel constructed in strict accordance with the latest edition of SMACNA standards for HVAC duct construction and with the International Mechanical Code. The use of round flexible duct shall be limited to connections to diffuser and air terminal units.
Fume hood branch exhaust shall be stainless steel type 304. Wet acid hoods shall utilize polypropylene ductwork. Exhaust mains which have significant dilution with general exhaust may utilize galvanized steel ductwork. Laboratory general exhaust may utilize galvanized steel

233300 – Ductwork Accessories

Provide balancing dampers with regulators, air turning vanes, fire and/or smoke dampers and flexible equipment connections as required for a complete and operational duct systems.

233400 – Power Ventilators

Provide exhaust fans for ventilation of mechanical/electrical rooms and dedicated processes such as the wet acid hood.

233500 – Sound Attenuators

Provide duct silencers as indicated to achieve the space acoustical criteria.

233600 – Air Terminal Units

VAV with integral hot water reheat coil. Single duct terminal type. Fan powered may be considered in areas with substantial heating loads (areas with significant glass).

233700 – Air Outlets and Inlets

Provide air inlets and outlets including grilles, registers, diffusers, and wall louvers.

234000 – Air Cleaning Devices

All fan systems shall be protected with filter sections.

236313 – Air Cooled Condensing Units

Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, and protective coil covers/screens.

236413 – Water Cooled Water Chillers

Provide factory assembled and tested water cooled liquid chillers consisting of compressors, condenser, evaporator, thermal expansion valve, refrigeration accessories, and control panel. Construction, testing, and ratings shall be in accordance with ARI.

237300 – Air Handling Units

Variable air volume air handling units shall be modular type, prepackaged by the manufacturer, and shall include plenum fan array, face and bypass steam coils, heat recovery coil, and chilled water coils, isolation dampers and pre/final filter. Non lab systems shall additionally include a return fan array and mixing box for economizer cooling.

237300 – Central System Lab Exhaust Fans

Fan array shall be variable air volume and shall consist of high performance centrifugal flow fans manifolded to a common intake plenum with heat recovery coil and filters (heat recovery coil and filters provided with 23 73 00). Fans have horizontal intake and vertical discharge and are constructed for corrosive lab environment. Provide with variable geometry nozzles to maintain constant discharge velocity. The fan housing design allows safe, easy access to all drive components without entering the contaminated exhaust air stream for maintenance. Fans are equipped with isolation dampers for service and air flow monitoring. Basis of Design: Vektor-CS

ELECTRICAL

Codes and Standards

The electrical systems will be designed to conform, as a minimum, to the following codes and standards:

- Eastern Washington University, Design and Construction Guidelines
- National Electrical Code
- International Building Code
- International Fire Code
- Regulations of the State Fire Marshal
- Electrical Safety Orders of the Washington State Department of Labor and Industries
- Washington Administrative Code
- Washington State Non-Residential Energy Code
- Requirements of Washington State Industrial Safety and Health Administration (WISHA)
- Americans with Disabilities Act (ADA)
- Illuminating Engineers Society of North America (IESNA)
- The National Fire Protection Association (NFPA)
- Underwriters Laboratories (UL)
- Applicable state and local ordinances

Project Location / Design Conditions

The project is located on the Eastern Washington University Campus in Cheney, Washington. Altitude: The project is located at an elevation of approximately 2352 feet above sea level.

Serviceability

Provide easy access to all panelboards, motor starters, variable frequency drives, fused switches, junction boxes and other equipment requiring service.

Capacity for Growth

All panelboards serving lab spaces be provided with minimum 20% spare electrical capacity, sufficient spare branch circuit breakers and feed through panelboard lugs where deemed appropriate. This will provide considerable flexibility to adapt labs in the future as the teaching programs and research continues to develop.

General building panelboards should be provided with minimum 10% spare or space and shall have (4) 1” conduits stubbed into nearest accessible ceiling with pull rope.

Energy Conservation

The electrical systems shall meet all of the requirements of the Washington State Non-Residential Energy Code.

At a minimum, electrical energy conservation features should include:

- Energy efficient LED lighting will be utilized as the primary lighting source.
- Occupancy sensors will be utilized to automatically shut off the lighting when rooms are not occupied. Sensors shall be capable of vacancy mode.

- Multi-level switching or manual dimming will be provided for normally occupied spaces to enable manual reduction of lighting levels.
- Automatic dimmable lighting controls for the purpose of daylight harvesting within areas where adequate natural daylight is present within the building.
- A programmable low voltage lighting control system shall be used for time schedule control of both interior and exterior lighting.
- High efficiency electrical distribution transformers.

Site Utilities

The building will receive power from the existing campus 13.2 KV primary electrical distribution system. Medium voltage cabling in conduit will be installed from the nearest medium voltage switch to the service transformers. A total of (2) pad mounted oil filled transformers will be installed on the site to provide 480V and 208V electrical services to the Building. The electrical service yard location is planned to be located at the NW corner of the existing Science Building.

Normal Power Electrical Distribution System

The building electrical services will be derived from (1) 1500kVA, 480/277V outdoor pad mount transformer and (1) 1000kVA 208/120V outdoor pad mounted transformer. The 480V and 208V services will be rated for 2000 Amp and 3000 Amp respectively. Both the 480V and 208V service switchboards will be located in a dedicated main electrical room at the ground floor.

The building electrical distribution will originate from a main electrical room on the ground floor and smaller stacked electrical rooms located on each floor above ground level. The building electrical distribution will be designed to provide separation of lighting, mechanical, lab and general building loads. Circuit breaker panelboards shall be provided throughout the building as required to adequately serve the associated building loads. Lab spaces will typically receive dedicated power panels located in close proximity of each lab room module. Each telecommunications room will be provided with a dedicated 120/208V standby power panelboard and an equipment ground bar. Multi- stage surge suppression shall be provided by installing transient voltage surge suppressors at the main switchboard, distribution panelboards and appropriate branch panelboard locations.

Refer to the mechanical narrative for proposed mechanical systems and possible equipment. Motor starters and disconnects will typically be located in close proximity to each associated piece of mechanical equipment. Motor control centers will be utilized when several pieces of mechanical equipment which require motor starters are located in close proximity to one another. Variable frequency drives will be provided by the mechanical contractor and installed by electrical contractor for various pieces of mechanical equipment.

Branch circuit distribution within each lab spaces will be closely coordinated with the specific function of each lab. Additional spare electrical capacity will be designed into each lab space in order to accommodate future potential changes to lab equipment and lab function. Refer to Lab Narrative for additional information.

Emergency Generator

The building emergency power systems will be derived from (1) 150kW, 480/277V outdoor pad mount gas fired propane generator. The single generator will service both NEC 700 Emergency and NEC 702 Optional Standby loads in the building. A propane fuel storage tank will be located adjacent to the generator on the site.

NEC Article 700 Emergency Power System

NEC Article 700 life safety loads within the building include egress lighting, exit lighting and the fire alarm system. Life safety loads within the building will be served from a dedicated NEC 700 power distribution system throughout the building. The building alternate power source will be provided from the NEC 700/702 gas fired propane generator. An NEC 700 automatic transfer switch will be provided in the building ATS electrical room.

NEC Article 702 Optional Standby Power System

NEC Article 702 legally required standby loads within the building include non-life safety loads such as fume hoods, telecommunications rooms (and associated cooling), lab refrigerators, lab freezers, and important research equipment which is deemed critical by EWU staff. NEC 702 loads within the building will be served from a dedicated NEC 702 power distribution system throughout the building. The building alternate power source will be provided from the NEC 700/702 gas fired propane generator. An NEC 702 automatic transfer switch will be provided in the building ATS electrical room.

Fire Alarm System

A complete battery backed addressable fire alarm system with manual pull stations, automatic detection and ADA compliant speaker/strobes will be provided throughout the facility. Initiating and annunciation devices will be installed as required by the governing codes, and in accordance with EWU campus standards. The building fire sprinkler system will be monitored by the fire alarm system for system flow and shutoff valve tampering. Central reporting capabilities will also be provided with the fire alarm system. Optical smoke imaging devices shall be provided for large multi-story atriums or other large volume spaces.

ELECTRICAL OUTLINE SPECIFICATIONS

DIVISION 26 - ELECTRICAL

260001 – Basic Electrical Requirements

The electrical systems will be designed and specified for installation in accordance with the latest edition of the following codes: IBC, NEC, NREC, OSHA, WISHA, NFPA, ADA, NEMA standard and Eastern Washington University (EWU) standards.

260102 – Project Finalization

All electrical systems shall be tested for proper operation. Complete as-built drawings and O & M Manuals shall be furnished to the Owner.

260519 – Building Wire and Cables

Conductors shall be copper only. Aluminum will not be permitted. Dedicated neutrals shall be provided for all computer outlets and multi-wire branch circuits. Minimum conduit and wire size for branch circuits shall be ¾" C and #12 AWG respectively. Minimum conduit and wire size for exterior lighting shall be 1" C and #10 AWG respectively.

260520 – Equipment Wiring

Verify load characteristics and properly connect electrically-powered equipment. Contractor shall be present during start-up procedures.

260526 – Grounding and Bonding

Grounding materials shall be copper. Grounding electrodes shall be provided per code requirements. Equipment grounding conductors shall be run with all feeders and branch circuits. Interior of all manholes and pull vaults to be grounded and bonded. A complete grounding distribution system shall be provided between ground bars at electrical closets, communication closets and the main building ground bar. A grounding ring shall be provided at each manhole, pull vault, pad-mount transformer and pad mount generator.

260530 – Conduit

Galvanized steel metal conduit shall be used inside building. Non-metallic conduit shall be used underground and within masonry/concrete, except at transitions. Metal conduit shall be rigid metal conduit, electrical metallic tubing (EMT), or flexible metal conduit. Non-metallic conduit shall be schedule 40 PVC. Conduit shall be concealed wherever possible. Conduit minimum size shall be 3/4" for power. EMT shall be equal to Allied True Color and color coded as follows: Fire Alarm (Red), Normal Power (Silver), Emergency Power (Orange), Low Voltage (Silver). Conduit fittings shall be steel compression type.

260532 – Boxes

Outlet boxes shall be pressed steel type with device rings. Outlet boxes shall be minimum 4" square by 2-1/8" in depth. Pull boxes shall be screw cover type. Boxes shall be color coded as follows: Fire Alarm (Red), Normal Power (Silver), Emergency Power (Orange), Low Voltage (Silver)

260536 – Cable Trays

Cable trays shall be steel wire-mesh type equal to Cablofil "EZ" Series. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps. Where cable tray is exposed in finished areas, provide steel solid corrugated bottom type tray equal to PW Tray. Minimum cable tray width shall be 12" with minimum 4" rail height.

260543 – Ductbank

Concrete encased underground ducts shall be PVC Schedule 80 for installation of power circuits. Slope vertically to each manhole, vault or hand hole. Provide duct spacers maximum 5'-0" on center. Provide horizontal reinforcing bars at corners of concrete duct banks. Band horizontal bars together every 10 feet with vertical reinforcing bar hoops.

260553 – Electrical Identification

Engraved phenolic nameplates shall be provided for motor controllers, disconnect switches, enclosed circuit breakers, panelboards, switchboards and separate over current devices in switchboards. Printed stick-on nylon labels shall be provided for all outlets indicating panel and circuit number. Switches controlling equipment or light switches controlling luminaires not within sight of switch shall have faceplate engraved to indicate function, or nameplate attached.

260573 – Power System Study

A complete power system study shall be conducted by a certified agent of the electrical contractor. The study shall include a short circuit analysis, coordination study and arc-flash study for required systems.

260800 – Electrical Systems Commissioning

Commissioning of installed electrical systems shall be provided per the Division 01 requirements.

261219 – Pad Mounted Distribution Transformers

Pad-mounted transformer shall be oil-filled and of sufficient capacity to service the building electrical loads. Secondary voltage shall be as indicated.

261513 – Medium Voltage Cable

Medium voltage cabling shall be 15KV type, MV-90, copper conductor with EPR insulation. Terminations of medium voltage cabling shall be made with load break elbows.

262213 – Dry Type Transformers

Dry type transformers shall be high efficiency type with continuously wound aluminum coils on primary and secondary. Transformers shall be mounted on a 4" concrete housekeeping curb.

262413 – Switchboards

Switchboards shall be free-standing dead-front style. Main devices shall be electronic trip equipped with ground fault protection where required by code. Distribution devices shall be factory-installed, molded-case thermal magnetic circuit breakers or fused switches. Switchboard shall be mounted on a 4" concrete housekeeping curb. Each switchboard shall be provided with power metering located in a separate enclosure.

262416 – Panelboards and Enclosed Circuit Breakers

Panelboards and enclosed circuit breakers shall be dead-front circuit breaker type with proper interrupting capacity. All panelboard bus bars shall be copper. Metering located in separate enclosures shall be provided for each panelboard which serves lighting or mechanical loads.

262419 – Motor Control Centers

Motor control centers shall be free-standing, dead-front style. Motor control centers shall be mounted on four 4" concrete housekeeping curbs.

262716 – Cabinets and Enclosures
NEMA 1 and 3R screw and hinged cover enclosures as required for application.

262726 – Wiring Devices
Switches and receptacles outlets shall be specification grade. Trim plates shall be brushed stainless steel.

262727 – Supporting Devices
Common materials required for the support of threaded rod, fasteners, and strut.

262813 – Fuses
Fuses shall be current-limiting type. Fuses in switchboards shall be Class J. Fuses in disconnects shall be Class RK1, time-delay type.

262816 – Enclosed Switches
Safety switches shall be heavy duty type with interlocking door and spring loaded contacts. Safety switches used as motor disconnects shall be fused. Outdoor safety switches shall be NEMA 3R. Safety switches downstream of VFD's or Starters shall be provided with auxiliary contacts for interlock.

262913 – Enclosed Motor Controllers
Separate motor controllers shall be magnetic motor starters with fused control power transformers, pilot lights, HOA selector switches and auxiliary contacts as required for control functions.

262933 – Elevator Power Module Panel
Enclosed switch for control of power to elevator machinery. Switches shall include class J fuses, control power transformer, shunt-trip device and (2) dry contracts (Form C).

263213 – Packaged Engine Generator Systems
NFPA 110, engine generator system to provide source of power for NEC 700 & 702 applications, and conforming to NFPA 99. Fuel type shall be propane. Generator to be provided with sound attenuating weatherproof enclosure and 6" concrete housekeeping pad. System to be provided with remote annunciator panel, monitoring and alarms.

263623 – Automatic Transfer Switch
Automatic transfer switches shall be 4-pole, switched-neutral, double-throw over-center contactor type. Switches shall be rated for serving NEC 700 and 702 loads as required.

264302 – Transient Voltage Surge Suppression
Transient-voltage surge suppressors shall be provided at service entrance switchboards and at selected 120/208 volt panel boards. Suppressors shall be externally mounted in separate enclosures.

DIVISION 28 – FIRE ALARM

283100 Addressable Fire Alarm System

The fire alarm control panels shall be modular, multi-zone, solid-state type with battery back-up. System shall include UL Listed modular fire alarm network that uses independently addressed fire detection devices, input/output control modules, amplifiers and speakers. Remote annunciators shall include optional microphone for voice announcements. The building shall be monitored by the existing campus monitoring system.

Fire alarm systems will be as manufactured by Edwards Systems Technology, EST-3

LIGHTING

Codes and Standards

The lighting systems will be designed to conform, as a minimum, to the following codes and standards:

- Eastern Washington University, Design and Construction Guidelines
- Illuminating Engineers Society of North America (IESNA)
- The National Fire Protection Association (NFPA)
- Underwriters Laboratories (UL)
- Applicable state and local ordinances

Interior Lighting & Lighting Controls

Lighting throughout the interior building spaces will respond to the primary use of each space while maintaining a level of flexibility to react to the future use of each space. Uniform ambient lighting will establish a basic minimum lighting level throughout each individual space with task, display and accent lighting used to establish contrast and interest. Specific attention will be given to the lighting for areas with computer workstations and projectors in order to minimize glare and conflict. Lighting within the building will be LED.

Lighting system design foot candle levels will be in accordance with IES standards and EWU standards. In general, areas within the building and on the site will be illuminated to the following light levels and lighting power densities:

Space type	Target Illumination (FC)	ASHRAE 90.1 2007 LPD (w/sf) (LEED baseline)	2015 WA Energy Code Allowed LPD (w/sf)	Target LPD (w/sf)
Lab/Lab Support	75	1.4	1.02	1
Lab Storage	10-20	0.8	0.5	0.5
Class	30-50	1.4	1	0.7
Study/seating	20-30	1.2	0.74	0.7
Hall/stairs	10-15	0.6	0.55	0.5
MEP Utility	10-20	1.5	0.76	0.76
Restrooms	10-15	0.9	0.78	0.78
Office	30-50	1.1	0.89	0.89
Exterior Entry	5	NA	NA	NA
Exterior Paths	2	NA	NA	NA
Parking Areas	1	NA	NA	NA
Overall Building LPD		1.2	1.01	**0.85**

Space type	Target Illumination (FC)	ASHRAE 90.1 2007 LPD (w/sf) (LEED baseline)	2015 WA Energy Code Allowed LPD (w/sf)	Target LPD (w/sf)

Notes:

1. Lab/Lab support Illumination are at the benchtop (source RFD Design Criteria Narrative-EWU Science II)
2. Lab storage illumination (source RFD Design Criteria narrative-EWU Science II)
3. Other spaces illumination from IES Handbook

Fully enclosed and gasketed lighting will be utilized within specific dirty areas where air born dust from Lab procedures is anticipated. Lighting with impact resistant lenses will also be considered for higher abuse areas.

Exit lighting will be LED type with integral battery backup. Emergency egress lighting will be provided throughout the path of egress, and will be supplied with generator power for backup in the event of a failure on the normal power system.

Exterior lighting will be selected to match the architectural building exterior and EWU campus standards. Exterior entry lighting which illuminates the path of egress will be supplied with generator power to provide illumination in the event of a failure on the normal power system. Exterior lighting will utilize full cut off light fixtures in order to avoid light trespass and meet associated dark sky lighting requirements.

LIGHTING OUTLINE SPECIFICATIONS

DIVISION 26

260943 – Low Voltage Lighting Controls

Furnish and install a complete system for the control of lighting and other equipment. The lighting control system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.

All system devices shall be networked together enabling digital communication and shall be individually addressable.

Lighting controls shall be provided with interface to Division 23 EMCS.

Standard of design shall be Nlight (Acuity Brands).

265000 – Lighting

Furnish and install a complete system of lighting in conformance with applicable standards and governing codes.

Lighting fixture voltage shall match the serving branch circuit.

Spare Parts: Furnish (2) of each plastic lens type. Furnish (4) of each lamp type or LED module. Furnish (2) of each ballast type or LED driver type.

Provide luminaires complete with lamps, tubes, ballasts, drivers, brackets, hardware, poles, bases, etc. as required for a complete and operable lighting system.

Luminaires shall have manufacturer's standard finish unless otherwise noted. Luminaires installed on exterior of building shall be weather-resistant design and display a "Damp" or "Wet" location label as required per applicable codes.

Luminaires installed on the exterior of the building and/or in unheated spaces shall be suitable for cold weather operation.

Lighting fixture lamping shall be LED type. Where selected interior fixtures are not available with LED lamping, provide fluorescent T5 or T5HO lamps.

Exit lights shall be self-contained, fully automatic AC/DC units with sealed pure lead battery and solid state charger. Exit lights shall have green letters on white. AC operating voltage shall be 120 or 277 volts as required to match area lighting. Lamps shall be LED type.

Emergency lighting control units shall be Bodine BLCD-20B or approved equal.

Per EWU standards, exterior lighting poles shall be provided with hinged bases to allow poles to be placed in a horizontal position for maintenance.

COMMUNICATIONS & SECURITY

Codes and Standards

The electrical systems will be designed to conform, as a minimum, to the following codes and standards:

- Eastern Washington University, Design and Construction Guidelines
- National Electrical Code
- Americans with Disabilities Act (ADA)
- The National Fire Protection Association (NFPA)
- Underwriters Laboratories (UL)
- Applicable state and local ordinances

Site Utilities

Existing buried communications duct banks will be impacted by the new building. The existing communications duct banks will be rerouted to avoid the new building footprint. New fiber cabling will be installed to replace cabling that was previously routing through the existing site communications duct banks. New duct banks and fiber cabling will be installed for communication services to the new building.

Communications

Communications Building Distribution: Communications building distribution cabling, devices and pathways will be provided by the contractor. Communications rooms will be located throughout the facility in accordance with EIA/TIA 568 and 569. The main telecom room will be located on the ground level of the building. Multiple secondary Communications rooms will to be located on each floor and stacked vertically from floor to floor. Horizontal station cable will be provided and routed to the Communications rooms located on each floor. Each Communications room shall be provided with a dedicated 120/208V standby power panelboard and an equipment ground bar. The building will be equipped with cabling provisions for wireless local area networking. Communications riser cabling will be provided from the entrance location to the Communications room on each floor. Cable trays will be installed on each level to facilitate cabling installation. All horizontal distribution of Communications risers will occur on the ground floor level. Vertical distribution of Communications risers will route vertically through the building and between floors via stacked secondary Communications rooms.

Communication Outlet Distribution: Communications devices will typically be located at ceiling mounted projector locations, labs, lab support, classrooms and commons/social areas.
A wireless Communications distribution system will be installed to provide students with WIFI coverage throughout the building. Wireless routers to be provided by EWU.

Community Antenna Television (CATV)

CATV system cabling and pathways will be provided by the contractor. CATV System service pathways will be provided by the contractor to the main Communications room. CATV outlets will typically be provided within labs and classrooms. All CATV equipment will be provided and installed by EWU.

Clock System

Clock System cabling and pathways will be provided by the contractor. Required locations for clocks will be closely coordinated with EWU. Clocks will typically be provided within the labs, classrooms, lobbies and circulation areas. All clocks and clock equipment will be provided and installed by EWU.

Security and Access Control System

A complete access control system will be provided in accordance with EWU campus standards. Required locations for miscellaneous access control devices will be closely coordinated with EWU. Typical spaces to be provided with access control include exterior entries, classrooms, labs, lab storage, mechanical, electrical, communications, roof and janitorial.

Video Surveillance (CCTV) System cabling and pathways will be provided by the contractor. Required locations for CCTV devices will be closely coordinated with EWU. Typical spaces which will include CCTV devices are all building entrances, lobbies, circulation areas and building exterior. All CCTV cameras, power supplies and active electronic equipment will be provided and installed by EWU.

Distributed Antenna System (DAS)

A distributed antenna system for emergency responder radio use is not planned for the building. This plan is in conformance with EWU standard approach for new construction projects.

COMMUNICATIONS & SECURITY OUTLINE SPECIFICATIONS

DIVISION 27 - COMMUNICATIONS

270528 – Communications

Provide, complete with all accessories, a structured cabling system for distribution of telephone, data, television, and video surveillance signals throughout the building as indicated on the Drawings.

The Contractor shall test the system to assure that it complies with the requirements of TIA/EIA Standard 568B and TIA TSB-67.

Wiring utilized for data and voice telephony signals shall originate on Category 6 patch panels with RJ-45 jacks with 30% spare capacity in data closets for connection to Owner-provided hubs and concentrators in equipment racks located in the various communications closets.

A fifteen (15) year Extended Product Warranty and System Assurance Warranty for the telephone/data distribution system shall be furnished by the manufacturer.

Provide 4-11/16" square x 2-1/8" deep metallic box for each wall-mounted communication outlet.

Provide a minimum 3/4” conduit from each wall-mounted communication outlet to the nearest cable tray, equipment closet, or core cabling pathway. Provide larger conduit sizes where indicated on the drawings.

Cable tray shall be wire-mesh type where installed in concealed ceilings or unfinished areas. Exposed cable tray in finished areas shall be corrugated solid bottom type.

The use of j-hooks is permitted where specifically shown on the plans. The intent is to allow the use of j-hooks where installation of cable tray is not feasible due to insufficient ceiling space. Exposed cabling shall not be permitted in finished areas.

Category 6 jacks and Patch Panels shall be SYSTIMAX, no equals.

Station cable shall be UL verified and complying with Category 6 requirements contained in EIA/TIA standard 568A. Cable routed within on-grade slabs, below grade or outside the building footprint shall be indoor/outdoor rated. Cabling shall be SYSTIMAX, no equals.

Copper riser cable shall conform to Category 3 requirements contained in TIA/EIA Standard 568B. Riser cable shall be equal to Avaya ANMW Series.

Fiber riser cable shall be Corning Freedom loose-tube, indoor/outdoor-rated hybrid, OFNR cable, 12SM/12MM 62.5 micron.

All fiber optic termination products used on this project shall utilize LC style connectors.

275313 – Clock System

Category 6 data outlets shall be provided for connection of IP type clocks.

Clocks shall be Inova Solutions OnTime Digital Clocks (Part Number 715412) and shall be supplied by the Owner. The clocks shall also be preconfigured by the Owner.

DIVISION 28 - SECURITY

281300 – Security Access System

The Access Control and Security System (ACSS) shall be based on a distributed system of fully intelligent, stand-alone controllers, operating in an existing multi-tasking, multi-user environment on a true peer-to-peer, token passing Local Area Network (LAN), called the Controller LAN. The Access Control System shall include all work station software, Control Units (CU's), Local Area Networks (LAN's), Security Control Units (SCU's), readers (where required), ID cards, and commissioning for a complete and operational system. Electrified hardware (electrical locks and/or strikes, electric locks w/ readers) are furnished and installed under Division 08.

All security cabling shall be installed in metallic raceway, minimum ¾".

Cabling shall be plenum rated equal to West Penn.

Proximity card readers shall be HID ThinLine II.

The request to exit (REX) devices shall be a DS 150i Series Request to Exit PIR Sensor as manufactured by Detection Systems, Inc. or approved equal.

Door position switches shall be designed for wide gap operation on metal doors, Sensor shall be a Sentrol 1076 or approved equal

All system components shall be powered from a generator supplied circuit and backed up with a minimum 120V, 1-Phase, 750 Watt UPS for each access control panel. Provide larger UPS where manufacturer requires. Electrified Exit Devices that need a local power supply shall have the battery back-up option in the power supply.

282303 – Video Surveillance System

Provide raceway, outlet boxes and cabling for the installation of network-based video surveillance cameras.

Raceways and cabling shall be installed in compliance with Divisions 26 & 27.

The Owner will install video surveillance cameras and equipment.

AUDIO VISUAL

Codes and Standards

The audio visual systems will be designed to conform, as a minimum, to the following codes and standards:

- Eastern Washington University, Design and Construction Guidelines
- National Electrical Code
- Americans with Disabilities Act (ADA)
- Underwriters Laboratories (UL)
- Applicable state and local ordinances

Audio Visual System

AV system data cabling and pathways will be provided by the contractor. Required locations for AV devices and equipment will be closely coordinated with EWU, but will typically include labs and classrooms. Each lab and classroom will typically be provided with video projectors, sound reinforcement systems, media controls and processing equipment. The complete system of AV equipment and cabling will be provided and installed by EWU through their preferred vendor/contractor.

AUDIO VISUAL OUTLINE SPECIFICATIONS

DIVISION 28 – AUDIO VISUAL

282340 – MultimediaSystem

A complete system of raceways, outlet boxes, data connections and 120V power shall be installed in compliance with Divisions 26 & 27.

AV system equipment and cabling shall be provided and installed by EWU.

INTRODUCTION

This narrative presents considerations for noise and vibration control for the schematic design phase of the new Eastern Washington University Integrated Science Center project. Included within this report will be architectural and mechanical system considerations.

Architectural

Architectural acoustics involves both the creation of desired acoustic environments within rooms and the control of sound between spaces. Specifically these are referred to as interior acoustics and acoustic separation respectively, and both of these environments will be described for each space.

Interior acoustic is the creation of desirable acoustical environments within rooms. It relates to the shape, volume, and interior surfaces of the room. A room response can be dampened, moderate, or lively. A lively room response would be desired for a cathedral, and to a lesser extent, for a concert hall. A moderate room response means that the room is evident in the sound, but to a limited degree. A dampened room response is desirable to optimize speech intelligibly. For the majority of spaces within the Integrated Science Center project, acoustically absorptive materials on the ceilings and walls will provide the desired acoustic environments by reducing reverberation. A list of acoustically absorptive materials is presented in Appendix I.

Acoustic separation is the reduction of sound between spaces within the building. It involves controlling the audibility of intruding sound with the architectural separation between two adjacent spaces. Acoustical separation is also directly related to the amount of background sound present in the room receiving the intruding sound. People in rooms with higher background sound levels, typically produced by the HVAC system, are less able to hear intruding sounds. Conversely, people in rooms that are quieter can hear intruding sounds more easily. So, when spaces are intended to have very quiet background noise levels, more is asked of the architecture to quiet intruding sounds. Examples of spaces with quiet background noise are lecture halls and spaces served chilled beam or air displacement systems.

Wall types used herein are designated as Wall Types 1 through 6 and are detailed at the end of this narrative in Appendix II. Door seals are described in Appendix III.

Tiered Classroom

The tiered classroom is located on the ground floor adjacent the mechanical room and the main electrical room. A dampened room response is planned for this room to accommodate both the lecture mode and media/film usage. To maintain the quiet background criteria, the acoustic separation between the classroom and adjacent spaces must be increased to ensure that outside noises do not intrude into the space.

Interior Acoustics

- Side Walls & Rear Wall - Absorptive material should be used on the rear two-thirds of the sidewalls and the rear wall, with the front one-third remaining reflective.
    - This sound absorptive material should be in the form of 2” thick acoustical wall panels on the rear wall and 1” thick acoustical panels on the side walls. These panels should be rated at an NRC-0.95 or better and should begin approximately 3-feet above the finished floor and extend up to 8-feet. This banner does not have to be continuous and can consist of spaced panels or other more monolithic absorptive products. Budget $25 per square foot for this material.
- Ceiling – The front one-third of the classroom ceiling should be sound reflective with the rear two-thirds being sound absorptive.
    - The reflective portion of the ceiling can be constructed out of wood, sheetrock, or other solid materials with surface density of 2 pounds per square foot or heavier. This reflective surface

should be angled so that it acts as a bouncing board for the speech emanating from the lecturer. This bouncing board will in turn direct the acoustic energy towards the seating area. The sounding board angle will be optimized during the DD phase of design.

- The absorptive portion of the ceiling can be acoustical tile or another sound absorptive material rated at NRC-0.70 or better. This ceiling can be monolithic, rectilinear, articulated, or installed as clouds. We will continue to develop this ceiling material as the project progresses.

Acoustic Separation

- Walls at MEP and Electrical Main should be Type 6.
- Entry wall should be Type 4.
- Doors
  a. Consider using a vestibule with two sets of doors leading to this classroom. The vestibule will act a sound lock separating the classroom from activities in the corridor. If used, the vestibule doors should be as follows:
     i. Inner vestibule door should be swinging doors and not include any hardware.
     ii. Outer vestibule door to circulation areas should be equipped with Full Seals.
  b. If vestibules are not possible, consider using acoustically rated doors with a minimum of STC-47 rating. With this option, noise from the corridor is expected to enter the classroom when the doors open with late arrivals. In addition, panic hardware noise is expected to be presents in the classroom with later arrivals and early departure. Allow for $4000 per 3x7 STC -47 door
  c. If options a and b are not possible, a standard solid wood door should be used and should be equipped with full seals including seals at the meeting stiles. This door is expected to perform at STC-30. Similar to option b, panic hardware noise and noise from the corridor are expected to be present in the classroom.
- A resiliently suspended sheetrock ceiling should be included in the room's design. The resiliently suspended isolated sheetrock ceiling is needed to increase the vertical separation from Level 1 activities. Specifically to mitigate footfall impact noise from the circulation area. This resiliently suspended ceiling consists of two layers of GWB suspended using spring isolators, which are typically installed 48-inches on center. Budget $25-30 per isolator. (Mason 30N spring hangers or similar)

Labs

Interior Acoustics

- Ceiling - An absorptive ceiling should be used in the labs. This ceiling material should be rated at NRC-0.70 or better.

Acoustic Separation

- The common walls between the labs include doors. This common wall should be Type 4.
- Entry wall should be Type 4.
- Doors should be equipped with full seals
- Attempts should be made to locate fume hoods in separate rooms or nooks to reduce noise exposure to the lab occupants

Corridor/Circulation/Study Areas

Interior Acoustics

- Acoustic tile ceiling, acoustical clouds or surface applied sound absorptive material should be applied overhead in these areas. The material should have a minimum acoustical of NRC 0.70 rating.

MECHANICAL SYSTEM NOISE & VIBRATION CONTROL

Criteria

Background noise within occupied spaces consists of ventilation system noise, electrical system noise, exterior noises intruding into the room and noise created by the users. Noise created by the users can be due to overhead projectors and laptops and is not part of the building design.

The acoustical design goal is the achievement of a level of background noise that is unobtrusive in quality (frequency content) and low enough in level (amplitude) that it does not interfere with the function of the space being served. To be unobtrusive the background noise should exhibit the following characteristics:

- A balanced distribution of sound energy over a broad frequency range to create a sound that is bland in character.
- No audible tonal characteristics such as a whine, hum, or rumble.
- No noticeable time-varying levels from system induced aerodynamic instability or air turbulence.

The recommended background noise criteria for this project are as follows:

Recommended Background Noise Criteria

Area	Criteria
Tiered Classrooms	NC-25 to 30
Labs with Fume Hoods	NC-45 to 55
Labs without Fume Hoods	NC-45
Circulation	NC-40 to 45

HVAC Noise Types

Noise is transmitted from ventilation fans via three mechanisms or paths:

- ductborne noise, which is created by fans and which transmits down attached ductwork, and which radiates out of the ductwork walls or grilles, into occupied areas;
- airborne noise, which is created by the equipment and which travels through the air surrounding the equipment, through surrounding walls or floors, and into occupied areas; and,
- structureborne noise, which is created by the vibration of equipment, and which travels as vibration into the walls, ceilings or floors surrounding occupied areas, and which then radiates as noise from those surfaces.

Allocation of Space for Duct Silencers

Our preliminary recommendations for this phase are to budget for silencers for the major air handling units. We will continue to evaluate the need for silencers as the HVAC design develops. Following are the recommended silencers:

- 5 feet long on the discharge side of all air handling units
- 3 feet long on the return side of all air handling units
- 5 feet long on the suction side of major exhaust fans

Allocation for Ductliner

An allowance for internal ductliner should be included in the budget. The inclusion of ductliner in addition to the silencers is consistent with designs for similar facilities with sound sensitive spaces. The following ductliner allowances should be included:

- Line the first 10-15 feet of supply and return duct from the units.
- Line the takeoff branches between the damper and the diffusers, for a minimum of 4-feet, in the Tiered Classroom.
- Line the first 5-feet downstream of any VAV boxes.
- Line the first 10-15 feet of ductwork from any exhaust fan serving a restroom.

Fume Hoods

- Do not locate hood air control valve directly over the hood. Attempts should be made to locate the valves at least 5 feet away from the hood.

VAV Boxes

It is likely that passive VAV boxes will be used for this project. Although these boxes do not include fans, the dampers used to regulate airflow do create turbulent airflow noise.

- VAV boxes should not be located above the sound sensitive with NC30 criteria or less. This guideline will be evaluated as the project progresses but should be followed during the HVAC layout planning early in the design.

Recommended Duct Velocities

Use the lowest possible air velocities consistent with air change requirements. The following velocity guidelines apply for supply duct (SD) and return duct (RD). Linear extrapolation should be used for higher NC Criteria.

Duct	**NC-20**		**NC-25**		**NC-30**		**NC-35**	
	Supply	Return	Supply	Return	Supply	Return	Supply	Return
Duct just prior to diffusers or grilles	300	350	350	350	425	500	500	600
Duct trunk prior to final diffuser or Grille duct	500	550	600	650	700	725	800	800
Next order supply or return duct	1000	1000	1200	1200	1300	1300	1400	1400
All other ductwork	1500	1500	1500	1500	1500	1500	1500	1500

Miscellaneous Recommendations

- Allow for at least 4-feet of flex ductwork prior to supply diffusers and return grilles.
- Volume dampers should be located at least 4-feet away from grilles/diffusers.

Equipment Vibration Isolation

In addition to quieting down the fan noise within the ductwork, it is also important to limit the amount of equipment vibration that enters the structure.

- Fans within the air handling units should be internally isolated on spring isolators. Typically the unit itself will be externally isolated on neoprene pads, which should be planned for at this point in the design. For this to work, it is important that the unit not be welded to the structure.
- All major exhaust fans should be isolated on springs
- All ductwork attached to noise generating equipment should be via flex duct connectors.

Appendix I - Acoustically Absorptive Materials

The following lists examples of acoustically absorptive products and manufacturers that can be used on walls:

1. Fabric-wrapped acoustical wall panels with NRC ≥ 0.80
   - Acoustic Panel AP.....www.decoustics.ca/products/walls
   - Quiet Touch .....www.jasco-usa.com
   - 1" thick ACT .....www.conweddesignscape.com
   - 1" thick A100.....www.walltechnology.com

2. Stretch fabric wall system with absorptive core
   - SnapTex .....www.snaptex.com
   - FabriTrak .....www.fabritrak.com

3. Tackable/Impact Resistant acoustical wall panels
   - HIR #1 .....www.decoustics.com
   - Quiet Touch Extra .....www.jasco-usa.com
   - LSS-OFP .....www.perdueacoustics.com
   - Respond High Impact.....www.conweddesignscape.com
   - A108 .....www.walltechnology.com
   - Fabri-Tough .....www.tectum.com
   - Kinetics KNP.....www.kineticsnoise.com

4. Perforated wood panels with 1" fiberglass backing
   - Quadrillo .....www.decoustics.com
   - Topakustic .....www.rpginc.com

5. Gypsum wallboard look-alike sound absorptive material
   - BASWAphon.....www.rpginc.com
   - Claro and Ceilencio.....www.decoustics.com
   - Snap-Tex Stretch Fabric System.....www.snaptex.com
   - New Dimensions .....www.walltechnology.com
   - Eurospan .....www.walltechnology.com
   - Hunter Douglas Techstyle.....www.hunterdouglascontract.com

6. Perforated metal panels with 1" fiberglass backing
   - Alpro .....www.alproacoustics.com

7. Spaced wood with 25% to 35% open area over fiberglass batts or boards
   - Ventwood.....www.ventwood.com
   - 9Wood www.9wood.com

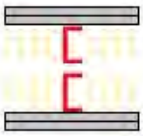
8. Perorated GWB with 1" fiberglass backing
   - Danoline.....http://danoline-uk.com/

9. Acoustical Ceiling Tile with NRC ≥ 0.7:
   - USG Frost #450 .....http://usg.com/
   - USG Eclipse #78775.....http://usg.com/
   - USG Mars #88785 .....http://usg.com/
   - USG Halcyon #98243 .....http://usg.com/
   - USG Sandrift #808.....http://usg.com/
   - USG Millenia.....http://usg.com/
   - Armstrong Ultima .....http://www.armstrong.com/
   - Armstrong Fine Fissured #1811 .....http://www.armstrong.com/
   - Armstrong Fine Fissured #1824 .....http://www.armstrong.com/

10. Miscellaneous Acoustic Absorption Materials
    - PEPP .....www.acousticalsurfaces.com

Appendix II - Wall Types

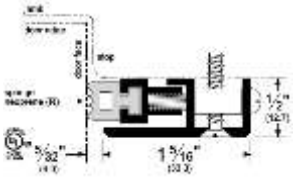
WALL TYPES

	Rating	25 gauge Stud Construction	20 or 16 gauge Construction	Notes
Type 1	STC-35	 • 1 layer 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 1 layer 5/8" GWB		• This wall stops 6" above the ceiling. • Mineral board acoustical tile ceiling should be used on both sides of the wall. • The tile should be rated at min NRC-0.55 and min CAC-35.
Type 2	STC-40	 • 1 layer 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 1 layer 5/8" GWB		**Option 1:** This wall stops 6" above the ceiling. Mineral board acoustical tile should be used on both sides of the wall. The tile should be rated at min NRC-0.55 and min CAC-40. **Option 2:** Extend 1 layer of GWB to underside of structure and use Mineral board acoustical tile ceiling on both sides of the wall. The tile should be rated at min NRC-0.55 and min CAC-35
Type 3	STC-45	 • 1 layer 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 1 layer 5/8" GWB	 • 2 layer 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 1 layer 5/8" GWB *OR*  • 1 layer 5/8" GWB • 5-5/8" metal stud • R-11 insulation • 1 layer 5/8" GWB	• One layer of GWB should extend to underside of structure. • The other layer can stop at 6" above the ceiling. • R-11 batts to extend as high as the shortest of the two layers
Type 4	STC-50	 • 2 layers 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 1 layer 5/8" GWB	 • 2 layer 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 2 layer 5/8" GWB *OR*  • 2 layer 5/8" GWB • 5-5/8" metal stud • R-11 insulation • 1 layer 5/8" GWB	• One layer of GWB should extend to underside of structure. • The other layer can stop at 6" above the ceiling. • R-11 batts to extend as high as the shortest of the two layers
Type 5	STC-55	 • 2 layers 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 2 layer 5/8" GWB	 • 2 layer 5/8" GWB • 3-5/8" metal stud • R-11 insulation • 3 layer 5/8" GWB *OR*  • 2 layer 5/8" GWB • 5-5/8" metal stud • R-11 insulation • 2 layer 5/8" GWB	• Two inner layers of GWB should extend to underside of structure. • R-11 batts to extend full height
Type 6	STC-63	 • 2 layers 5/8" GWB • 3-5/8" metal studs • R-11 insulation in cavity • minimum 1" air space • R-11 insulation in cavity • 3-5/8" metal studs • 2 layers 5/8" GWB.		• All four layers layers of GWB should extend to underside of structure. • R-11 batts to extend full height • STC rating degrades significantly when blocking is added in a wall bridging the two sides of the double-studs. Such blocking is added to support plumbing or other objects and should not be allowed to bridge the two sides of the wall.

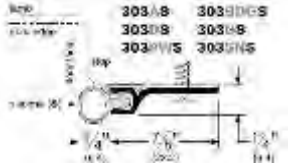
Appendix III - Acoustical Treatment for Doors

Sound can transmit easily around unsealed doors. Doors can be treated acoustically if greater acoustics separation is required. Adding full or partial acoustical seals or replacing the door with an acoustical door will substantially improve the noise reduction capabilities of the door. Sealed doors consist of adding seals to a typical door. Another option is to create a vestibule. This would allow for an additional separation before entering the room.

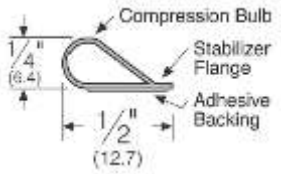
	Description	Material
Full Seals	Full seals around a standard door consist of a top seal, jamb and hinge seal, bottom seal and a threshold. An automatic drop bottom seal is needed if threshold is not used *Cost is approximately $250 per door*	• Perimeter seal: Pemko 379. • Bottom Gasket (Automatic Drop Bottom): Pemko 411, 430, or 434. • Astragal Gasket (for pair of doors): Pemko 354.
Partial Seals	A minimal seal assembly consists of top, jamb and hinge seals. *Cost is approximately $150 per door*	• Perimeter Seal: Pemko S88. • No bottom gasket required
Acoustical Doors	Acoustical Doors are ordered as a complete assembly from the manufacturer. Included in the package are the door, frame, perimeter sound seals, and door bottom. The doors should be acoustically rate to STC 51 if metal, and STC 46 if wood. *Cost is approximately $3000 per door*	• Perimeter Seal: Included with door assembly • Bottom Gasket: Included with door assembly • Astragal Gasket: Included with door assembly
Vestibule	The exterior vestibule door would consist of panic hardware and full seals. The interior door would just be a typical swinging door.	*Vestibule exterior door seals* • Perimeter seal: Pemko 379. • Bottom Gasket (Automatic Drop Bottom): Pemko 411, 430, or 434. • Astragal Gasket (for pair of doors): Pemko 354



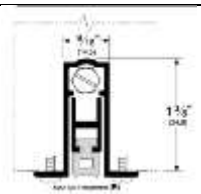
Pemko 379 - adjustable



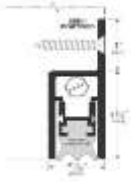
Pemko 303 - non adjustable



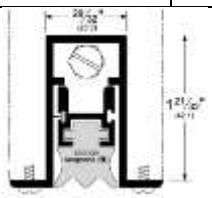
Pemko S88



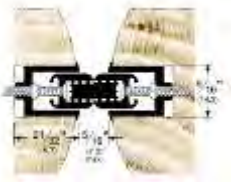
Pemko Bottom Gasket 411



Pemko Bottom Gasket 430



Pemko Bottom Gasket 434



Pemko Astragal Gasket 354

OUTLINE SPECIFICATIONS

DIVISION 23 – Mechanical

23 05 48 – Vibration and Seismic Control for HVAC Systems
23 07 00 – Insulation for HVAC Systems
23 33 19 – Duct Silencers

END OF OUTLINE ACOUSTICS SPECIFICATIONS

EWU Interdisciplinary Science Center

last updated

LEED 2009 for New Construction — March 15, 2016

EWU Design Guideline Prerequisite or Credit

Recommend Changing Design to Achieve this credit

Needs Further Study -- attainment uncertain at this time

ACTION ITEM

Yes	Y?	N?	No						
15	6	1	4	**Sustainable Sites**			Responsibility	Status / Remarks	26 Points
P					Prereq 1	**Construction Activity Pollution Prevention**	Contractor - TBD		Required
1					Credit 1	**Site Selection**	LMN		1
5					Credit 2	**Development Density & Community Connectivity**	LMN	3/9/16 - LMN to ask CPL/P+W for PUB scorecard	5
			1		Credit 3	**Brownfield Redevelopment**	na		1
6					Credit 4.1	**Alternative Transportation**, Public Transportation Access	LMN	Opt 2 (Buses). 3/9/16 - LMN to confirm with EWU bus stop re-routes	6
	1				Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing	LMN	3/9/16 - LMN to check distance to Rec Center or PUB for bikes. 3/22/16 - What is campus bike rack standard?	1
			3		Credit 4.3	**Alternative Transportation**, Low-Emit & Fuel-Efficient Vehicles	LMN	no new parking at ISC	3
2					Credit 4.4	**Alternative Transportation**, Parking Capacity	LMN	no new parking at ISC	2
	1				Credit 5.1	**Site Development,** Protect or Restore Habitat	Berger	3/9/16 - Berger to confirm that new plantings will be native or adaptive and run calculations on % of site area. 3/22/2016 - How does potential PUB site work affect this credit?	1
	1				Credit 5.2	**Site Development,** Maximize Open Space	Berger	3/9/16 - Berger to confirm that new plantings will be native or adaptive and run calculations on % of site area	1
	1				Credit 6.1	**Stormwater Design,** Quantity Control	CPL	3/9/16 - CPL to determine feasibility and consistency with EWU requirements and aspirations.	1
		1			Credit 6.2	**Stormwater Design,** Quality Control	CPL	3/9/16 - CPL to determine feasibility and consistency with EWU requirements and aspirations.	1
	1				Credit 7.1	**Heat Island Effect,** Non-Roof	Berger	3/9/16 - Berger to confirm that design intent is for compliance with this credit	1
1					Credit 7.2	**Heat Island Effect,** Roof	LMN		1
	1				Credit 8	**Light Pollution Reduction**	MW	3/9/16 - MW to confirm if this is achievable	1

Yes	Y?	N?	No						
4	3	3		**Water Efficiency**			Responsibility	Status / Remarks	10 Points
P					Prereq 1	**Water Use Reduction**	MW		Required
2					Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	Berger		2
	2				Credit 1.2	**Water Efficient Landscaping**, No Potable Use or Irrigation	Berger	3/10/16 - Berger to confirm practicality of this. Watering is ok for 1-2 year establishment of plants	2
		2			Credit 2	**Innovative Wastewater Technologies**	MW		2
2					Credit 3	**Water Use Reduction**, 30% Reduction	MW		2
	1				Credit 3	**Water Use Reduction**, 35% Reduction	MW		1
		1			Credit 3	**Water Use Reduction,** 40% Reduction	MW		1

EWU Interdisciplinary Science Center

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LEED 2009 for New Construction — March 15, 2016

EWU Design Guideline Prerequisite or Credit

Recommend Changing Design to Achieve this credit

Needs Further Study -- attainment uncertain at this time

ACTION ITEM

Yes	Y?	N?	No			Energy & Atmosphere	Responsibility	Status / Remarks	35 Points
14	5	6	10						
P					Prereq 1	**Fundamental Cx of Building Energy Systems**	**MW**		Required
P					Prereq 2	**Minimum Energy Performance**	**MW**		Required
P					Prereq 3	**Fundamental Refrigerant Management**	**MW**		Required
					Credit 1	**Optimize Energy Performance**			1 to 19
1						12% for New Bldgs. or 8% for Existing Bldgs. Reno	**MW**	MW to confirm approximate energy reductions likely	1
1						14% for New Bldgs. or 10% for Existing Bldgs. Reno			1
1						16% for New Bldgs. or 12% for Existing Bldgs. Reno			1
1						18% for New Bldgs. or 14% for Existing Bldgs. Reno			1
1						20% for New Bldgs. or 16% for Existing Bldgs. Reno			1
1						22% for New Bldgs. or 18% for Existing Bldgs. Ren			1
1						24% for New Bldgs. or 20% for Existing Bldgs. Reno			1
	1					26% for New Bldgs. or 22% for Existing Bldgs. Reno			1
	1					28% for New Bldgs. or 24% for Existing Bldgs. Reno			1
	1					30% for New Bldgs. or 26% for Existing Bldgs. Reno			1
	1					32% for New Bldgs. or 28% for Existing Bldgs. Reno			1
	1					34% for New Bldgs. or 30% for Existing Bldgs. Reno			1
		1				36% for New Bldgs. or 32% for Existing Bldgs. Reno			1
		1				38% for New Bldgs. or 34% for Existing Bldgs. Reno			1
		1				40% for New Bldgs. or 36% for Existing Bldgs. Reno			1
			1			42% for New Bldgs. or 38% for Existing Bldgs. Reno			1
			1			44% for New Bldgs. or 40% for Existing Bldgs. Reno			1
			1			46% for New Bldgs. or 42% for Existing Bldgs. Reno			1
			1			48%+ for New Bldgs. or 44%+ for Existing Bldgs. Reno			1
		1			Credit 2	**On-Site Renewable Energy,** 1%	**MW**		1
			1		Credit 2	**On-Site Renewable Energy,** 3%			1
			1		Credit 2	**On-Site Renewable Energy,** 5%			1
			1		Credit 2	**On-Site Renewable Energy,** 7%			1
			1		Credit 2	**On-Site Renewable Energy**, 9%			1
			1		Credit 2	**On-Site Renewable Energy,** 11%			1
			1		Credit 2	**On-Site Renewable Energy,** 13%			1
2					Credit 3	**Enhanced Commissioning**	**MW/LMN/EWU**	3/9/16 - MW to confirm if EWU Standard requires this credit, 4/8/2016 - EWU to generate Owner Project Requirements (OPR)	2
2					Credit 4	**Enhanced Refrigerant Management**	**MW**	3/9/16 - MW to confirm if EWU Standard requires this credit	2
3					Credit 5	**Measurement and Verification**	**MW/LMN**	3/9/16 - MW to confirm if EWU Standard requires this credit	3
		2			Credit 6	**Green Power**	**MW/LMN/EWU**		2

EWU Interdisciplinary Science Center

last updated

LEED 2009 for New Construction — March 15, 2016

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Needs Further Study -- attainment uncertain at this time

ACTION ITEM

Yes	Y?	N?	No						
3	3	2	6	**Materials & Resources**			Responsibility	Status / Remarks	14 Points
P					Prereq 1	**Storage and Collection of Recyclables**	EWU / LMN		Required
			1		Credit 1.1	**Building Reuse,** Maintain 55% of Existing Walls, Floors & Roof	na	na	1
			1		Credit 1.1	**Building Reuse,** Maintain 75% of Existing Walls, Floors & Roof	na	na	1
			1		Credit 1.1	**Building Reuse,** Maintain 95% of Existing Walls, Floors & Roof	na	na	1
			1		Credit 1.2	**Building Reuse**, Maintain Interior Nonstructural Elements	na	na	1
1					Credit 2.1	**Construction Waste Mgmt,** 50% Recycled or Salvaged	Contractor - TBD	Does EWU have policies for this credit?	1
	1				Credit 2.2	**Construction Waste Mgmt,** 75% Recycled or Salvaged	Contractor - TBD	Does EWU have policies for this credit?	1
			1		Credit 3.1	**Materials Reuse,** 5%	na		1
			1		Credit 3.2	**Materials Reuse,**10%	na		1
1					Credit 4.1	**Recycled Content,** 10% (post-consumer + ½ pre-consumer)	LMN/Contractor		1
	1				Credit 4.2	**Recycled Content,** 20% (post-consumer + ½ pre-consumer)	LMN/Contractor		1
1					Credit 5.1	**Regional Materials,** 10% Extracted, Processed & Manuf	LMN/Contractor		1
	1				Credit 5.2	**Regional Materials,** 20% Extracted, Processed & Manuf	LMN/Contractor		1
		1			Credit 6	**Rapidly Renewable Materials** - 2.5%	LMN		1
		1			Credit 7	**Certified Wood** - 50%	LMN		1

Yes	Y?	N?	No						
10	4	1		**Indoor Environmental Quality**			Responsibility	Status / Remarks	15 Points
P					Prereq 1	**Minimum IAQ Performance**	EWU / LMN		Required
P					Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	EWU / LMN		Required
1					Credit 1	**Outdoor Air Delivery Monitoring**	MW		1
	1				Credit 2	**Increased Ventilation**	MW		1
1					Credit 3.1	**Construction IAQ Management Plan**, During Construction	Contractor - TBD		1
1					Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	Contractor - TBD		1
1					Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	LMN		1
1					Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	LMN		1
1					Credit 4.3	**Low-Emitting Materials**, Flooring Systems	LMN		1
	1				Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	LMN		1
1					Credit 5	**Indoor Chemical & Pollutant Source Control**	MW/LMN		1
1					Credit 6.1	**Controllability of Systems**, Lighting	MW	3/11/16 - MW noted that achieving this is nearly no cost	1
1					Credit 6.2	**Controllability of Systems**, Thermal Comfort	MW		1
1					Credit 7.1	**Thermal Comfort**, Design	MW		1
		1			Credit 7.2	**Thermal Comfort**, Verification	EWU		1
	1				Credit 8.1	**Daylight & Views:** Daylight	LMN		1
	1				Credit 8.2	**Daylight & Views:** Views	LMN		1

Yes	Y?	N?	No						
5	1			**Innovation in Design (up to 5 points)**			Responsibility	Status / Remarks	6 Points
1					Credit 1.1	**Green Building Education**			1
1					Credit 1.2	**Healthy Product Declarations**			1
1					Credit 1.3	**Environmental Product Declarations**			1
1					Credit 1.4	**Exemplary Performance for MRc4 or MRc5**			1

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LEED 2009 for New Construction — March 15, 2016

EWU Design Guideline Prerequisite or Credit

Recommend Changing Design to Achieve this credit

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ACTION ITEM

	1				Credit 1.5	Green Housekeeping	EWU/LMN	3/10/16 - Does EWU have Green Housekeeping program?	1
1					Credit 2	LEED® Accredited Professional			1
Yes	Y?	N?	No						

1	2	1	2	Regional Priority (building location zip code 99004)		Responsibility	Status / Remarks	4 Points
			1	Credit 1.1	Optimize Energy Performance (48% Threshold)	MW		4 total RPC
			1	Credit 1.2	On-Site Renewable Energy (13%)	MW		4 total RPC
		1		Credit 1.3	Certified Wood	LMN		4 total RPC
1				Credit 1.4	Site Selection	LMN		4 total RPC
	1			Credit 1.5	Water Efficient Landscaping (No water for irrigation)	MW		4 total RPC
	1			Credit 1.6	Water Use Reduction (40%)	MW		4 total RPC
Yes	Y?	N?	No					

52	24	14	22	Totals	112

Certified: **40-49** points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

76 total if all of "yes" and "Yes maybe" credits were achieved

This code summary includes requirements and commentary associated with a number of the most important building code issues for the Interdisciplinary Science Center. The numbers indicated in headings and text below are references to the 2015 International Building Code with Washington State Amendments.

APPLICABLE CODES

2015 International Building Code (IBC) with Washington State Amendments*
2015 International Fire Code (IFC) with Washington State Amendments*
2015 International Mechanical Code (IMC) with Washington State Amendments*
2015 Uniform Plumbing Code with Washington State Amendments*
2015 International Energy Conservation Code/ Washington State Energy Code*
2014 National Electrical Code, NFPA 70
ICC A117.1-2009 Accessible and Usable Buildings and Facilities

* Schedule to go into effect July 1, 2016

OCCUPANCY CLASSIFICATION

Assembly:	A-3	Student Study if over 749 SF, Classrooms if over 999 SF
Business:	B	Laboratories, Conference Rooms, Offices, all other
Storage:	S-1	Chemical Stock Room, Biology Stock Room, General Storage, Hazardous Waste Storage, Cylinder Storage

HAZARDOUS MATERIALS

414.1.3 Information Required
A report shall be submitted to the building official identifying the maximum expected quantities of hazardous materials to be stored, used in a closed system and used in an open system, and subdivided to separately address hazardous material classification categories based on IBC Tables 307.1(1) and 307.1(2). The methods of protection from such hazards, including but not limited to control areas, fire protection systems and Group H occupancies shall be indicated in the report and on the construction documents. The opinion and report shall be prepared by a qualified person, firm or corporation approved by the building official and provided without charge to the enforcing agency.

202 Definition of Control Area
Spaces within a building where quantities of hazardous materials not exceeding the maximum allowable quantities per control area are stored, dispensed, used or handled. See also the definition of "Outdoor control area" in the International Fire Code.

414.2.2 Control Area - Percentage of Maximum Allowable Quantities.
The percentage of maximum allowable quantities of hazardous materials per control area permitted at each floor level within a building shall be in accordance with Table 414.2.2.

414.2.3 Control Area - Number
The maximum number of control areas within a building shall be in accordance with Table 414.2.2.

414.2.2 Control Area - Fire-Resistance-Rating Requirements
The required fire-resistance rating for fire barriers shall be in accordance with Table 414.2.2. The floor assembly of the control area and the construction supporting the floor of the control area shall have a fire-resistance rating of not less than 2 hours.

Table 414.2.2 Design and Number of Control Areas

Floor Level	% of Max Quantity per Control Area	Max Number of Control Areas/Floor	Fire-Resistance Rating for Fire Barriers (hours)
4 (ISC Level 3)	12.5%	2	2
3 (ISC Level 2)	50%	2	1
2 (ISC Level 1)	75%	3	1
1 (ISC Ground Level)	100%	4	1

BUILDING HEIGHT AND AREA

202 Definitions
Basement: A story that is not a story above grade plane.

Story above Grade Plane: Any story having its finished floor surface entirely above grade plane, or in which the finished surface of the floor next above is:

1. More than 6 feet above grade plane; or
2. More than 12 feet above the finished ground level at any point.

Height, Building: The vertical distance from grade plane to average height of the highest roof surface.

Table 504.3 Allowable Building Height in Feet above Grade Plane
For a sprinklered Group B occupancy, allowable building height is 85 feet for Type IIA construction and 75 feet for Type IIB construction.

Table 504.4 Allowable Number of Stories above Grade Plane
For a sprinklered Group B occupancy, allowable stories are 6 for Type IIA construction and 4 for Type IIB construction.

Table 506.2 Allowable Area Factor
This table shows allowable area factor. Classification “SM” applies to this project. For a sprinklered Group B occupancy, allowable area factor is 112,500 SF for Type IIA construction and 69,000 SF for Type IIB construction.

506.3 Frontage increase
Where a building has more than 25% of its perimeter on a public way or open space having a minimum width of 20’, the area factor increase based on frontage shall be determined in accordance with the following:

$I_f = [F/P - 0.25]\ W/30 = [900'/900' - 0.25]30/30 =$ **0.75**

I_f = Area factor increase due to frontage
F = Building perimeter on an open space having 20’ open min width in feet
P = Perimeter of entire building in feet
W = Width of public way or open space in feet = 30 [30 is maximum allowed per 506.3.2]

Construction Type Analysis

	Type IIB Construction Separated Occupancies	**Type IIB Construction Separated Occupancies**	**Type IIA Construction Non-Separated Occupancies**	**Type IIB Construction Non-Separated Occupancies**
Relationship between bldgs	ISC & Science as a single building	ISC & Science as separate buildings	ISC & Science as separate buildings	ISC & Science as separate buildings
Allowable Building Height (Table 504.3)	75 feet	75 feet	85 feet	75 feet
Allowable No. of Stories (Table 504.4)	A-3: 3 stories B: 4 stories S-1: 3 stories	A-3: 3 stories B: 4 stories S-1: 3 stories	A-3: 4 stories B: 6 stories S-1: 5 stories	A-3: 3 stories B: 4 stories S-1: 3 stories
Total Allowable Building Height	4 stories 75 feet with A-3 & S-1 no higher than 3rd floor	4 stories 75 feet with A-3 & S-1 no higher than 3rd floor	4 stories 85 feet	3 stories 75 feet
Anticipated Building Height	4 stories 68 feet **Acceptable**	4 stories 68 feet **Acceptable**	4 stories 68 feet **Acceptable**	4 stories 68 feet **Not Acceptable**
Allowable Area Factor (Table 506.2)	A-3: 28,500 SF B: 69,000 SF S-1: 52,500 SF	A-3: 28,500 SF B: 69,000 SF S-1: 52,500 SF	A-3: 46,500 SF B: 112,500 SF S-1: 78,000 SF	A-3: 28,500 SF B: 69,000 SF S-1: 52,500 SF
Allowable Area	(7% x 28,500) + (88% x 69,000) + (5% x 52,500) = 65,340 SF	(7% x 28,500) + (88% x 69,000) + (5% x 52,500) = 65,340 SF	46,500 SF	28,500 SF
Area Increase for Frontage (506.3)	21,565 SF x 0.75 = 16,173 SF	21,565 SF x 0.75 = 16,173 SF	15,500 x 0.75 = 11,625 SF	9,500 SF x 0.75 = 7,125 SF
Total Allowable Area per Floor	65,340 + 16,173 = 81,513 SF	65,340 + 16,173 = 81,513 SF	46,500 + 11,625 = 58,125 SF	28,500 + 7,125 = 35,625 SF
Anticipated Largest Floor Area (Level 1)	48,970 (exist) + 28,500 (new) = 77,470 SF **Barely Acceptable**	28,500 **Acceptable**	28,500 **Acceptable**	28,500 **Acceptable**
Notes	No separation of existing and new buildings not required; however, requires occupancy separations	Separation of existing and new buildings required; also requires occupancy separations	Separation of existing and new buildings required	Separation of existing and new buildings required; better than IIA for exterior wall fire-rating
Total Allowable Area per Building	81,513 x 3 = 244,539 SF	81,513 x 3 = 244,539 SF	58,125 x 3 = 174,375 SF	35,625 x 3 = 106,875 SF
Anticipated Total Building Area	115,000 (exist) + 96,500 (new) = 211,500 SF **Acceptable**	96,500 **Acceptable**	96,500 **Acceptable**	96,500 **Acceptable**

Selected Construction Type: **Type IIA, non-separated occupancies, fully sprinklered, where the ISC and Science are considered separate buildings.**

Explanation:
Since the existing Science building is equivalent to Type IIB construction, a scheme that joins the ISC with Science in a single building requires that the new building also be Type IIB. However, the allowable area for a Type IIB building, even with separated occupancies, is barely adequate for a single building and would provide EWU with little growth capacity for future additions. Type IIA requires non-combustible construction and 1-hour fire-resistance rating on structural frame, floors and roofs, while control zones in Type IIA require 2-hour fire-rating on floor assemblies and on construction supporting the floors of labs. Type IIB requires non-combustible construction and no fire-rating on structure, while control areas must have 2-hour protection for the floors of labs. A Type IIA building must be over 40 feet from the Science building to have non-rated exterior walls; a Type IIB building must be over 20 feet from the Science building to have non-rated exterior walls. Type IIA allows occupancies to be non-separated, while Type IIB requires occupancies to be separated. Type IIA allows all occupancy groups on all floors, while Type IIB does not permit groups A-3 and S-1 on Level 3. Type IIA is seen as having the greatest advantage for the ISC.

FIRE RESISTANCE RATING REQUIREMENTS

Table 601 Fire-Resistance Rating Requirements for Building Elements

Building Element	**Fire Resistance Ratings for Type IIA**
Primary Structural Frame	1 hour, however control zones require 2-hour rating of construction supporting floors of control areas (414.2.4)
Bearing Walls – Exterior	1 hour
Bearing Walls – Interior	1 hour
Nonbearing – Exterior walls/partitions	0 hour per Table 602 if more than 10’ from property line
Nonbearing – Interior walls/partitions	0 hour
Floors	1 hour, however control zones require 2-hour rating of floor assemblies at control areas (414.2.4)
Roofs	1 hour

Table 602 Fire-Resistance Rating Requirements for Exterior walls Based on Fire Separation Distance

Group A, B and S-1 occupancies in Type IIA Construction:

<5’	1 hour (A & B); 2 hour (S-1)
>5’ and <10’	1 hour (A & B & S-1)
>10’ and <30’	1 hour (A & B & S-1)
>30’	0 hour

Footnote “g” of Table 602 states that ‘Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire resistance rating for the exterior walls is 0 hours.

(See 705.3 below) Since it is Type IIB construction, the existing Science Building has an imaginary property line 10’-1” from its north wall. If the ISC building, which will be Type IIA construction, is closer than 40’-1” from the Science Building, the south exterior wall of the ISC requires a 1-hour fire resistance rating. Per IBC 705.5, the rating can be achieved with 5/8” Type X GWB on the inside only.

705.3 Buildings on the same lot
For the purposes of determining the required wall and opening protection and roof covering requirements, buildings on the same lot shall be assumed to have an imaginary line between them. Where a new building is to be erected on the same lot as an existing building, the location of the assumed imaginary line with relation to the existing building shall be such that the exterior wall and opening protection of the existing building meet the criteria as set forth in Sections 705.5 and 705.8.
Exception 1: Two or more buildings on the same lot shall be either regulated as separate buildings or shall

be considered as portions of one building if the aggregate area of such buildings is within the limits specified in Chapter 5 for a single building. Where the buildings contain different occupancy groups or are of different types of construction, the area shall be that allowed for the most restrictive occupancy or construction.

705.8.1 Allowable Area of Openings
The maximum area of unprotected and protected openings permitted in an exterior wall in any story of a building shall not exceed the percentages specified in Table 705.8.

Table 705.8 Maximum Area of Exterior wall Openings
Unprotected, sprinklered openings:

0 to less than 3’	Not permitted
3’ to less than 5’	15%
5’ to less than 10’	25%
10’ to less than 15’	45%
15’ to less than 20’	75%
20’ or greater	No limit

713.4 Shaft Enclosures, Fire-resistance Rating
Shaft enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more, and not less than 1 hour where connecting less than four stories. The number of stories connected by the shaft enclosure shall include any basements but not any mezzanines. Shaft enclosures shall have a fire-resistance rating not less than the floor assembly penetrated, but not to exceed 2 hours. Shaft enclosures shall meet the requirements of 703.2.1.

CHAPTER 9: FIRE PROTECTION SYSTEMS

903.2.1 Automatic Sprinkler Systems
An automatic sprinkler system shall be provided throughout buildings and portions thereof used as Group A occupancies as provided in this section. The automatic sprinkler system shall be provided throughout the story where the fire area containing the Group A occupancy is located, and throughout all stories from the Group A occupancy to and including, the level of exit discharge serving the Group A occupancy.

905.3.1 Standpipes Required
Class I standpipes shall be installed throughout buildings where the floor level of the highest story is located more than 30 feet above the lowest level of fire department vehicle access and which are equipped throughout with an automatic sprinkler system.

906 Portable Fire Extinguishers
906.1 Portable fire extinguishers shall be installed in areas where flammable or combustible liquids are stored, used or dispensed; and where required by the IFC sections indicated in Table 906.1.

907.2 Fire Alarm and Detection Systems – Where Required
An approved fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.23 and provide occupant notification in accordance with Section 907.5, unless other requirements are provided by another section of this code.

MEANS OF EGRESS

Table 1004.1.2 Maximum Floor Area Allowances per Occupant

Function of Space	Floor Area (Sq. Ft. /Occupant)
Lobby/ Student Study	15 net
Student Lounge	15 net
Conference Room	15 net
Classroom without fixed seats	20 net
Laboratory	50 net
Office	100 gross
Loading Dock/Receiving	300 gross
Storage	300 gross
Mechanical & Electrical	300 gross

1006.2.1 Egress Based on Occupant Load and Common Path of Egress Travel Distance
Two exits or exit access doorways from any space shall be provided where the design occupant load or the common path of travel distance exceeds the values listed in Table 1006.2.1.

Table 1006.2.1 Maximum Occupant Load with One Exit
The maximum occupant for A and B occupancies with one exit is 49. The maximum occupant for S occupancies with one exit is 29.

Table 1006.2.1 Common Path of Egress Travel
The common path of egress travel in a sprinklered building shall not exceed 75 feet for A occupancies, and 100 feet for B and S occupancies. In Group H occupancies, the common path of egress travel shall not exceed 25 feet.

Table 1006.3.1 Minimum Number of Exits or Access to Exits per Story

Occupant Load 1 – 500	2
Occupant Load 501 – 1,000	3

1009.3 Stairways (and Areas of Refuge)
In order to be considered part of an accessible means of egress, a stairway between stories shall have a clear width of 48 inches minimum between handrails and shall either incorporate either an area of refuge within an enlarged floor-level landing or shall be accessed from either an area of refuge complying with Section 1009.6 or a horizontal exit.
Exception 2: The clear width of 48 inches between handrails is not required in buildings equipped throughout with an automatic sprinkler system.
Exception 4: Areas of refuge are not required at exit access stairways where two-way communication is provided at the elevator landing in accordance with 1009.8.
Exception 5: Areas of refuge are not required at stairways in buildings equipped throughout with an automatic sprinkler system.

1009.8 Two-way communication
A two-way communication system complying with Sections 1009.8.1 and 1009.8.2 shall be provided at the landing serving each elevator or bank of elevators on each accessible floor that is one or more stories above or below the level of exit discharge.

1017.2 Exit Access Travel Distance Limitations
Exit access travel distance shall not exceed the values given in Table 1017.2.

Table 1017.2 Exit Access Travel Distance

With sprinkler system:	
Group A	250 feet
Group B	300 feet
Group S-1	250 feet

ACCESSIBILITY

1104.2 Accessible route within a site
At least one accessible route shall connect accessible buildings on the same site.

1105.1 Public entrances
At least 60 percent of all public entrances shall be accessible.

1105.1.2 Entrances from tunnels or elevated walkways
Where direct access is provided for pedestrians from a pedestrian tunnel or elevated walkway to a building or facility, at least one entrance to the building or facility from each tunnel or walkway shall be accessible.

CHAPTER 15: ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

202 Definition of Penthouse
An enclosed, unoccupied rooftop structure used for sheltering mechanical and electrical equipment, tanks, elevators and related machinery, and vertical shaft openings.

1510.2 Penthouses
Penthouses in compliance with Sections 1510.2.1 through 1510.2.5 shall be considered as a portion of the story below the roof deck on which such penthouses are located. All other penthouses shall be considered as an additional story of the building.

1510.2.1 Height above roof deck
Penthouses constructed on buildings of other than Type I construction shall not exceed 18 feet above the roof deck as measured to the average height of the roof of the penthouse.

1510.2.2 Area limitations
The aggregate area of penthouses and other rooftop structures shall not exceed one-third the area of the supporting roof. Such penthouses shall not be required to be included in determining the building area or number of stories as regulated by Section 503.1. The area of the penthouse shall not be included in determining the fire area defined in Section 1.7.

1510.2.3 Use limitations
Penthouses shall not be used for purposes other than shelter of mechanical or electrical equipment, tanks, or vertical shaft openings in the roof assembly.

1510.2.5 Type of construction
Penthouses shall be constructed with walls, floors and roof as required for the building.
Exception 2: On buildings of Type II construction, the exterior walls and roofs of penthouses with a fire separation distance of more than 5 feet and less than 20 feet shall be permitted to have not less than a 1-hour fire-resistance-rating or a lesser fire-resistance rating as required by Table 602 and be constructed of fire-retardant-treated wood. The exterior walls and roofs of penthouses with a fire separation distance of 20 feet or greater shall be permitted to be constructed of fire-retardant-treated wood and shall not be required to

have a fire-resistance rating. Interior framing and walls shall be permitted to be constructed of fire-retardant-treated wood.

PLUMBING SYSTEMS

Requirements are based on Chapter 29 of the 2015 Washington State Amendments to the 2015 IBC.

2902.1 Minimum number of fixtures

Plumbing fixtures shall be provided for the type in the minimum number shown in Table 2902.1 based on the actual use of the building or space. Uses not shown in Table 2902.1 shall be considered individually by the code official. The number of occupants shall be determined by this code.

Occupant Load Calculation

For this calculation, occupant loads are based on program areas, as opposed to measured areas. Table 1004.1.2 has been utilized to determine the occupant load factor in each category of space.

Function of Space Space	Occupancy Group (Chapter 3)	Occupant Load Factor (1004.1.2)	Program Area
Classroom	A-3	20 NSF/occupant	2,200 SF
Student Study	A-3	20 NSF/occupant	800 SF
Student Lounge	A-3	15 NSF/occupant	2,500 SF
Office	B	100 GSF /occupant	760 SF
Laboratory	B	50 NSF/occupant	45,820 SF
Accessory Storage	B	300 GSF/occupant	1,030 SF

Occupant Loads are calculated as follows:

ASSEMBLY (A-3):		
Classroom	2,200 SF / 20 NSF per occ =	110 occupants
Study and Lounge	3,300 SF / 15 NSF per occ =	220 occupants
Total Assembly Occupants		330 occupants
BUSINESS (B):		
Office	760 SF / 100 GSF per occ =	8 occupants
Laboratory	45,820 SF / 50 NSF per occ =	917 occupants
Accessory Storage	1,030 SF / 300 GSF per occ =	4 occupants
Total Business Occupants		929 occupants

2902.1.1 Fixture calculations

To determine the occupant load of each sex, the total occupant load shall be divided in half. To determine the required number of fixtures, the fixture ratio or ratios for each fixture type shall be applied to the occupant load of each sex in accordance with Table 2902.1. Fractional numbers resulting from applying the fixture ratios on Table 2902.1 shall be rounded up to the next whole number. For calculations involving multiple occupancies, such fractional numbers for each occupancy shall first be summed and then rounded up to the next whole number.

Table 2902.1 provides the following requirements:

Classification	Water Closets	Lavatories
Assembly A-3, auditoriums w/out permanent seating	Males: 1 per 125 Females: 1 per 65	Males: 1 per 200 Females: 1 per 200
Business B, buildings for business & similar uses	Males & Females: 2 per first 50 and 1	Males & Females: 2 per first 80 and 1

		per 50 thereafter		per 80 thereafter

The numbers of required plumbing fixtures are calculated as follows, using half the occupant load for each sex:

Classification	Water Closets/ Urinals - Male	Water Closets - Female	Lavs - Male	Lavs - Female
Assembly A-3	165 occs	165 occs	165 occs	165 occs
	165 /125 = 1.32	165 /65 = 2.54	165 /200 = 0.83	165 /200= 0.83
Business B	464.5 occs	464.5 occs	464.5 occs	464.5 occs
	First 50 = 2.00	First 50 = 2.00	First 80 = 2.00	First 80 = 2.00
	414.5/50 = 8.29	414.5/50 = 8.29	384.5/80 = 4.81	384.5/80 = 4.81
Total Required Fixtures	11.61	12.83	7.64	7.64
Rounded up per 2902.1.1	**12**	**13**	**8**	**8**

2902.5.1 Drinking fountain number
Occupant loads over 30 shall have one drinking fountain for the first 150 occupants, then one per each additional 500 occupants. Total of 4 required.

2902.5.4.2 Bottle filling stations
In all occupancies that require more than two drinking fountains per floor or secured area, bottle filling stations shall be permitted to be substituted for up to 50 percent of the required number of drinking fountains.

PEDESTRIAN WALKWAYS
[Applies to the bridges between ISC and Science]

202 Definition of Pedestrian Walkway
A walkway used exclusively as a pedestrian trafficway.

3104.3 Construction of Pedestrian Walkways
The pedestrian walkway shall be of noncombustible construction.

3104.4 Contents of Pedestrian Walkways
Only materials and decorations approved by the building official shall be located in the pedestrian walkway.

3104.5 Connection of Pedestrian Walkways to Buildings
The connection of a pedestrian walkway to a building shall comply with 3104.5.1, 3104.5.2, 3104.5.3 or 3104.5.4.
Exception: Buildings that are on the same lot and considered as portions of a single building in accordance with Section 503.1.2.

3104.5.2 Alternative separation
The wall separating the pedestrian walkway and the building shall comply with Section 3104.5.2.1 or 3104.5.2.2 where:

1. The distance between the connected buildings is more than 10 feet.
2. The pedestrian walkway and connected buildings are equipped throughout with an automatic sprinkler systems and the roof of the walkway is not more than 55 feet above grade connecting to the fifth, or lower, story above grade plane.

3104.5.2.1 Passage of Smoke
The wall shall be capable of resisting passage of smoke.

3104.5.2.2 Glass
The wall shall be constructed of a tempered, wired or laminated glass wall and doors or glass separating the interior of the building from the pedestrian walkway. The glass shall be protected by an automatic sprinkler system that, when actuated, shall completely wet the entire surface of interior sides of the wall or glass. Obstructions shall not be installed between the sprinkler heads and the wall or glass. The glass shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler operates.

3104.8 Width
The unobstructed width of pedestrian walkways shall be not less than 36 inches. The total width shall be not greater than 30 feet.