FORMAL PROJECT APPROVAL

Name of Project:	**Duckering Building Engineering Expansion**
Location of Project:	**Fairbanks**
Project Number:	**2010149 DUEE**
Date of Request:	**June 3, 2010**

Total Project Cost:	**$ 63,000,000**
Approval Required:	**Full Board Approval**
Prior Approvals:	**Preliminary Project Approval (date 09/2006)**

Reference Materials:

1. Project budget
2. Program
3. Site Plan
4. Aerial View

UAF Engineering Space Study
CEM Building Program
College of Engineering and Mining

BDS
Bezek Durst Seiser, Inc.
3330 C Street, Suite 200
Anchorage, AK 99503
Ph 907.562.6076
F 907.562.6635

	No.	Occ.	SF	Total GSF	
Mechanical Engineering (ME)					
class labs	5		999	4995	
class lab prep & storage	6		200	1200	
class labs	1		1344	1344	
class lab prep & storage	1		144	144	
power mechanics lab	1		1152	1152	
research labs	1		1120	1120	
research lab prep & storage	2		195	390	
research labs	1		1091	1091	
research lab prep & storage	1		172	172	
research labs	1		999	999	
offices	12		137	1644	
offices	5		150	750	
offices	1		282	282	
offices	2		132	264	
office storage	2		121	242	
office-grad student	1		527	527	
			subtotal	**16316**	25% of net usable floor space
Civil Engineering (CE)					
Structures/Mixing Lab	1		1103	1103	
Flume Room	1		1344	1344	
class lab prep & storage	1		189	189	
			subtotal	**2636**	4% of net usable floor space
Chemical Engineering (CHEM)					
class labs	1		960	960	
class lab prep & storage	1		179	179	
			subtotal	**1139**	2% of net usable floor space
Petroleum Engineering (PETE)					
PDL Lab	1		990	990	
class lab prep & storage	1		225	225	
			subtotal	**1215**	2% of net usable floor space

College of Engineering and Mining (CEM)					
High bay	1		2016	2016	
Engineering Fabrication Lab	1		3936	3936	
Storage	1		338	338	
	1		189	189	
Field preparation	1		992	992	
Computer lab	1		1520	1520	
	1		1600	1600	
Seminar-large	1		876	876	
Seminar-small	1		648	648	
Classroom	1	93	1242	1242	
	1	60	2112	2112	
	1	45	1600	1600	
Cold room	1		427	427	
Office-admin	1		375	375	
Office	2		149	298	
Office-grad students	1		616	616	
	1		500	500	
Conference room	2		250	500	
Student commons	1		952	952	
	1		358	358	
Faculty commons	1		824	824	
			subtotal	**21919**	33% of net usable floor space
			total assignable space	**43225**	66% of net usable floor space
Utility/Mechanical (UT)					
Receiving	1		864	864	
Flume tank/mechanical	1		1344	1344	
Toilet block	5		500	2500	
Fan room	1		4069	4069	
			subtotal	**8777**	13% of net usable floor space

Area Statistics	footprint	assignable	circ+core+ UT	
Floor 1	16490	10568	5922	64% efficiency
Floor 2 (6048 sf dbl ht)	16163	6670	3445	66% efficiency
Floor 3	15463	10956	4507	71% efficiency
Floor 4 (7316 sf dbl ht)	15463	4314	3842	53% efficiency
Floor 5	14696	11101	3595	76% efficiency
Penthouse	4809		4809	
subtotal	**83084** *	**43609**	**26120**	

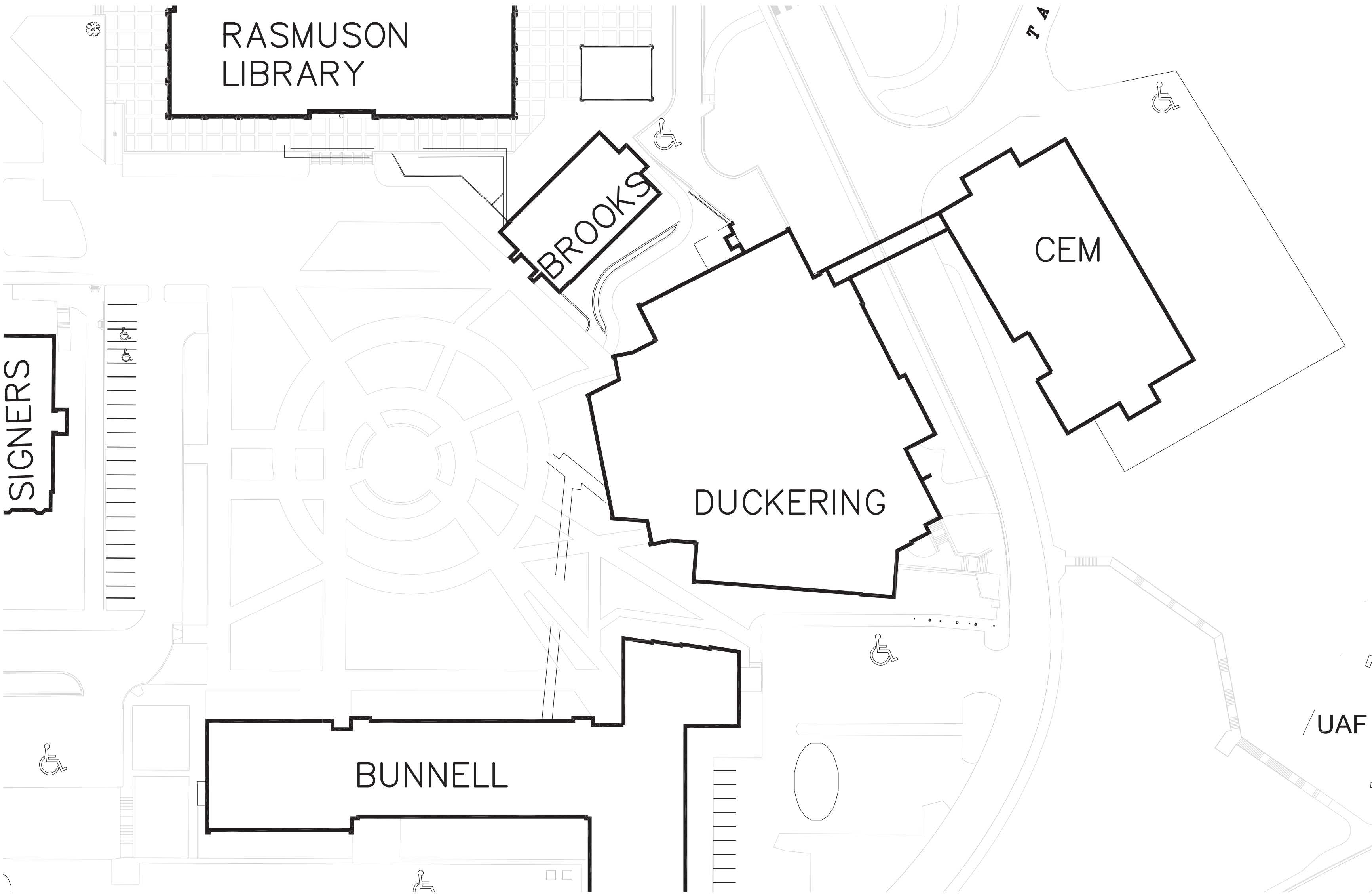
*footprint total for budget purposes

65660 **net usable floor space**

70,000 gsf after deducting dbl. ht.

UNIVERSITY OF ALASKA			
Project Name: Duckering Building Engineering Expansion			
MAU: UAF			
Building: Duckering / Date: May 12, 2010			
Campus: Fairbanks / Prepared By: Wohlford			
Project #: 2010149 DUEE / Account No.: TBD			
Total GSF Affected by Project: 105000	Reallocation of Space	Expansion	Total Project Cost
PROJECT BUDGET	FPA Budget -- 40,000gsf	FPA Budget -- 70,000 gsf	FPA Budget
A. Professional Services			
Advance Planning, Program Development	$0	$0	$0
Consultant: Design Services	$225,000	$3,750,000	$3,975,000
Consultant: Construction Phase Services	$0	$500,000	$500,000
Consul: Extra Services (List:_____________________)	$0	$0	$0
Site Survey	$0	$250,000	$250,000
Soils Testing & Engineering	$0	$500,000	$500,000
Special Inspections	$0	$50,000	$50,000
Plan Review Fees / Permits	$0	$250,000	$250,000
Other	$0	$0	$0
Professional Services Subtotal	**$225,000**	**$5,300,000**	**$5,525,000**
B. Construction			
General Construction Contract (s)	$4,000,000	$42,750,000	$46,750,000
Other Contractors (List:________________________)	$0	$50,000	$50,000
Construction Contingency	$340,000	$3,638,000	$3,978,000
Construction Subtotal	**$4,340,000**	**$46,438,000**	**$50,778,000**
Construction Cost per GSF	***$108.50***	***$663.40***	***$483.60***
C. Building Completion Activity			
Equipment	$0	$500,000	$500,000
Fixtures	$0	$0	$0
Furnishings	$0	$500,000	$500,000
Signage not in construction contract	$0	$20,000	$20,000
Move-Out Cost/Temp. Reloc. Costs	$0	$75,000	$75,000
Move-In Costs	$0	$75,000	$75,000
Art	$0	$0	$0
Other (List:________________________)	$0	$0	$0
OIT Support	$0	$180,000	$180,000
Maintenance/Operation Support	$0	$100,000	$100,000
Building Completion Activity Subtotal	**$0**	**$1,450,000**	**$1,450,000**
D. Owner Activities & Administrative Cost			
Project Planning and Staff Support	$205,425	$2,393,460	$2,598,885
Project Management	$229,575	$2,283,540	$2,513,115
Misc Expenses: Advertising, Printing, Supplies	$0	$135,000	$135,000
Owner Activities & Administrative Cost Subtotal	**$435,000**	**$4,812,000**	**$5,247,000**
E. Total Project Cost	**$5,000,000**	**$58,000,000**	**$63,000,000**
Total Project Cost per GSF	***$125.00***	***$828.57***	***$600.00***
F. Total Appropriation(s)	**$5,000,000**	**$58,000,000**	**$63,000,000**

\\Bds1\projects\600000'S\606019 UAF Term Contract\60601905 Engineering Building Planning\5. CAD\CEM Bldg\UAF_MAP.dwg



CEM BUILDING
1/64" = 1'-0"

SITE PLAN
Apr 25, 2009

/UAF ENGINEERING
SPACE STUDY

BDS

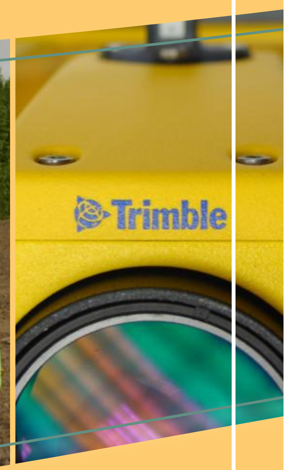
Bezek Durst Seiser, Inc.
3330 C Street, Suite 200
Anchorage, Alaska 99503
P.907.562.6076 F.907.562.6635

UNIVERSITY OF ALASKA			
Project Name:	Engineering Phase 1 - Engineering & Industry Bldg		
MAU:	Anchorage	Anchorage Campus	
Building:	Engineering	Date:	5/10/2010
Campus:	Anchorage	Prepared by:	J. L. Hanson
Project #:		Acct #:	
Total GSF Affected by Project:		50000	50000
PROJECT BUDGET		FPA Budget	SDA Budget
A. Professional Services			
Advance Planning, Program Development		$500,000.00	
Consultant: Design Services		$3,400,000.00	
Consultant: Construction Phase Services		$1,000,000.00	
Consul: Extra Services (List:____________________)		$550,000.00	
Site Survey		$20,000.00	
Soils Testing & Engineering		$25,000.00	
Special Inspections		$150,000.00	
Plan Review Fees / Permits		$345,000.00	
Other		$300,000.00	
	Professional Services Subtotal	**$6,290,000.00**	
B. Construction			
General Construction Contract(s)		$29,195,000.00	
Other Contractors (List:______________________)		$5,500,000.00	
Construction Contingency		$3,400,000.00	
	Construction Subtotal	**$38,095,000.00**	
Construction Cost per GSF		*761.9*	*0*
C. Building Completion Activity			
Equipment		$1,000,000.00	
Fixtures			
Furnishings		$1,000,000.00	
Signage not in construction contract		$75,000.00	
Move-Out Costs			
Move-In Costs		$200,000.00	
Art		$285,000.00	
Other (Interim Space Needs or Temp Reloc. Costs)		$60,000.00	
OIT Support		$25,000.00	
Maintenance Operation Support		$125,000.00	
	Building Completion Activity Subtotal	**$2,770,000.00**	
D. Owner Activities & Administrative Costs			
Project Plng, Staff Support		$50,000.00	
Project Management		$2,720,000.00	
Misc. Expenses: Advertising, Printing, Supplies, Etc.		$75,000.00	
	Owner Activities & Administrative Costs Subtotal	**$2,845,000.00**	
E. Total Project Cost		**$50,000,000.00**	
Total Project Cost per GSF		*1000*	*0*
F. Total Appropriation(s)			

UNIVERSITY *of* ALASKA ANCHORAGE

SCHOOL *of* ENGINEERING

Programmatic Study



REVISED 09.15.2009

Programmatic Study
SCHOOL *of* ENGINEERING

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UNIVERSITY *of* ALASKA ANCHORAGE

Prepared by ECI/HYER ARCHITECTURE & INTERIORS

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Acknowledgements

Owner

University of Alaska Anchorage
School of Engineering Departments:

- Bachelor of Science in Engineering
- Civil Engineering
- Engineering, Science, & Project Management
- Geomatics

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Principal Mechanical Engineer, RSA Engineering

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Grant Baker, P.E., Ph.D.
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Jang Ra, Ph.D., PMP
Chair, UAA Engineering, Science, & Project Management Program

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Student, UAA Bachelor of Science in Engineering Program

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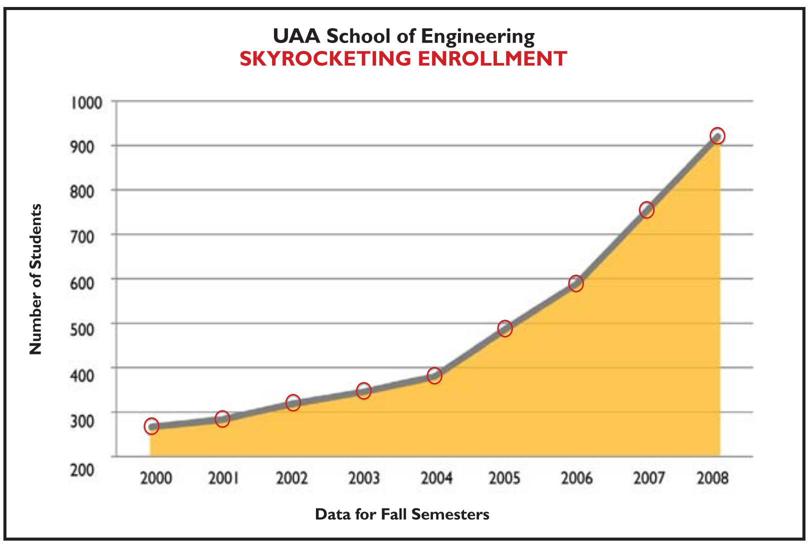
Graduate Student, UAA Arctic Engineering Program

EXISTING SCHOOL OF ENGINEERING BUILDING

Introduction



Substantial Growth

In the Fall 2007 Regents Report, Chancellor Fran Ulmer published that, since 1999, enrollment for the University of Alaska Anchorage's School of Engineering (SoE) has grown 308 percent. The number is now reaching 345 percent. As more and more engineering students flock to the program, the existing facilities will not adequately support this explosive demand. An expanded facility is vital for the School of Engineering to be able to provide the highest level of education for Alaska. The program alone has increased enrollment by 20 percent annually, and by 2013 expanded facilities totaling approximately 200,000 gross square feet (GSF) (120,000 assignable square feet (ASF)) will be needed to house the students and faculty. Designing the appropriate building for the School of Engineering, while taking this skyrocketing growth into account, is critical to Alaska in order to address the major shortage of engineers within the state.

Phase 1 - Engineering & Industry Building

In order to meet current demands and funding concerns, the University of Alaska recognizes that a phased approach must be implemented. Phase 1 will commence with a new facility called the Engineering and Industry Building, as shown on the Site Plan on page 12. This 50,000 GSF (30,000 ASF) facility will meet current needs and will house specialized teaching spaces including undergraduate laboratories and associated support functions.

Anchorage is the center of Alaska business in which UAA has developed strong industry partnerships. Because of these alliances, many students take advantage of hands-on paid internship jobs with industry in addition to their classroom and lab education. The facility is aptly named—more than 100 companies specializing in engineering, energy, oilfield development, utilities, and construction have offices within four miles of the UAA campus. Furthermore, more than 70 percent of the professionally licensed engineers with Alaska residences reside in the Anchorage area.

Additional phases are necessary to fulfill the remaining program requirements and meet future demands.

Existing SoE

The Demand

The existing School of Engineering currently inhabits 32,600 GSF (20,400 ASF) in a building shared with the University's WWAMI Biomedical Program. Disciplines within the School of Engineering are not centrally located, causing a sense of disconnect. For example, the Engineering, Science, and Project Management program is located off-campus in the University Center Mall, more than two miles away, forcing students to commute between classes. As of the 2009-2010 school year, the SoE was given approximately 14,000 GSF of temporary space at various locations, including space in the University Lake Annex Building, a portable trailer adjacent to their main building, and some space within a short term leased warehouse.

There is an extreme space shortage even when all spaces available are included. Currently, the SoE has approximately 44 GSF (27 ASF) per student which is less than one-half of the national average of 115 GSF (69 ASF) for peer institutions. A space comparison graph is provided on page 27 within the report.

The School of Engineering at the University of Alaska Anchorage has more than 900 students enrolled in the following undergraduate and graduate disciplines:

- Bachelor of Science in Engineering (BSE)
  - Computer Systems Engineering
  - Electrical Engineering
  - Mechanical Engineering
- Civil Engineering
  - Civil Engineering
  - Arctic Engineering
  - Applied Environmental Science & Technology
  - Port & Coastal Engineering
- Engineering, Science, & Project Management (ESPM)
- Geomatics (Includes GIS)

Bachelor of Science in Engineering (BSE)

Upon launching the new BSE program four years ago, enrollment has increased in excess of 350 students. Classes are currently held in multiple locations across the campus due to inadequate space within the current engineering building. This program is one of the primary reasons there has been such a burst in enrollment for the SoE and it remains one of the fastest growing programs at the University.

Recent ABET accreditation of all three new BSE Engineering programs, and active growing programs promoting Engineering awareness in active K-12 programs, ensures continued enrollment growth to meet the engineering shortage in Alaska.

Geomatics & GIS

UAA's Geomatics Department offers the only accredited surveying program in Alaska. Students enrolled in this discipline have already outgrown the provided space, which causes problems in retaining students after their freshman year. Recently, Trimble (a positioning equipment manufacturer) donated much needed equipment to the department, but even the simplistic storage space is inadequate to house basic equipment. The Geomatics Department also plans to develop graduate level curriculum in the future.

Engineering, Science, & Project Management (ESPM)

The ESPM program is one of the oldest programs at UAA, as well as one of the most cutting-edge. Courses are offered via distance delivery, nationally and internationally. It is one of 15 accredited graduate programs of its type in the world and the only one on the west coast; it is currently occupying rented space at the University Center Mall. Separation from

the main campus forces students to commute between classes and prevents opportunities for synergies with fellow students and faculty. As the program grows, expansion within the University Center Mall will not be possible.

Civil Engineering

UAA offers graduate and undergraduate level degrees in Civil Engineering. Alaska's unique environment challenges UAA's Civil Engineering program to develop extraordinary students capable of being pioneers in a variety of Arctic and seismic related fields. Providing students with the necessary laboratories and equipment is imperative in advancing UAA's standing amongst other nationally recognized schools.

Arctic Engineering

Alaska's cold weather climate makes a home for engineers from this area of study, as it is paramount to every aspect of working within cold climates. Arctic research has growing national and global importance and UAA's program responds to new research initiatives aimed at climate change impacts to infrastructure within cold regions. The program is offered online with additional elective courses available in a classroom setting.

Port & Coastal Engineering

Alaska's distinct location and culture sets this program apart from others. Specialized training is necessary to design, build, and operate coastal infrastructure in cold regions and to evaluate their effects on land and marine environments. A graduate certificate is offered within this field.

AEST (Applied Environmental Science & Technology)

The AEST program is interdisciplinary in nature and encourages candidates to develop an understanding of environmental principles through advanced studies in biology, chemistry, geology, statistics, and environmental engineering. This degree offers a Master of Science AEST, as well as a Master of AEST, with the latter being more appropriate for those seeking to enhance their education solely for professional practice. A portion of the courses are offered online, affording a broader range of students for this educational opportunity.

Accredited Programs

All baccalaureate programs in the SoE are Accreditation Board for Engineering and Technology (ABET) accredited. The Civil Engineering and Geomatics programs have been accredited for several years. ABET approved continued accreditation for these programs in 2009.

During 2009, ABET approved accreditation for each of the three new engineering programs in the BSE Department, inclusive of Mechanical, Electrical, and Computer Systems Engineering.

The UAA ESPM Department received national recognition and accreditation in 2007 by the Project Management Institute (PMI) and is 1 of 15 accredited programs worldwide.

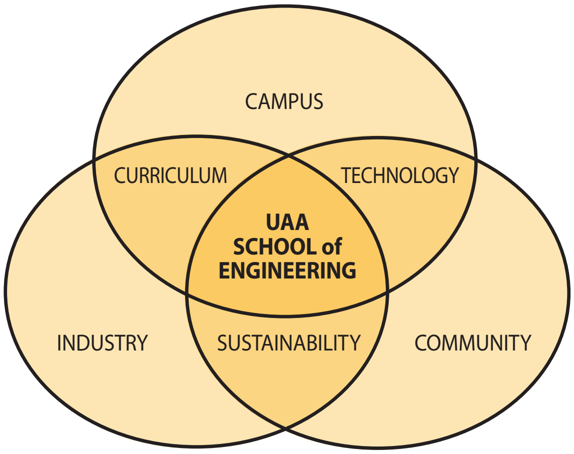
Engineering Initiative

Taking Action

The State of Alaska is currently experiencing a major shortage of engineers, and as of 2007, is ranked 49th lowest (2nd to last) in the United States for the number of engineers graduated per capita. Based on data from the American Society for Engineering Education, the University of Alaska is only graduating half (which is approximately 100 engineers per year) of the national average, although UA has set a goal to graduate 200 baccalaureate engineers by 2012. Although this expansion initiative will give some relief, industry in Alaska requires approximately 400 new engineers per year (this number does not take into account the installation of major forthcoming projects, such as a natural gas pipeline). Current enrollments have far exceeded the space available and an additional building is needed now. With the commitment to meet industry demand by doubling the number of graduates, an expanded new facility will be required to support the expected growth and needs of the community, students, university, and industry.

STUDENTS

When the BSE program recently opened at UAA, it offered students a chance to pursue a highly sought after engineering degree with



COMMUNITY BENEFIT

the convenience of remaining in Anchorage. With the installation of this new program there was an immense increase in student demand and now UAA is faced with a shortage of space for storage, equipment, and most importantly, classroom and laboratory spaces within the existing building. The lack of space in some cases contributed to attrition within the student body. If the existing facilities are already well beyond capacity, imagine how the School of Engineering could potentially look in five years.

UNIVERSITY

In order to enhance the University as a frontier for learning and discovery, encouraging the growth of Engineering is necessary. Throughout history, development of higher education, as well as an increase in the number of engineers within a community, has proven to boost economic prosperity. Part of this will lend to integrating teaching and research functions, which will create community partnerships as well as attract high quality staff and students for UAA's SoE.

INDUSTRY

Roughly half of the 5,000 licensed engineers in Alaska reside out-of-state, forcing Alaska employers to hire nonresident workers. This not only increases turnover rates, but also has a negative economic impact on the state. History shows that 80 percent of engineers trained at the University of Alaska will stay in Alaska and contribute to the success of Alaskan businesses and agencies.

COMMUNITY

In order to bridge economic development between education and industry, the expanded facility could serve as a public venue for hosting seminars and events, which cannot currently be accommodated in the existing occupied building. A recent change in the professional development courses for practicing engineers now requires additional learning credits, resulting in further coursework or seminars. This pushes the engineering community to depend on UAA for advancement. The expanded facility could open more doors in cultivating cooperative relationships, as well as partnering with neighboring institutions to create a center of excellence, and achieve mutually beneficial objectives.

FACULTY

UAA's SoE will need more faculty and support staff with the influx in enrollment, as well as more specialized learning space outside of classrooms and offices. In order to compete with other universities, keeping faculty members up-to-date with the latest teaching and research is necessary, as well as a requirement for their profession. New facilities would also be an advanced tool to create community partnerships that would be beneficial to faculty.


FACULTY TRAINING

Site Description

Location

The existing School of Engineering Building is located between West and Central Campus, while the ESPM program is off-campus at University Center Mall. The proposed site is on UAA's main campus and is west of the existing Alaska Native Science and Engineering Program (ANSEP) Building. Locating the Expansion Phase 1 and future phases across from the ANSEP building begins to create a hub for Engineering on campus. By locating the new Engineering and Industry Building on an existing paved parking lot along Providence Drive, UAA will have the opportunity to protect existing green space as well as have an ever present public face within the U-Med District.

Scenic Surroundings

Aligning with concepts found in the Master Plan, the design of the new expansion must show a high regard for the natural landscape and habitat on campus. This can be accomplished through thoughtful placement of the building and infrastructure that respects the character of the surroundings. This can be accomplished through orientation of the building, as well as appropriate placement of windows, that will provide abundant daylight and views.

Parking

Accommodating parking for the expanded facility will require further investigation as the project develops. Approximately 300 additional parking stalls will be needed to accommodate the 50,000 GSF Phase 1.

Circulation

Currently at UAA, the highly used interior walkway or "Circulation Spine" acts as the main interactive corridor connecting the East and West campus. By siting the Engineering and Industry Building south of the Wells Fargo Sports Complex, there is an opportunity to expand the "Circulation Spine" in a north to south direction. As shown on the Overall Site Plan on page 12, the School of Engineering will become integrated at the heart of campus, being located closely to the campus core. With a multi-use route nearby, a pedestrian approach to the building will welcome students and faculty, as shown in the December 2008 Draft Master Plan on page 13.

OVERALL SITE PLAN DESCRIPTION

1 PHASE I: ENGINEERING & INDUSTRY BUILDING: 50,000 GSF (30,000 ASF)

2 FUTURE PHASES: ENGINEERING & INDUSTRY BUILDING

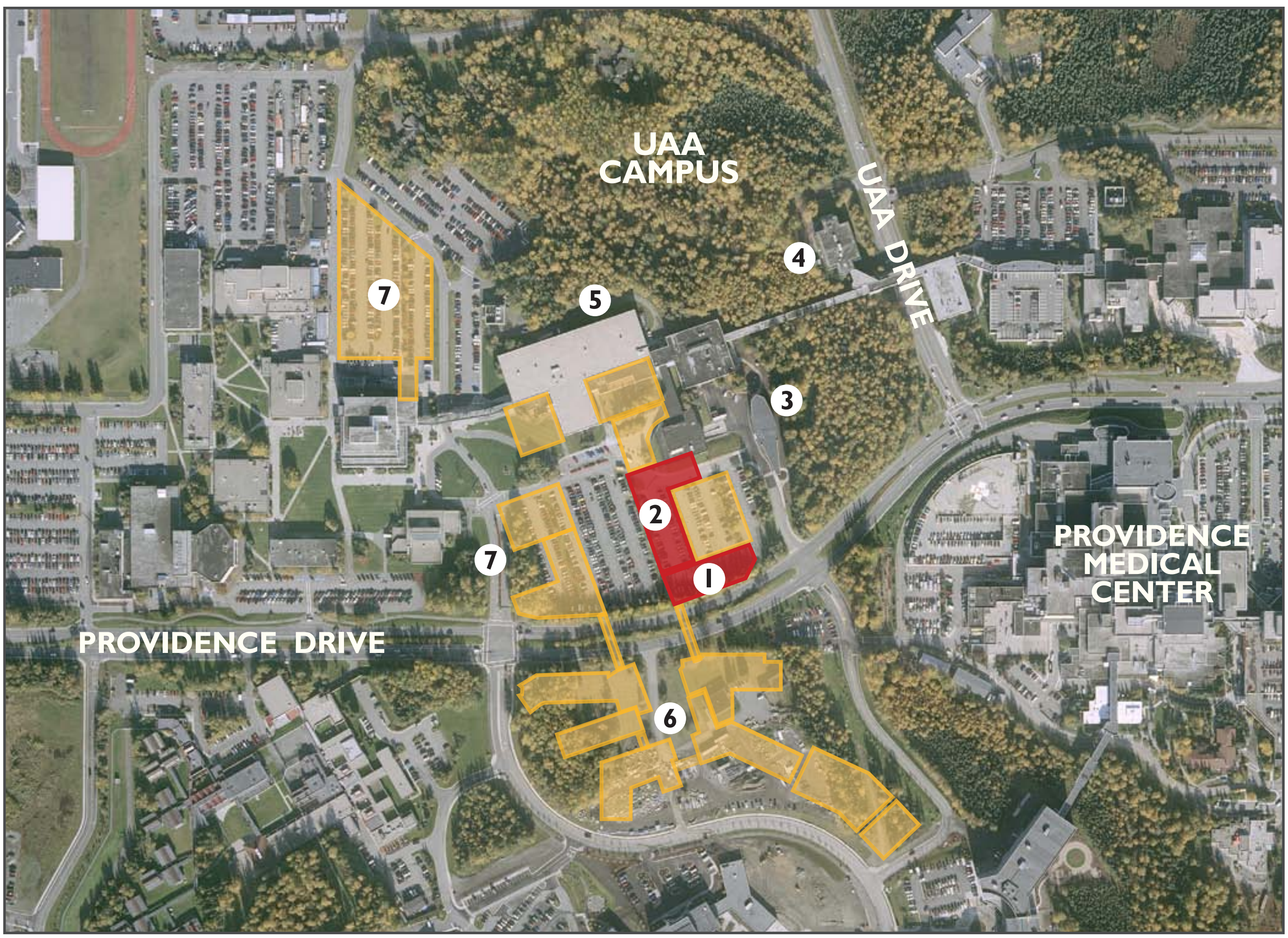
3 EXISTING ALASKA NATIVE SCIENCE & ENGINEERING PROGRAM BUILDING (ANSEP)

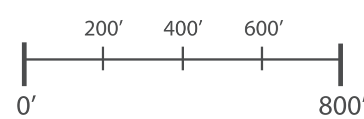
4 EXISTING ENGINEERING BUILDING: (32,600 GSF shared with other programs)

5 WELLS FARGO SPORTS COMPLEX

6 HEALTH SCIENCES

7 FUTURE CAMPUS GROWTH

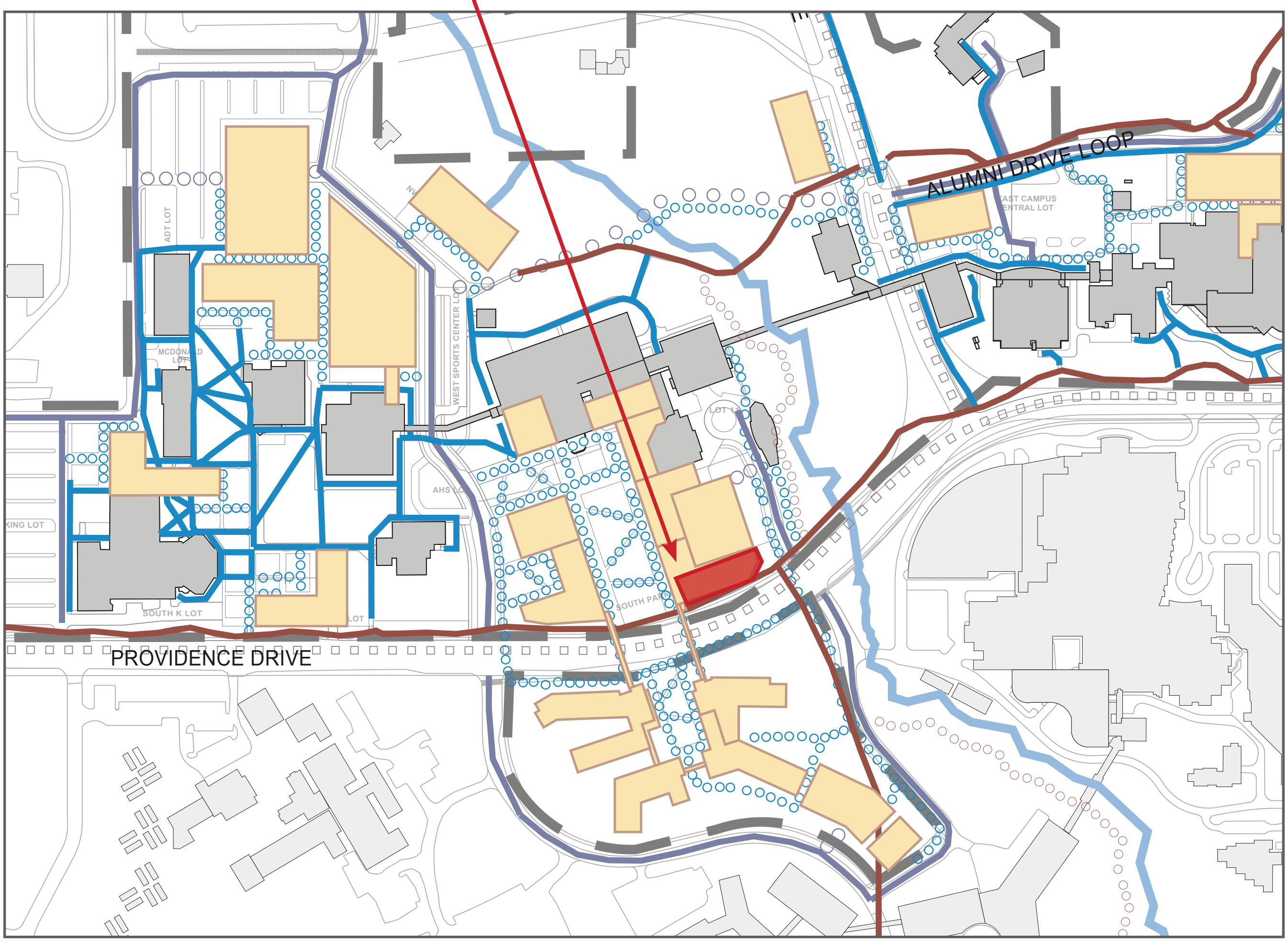




CAMPUS TRAIL SYSTEM
SURROUNDING PROPOSED SITE

Site Boundary
Proposed Facilities
Existing Buildings
Lakes
Existing Pedestrian Routes
Existing Multi-Use Routes
Existing Ski Trails
Proposed Pedestrian Routes
Proposed Multi-Use Routes
Proposed Ski Trails
Existing Vehicular Routes
Proposed Vehicular Routes
Proposed Bike Lane

PHASE I:
PROPOSED SITE



FROM THE DECEMBER 2008 DRAFT MASTER PLAN
"PEDESTRIAN, BICYCLE, & SKI CIRCULATION" GRAPHIC

UAA School of Engineering - Engineering & Industry Building Phase I
Option A: 50,000 gross square feet (30,000 assignable square feet)

Teaching Areas	Descriptions	No. of Modules (363 SF/Module)	Square Ft (SF)
Communications/Antennas Engineering	Specialized equipment; permanent stations	3.5	1,271
Controls/Instrumentation Engineering	Specialized equipment; permanent stations	3.5	1,271
Corrosion/Materials Engineering	Chemical resistant surfaces; corrosives to be separated	5.0	1,815
Electrical Engineering	Dry lab with specialized eqpt.; permanent stations	5.0	1,815
Electrical Utility Power & Transmission Engineering	Specialized equipment; permanent stations	4.5	1,634
Kinematics & Machine Design Engineering	Specialized equipment; permanent stations	3.5	1,271
Fluids Engineering	Use of open channel flume; stationary devices	6.0	2,178
Heat & Mass Transfer Engineering	Specialized equipment; permanent stations	3.5	1,271
Heating, Ventilating, & Air Conditioning Engineering	Use of large eqpt.: air flow channels, wind tunnels, etc.	5.0	1,815
Soil Mechanics Engineering	Use of soil compaction, stability, conduction, etc. eqpt.	4.0	1,452
Photogrammetry/Cartography/GIS	Stations for cartography eqpt., computer stations, lay-out space, flat files, etc.	4.0	1,452
Seismic & Earthquake Engineering	High bay lab: Strong floor & wall, shake table, etc.	6.0	2,178
Foundation Engineering	Large foundational structures; stationary devices	3.0	1,089
Transportation/Highway Engineering	Specialized equipment; permanent stations	5.0	1,815
Land Surveying	Secure area, instrument storage & cleaning space	6.0	2,178
Machine (Shaping, cutting, welding) Shop	Use of shaping,cutting,welding eqpt.; stationary devices	6.0	2,178
Equipment Maintenance	Specialized repair equipment; support for all labs	3.0	1,089
Total			**27,770**

Spaces Adjacent to Teaching Areas	Description	No. of Persons	SF/ Person	Square Ft (SF)
Small Adjacent Teaching/Mentoring Areas (10 spaces)	Instructor support, holds long-term experiments	10	140	1,400
Small Seminar Classes (1)	With computers or laptop capable arrangement	34	20	680
Total				**2,080**

Other Spaces	Description	No. of Persons	SF/ Person	Square Ft (SF)
Small Conference Room	Staff support; chairs & small table	10	24	240
Large Conference Room	Staff support; chairs & large table	20	22.5	450
Total				**690**
Total Assignable Area				**30,540**
Efficiency	Partitions, Bathrooms, Circulation, MEP		60%	20,360

SPACE TOTAL 50,899

Space Assessment

The Analysis

The original space assessment study conducted by ECI/Hyer (dated May 5, 2008) concluded that in order to meet the projected future growth in the next 10 years, the School of Engineering will need approximately 200,000 GSF (120,000 ASF) of total building space. The program consists of various classroom types, computer laboratories, as well as new teaching areas. An outdoor storage yard for boats and teaching materials, also known as a "Dirty Yard," should be included for quick and convenient access. Office spaces for full-time and adjunct professors, as well as for graduate students, and teaching assistants are included. Lecture hall, conference rooms, and various support spaces were also included within this program.

Phase 1 - Basic Needs

In order to meet current demands, the SoE recognizes that a phased approach should be implemented and will commence with the Engineering and Industry Building. Phase I only represents the most critical space needed by the current level of enrolled students and is broken into Options 'A' and 'B.' Option 'A' brings some much needed relief to the SoE, and includes 50,000 GSF (30,000 ASF) of basic undergraduate laboratories: electronics, instrumentation, materials, fluids, photogrammetry, soils, and seismology. The estimated project cost of Phase I, Option 'A' is $50,000,000. Option 'B' meets current needs under a no growth scenario and provides additional needed student labs at an estimated project cost of $70,000,000.

The Process

At the beginning of this programming process, representatives from each of the departments within the SoE, as well as several community entities, convened to form the School of Engineering Steering Committee. Their purpose was to provide input and guidance for the study based on current demands and future needs. This process was invaluable to the consultant team and shaped their findings.

Each department completed a spreadsheet regarding current and possible future courses and laboratories. Each department then submitted details on each course, such as the type of space needed for the course (seminar, distance learning, computer laboratory, etc.), ideal number of students per section, number of professors needed per semester, and the number of course sections per year. The information was then merged with other important factors such as the number of credits offered per course and whether it met during the day or night thus calculating the number of available scheduling hours per day. The space summary includes current needs as well as near-term growth projections for current and future degree-seeking students. The projection assumes that enrollment will level off once the immediate demands are met and the graduation rate catches up with the enrollment rate.

Space Descriptions

Teaching Areas

During the programming process, ECI/Hyer brought Scott Lindner, with Xnth (formerly Earl Walls Associates) to the team. Scott has extensive experience in estimating specialized laboratory needs for university science and engineering programs worldwide. For the School of Engineering, he provided input on the size, types, and additional needs regarding specific teaching areas. The space program utilizes a modular laboratory design in order to create the most efficient and flexible spaces using various module sizes.

The teaching areas include specific equipment related to the corresponding area of study, such as apparatuses, structures, and student stations, that promote a hands-on learning experience, which is coherent with the School of Engineering's curriculum. These stations cannot be disassembled or moved to other laboratories in a daily time frame and need their designated space in order to accommodate the students in a safe environment.

During the planning process with the Steering Committee, ECI/Hyer compiled a list of needed spaces that would better serve the

GENERAL MODULAR -TYPE SPACE

SoE. The following are descriptions of these teaching areas:

ADJACENT TEACHING AREAS: These are instructor support spaces programmed next to the laboratories for the mentoring and tutoring of students. This space also allows for safe supervision of the labs.

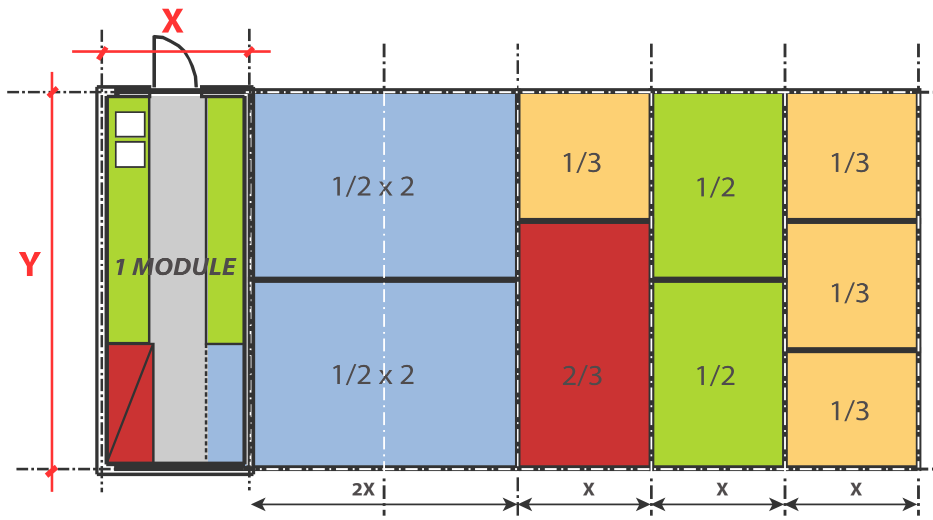
COMMUNICATIONS/ANTENNAS ENGINEERING: Communications & Antenna design are fundamental to electrical engineers and have important applications in industry in Alaska. This lab focuses on antenna performance parameters including field patterns, power patterns, beam area, directivity, gain, beam efficiency, radiation intensity, antenna apertures, impedance, polarization, and the radio communication link.

CONTROLS/INSTRUMENTATION ENGINEERING: There is a strong industry demand for well-trained engineers in this area. This lab focuses on the use of linear system representation by transfer functions, signal flow graphics, and state equations. Feedback, time, and frequency response of linear systems are components of this specific area of study. This is the application and study of instrumentation theory and concepts of digital and analog devices, transducers, data sensing transmission, recording and display, instrumentation system, remote sensing, as well as effects of hostile environmental conditions.

CORROSION/MATERIALS ENGINEERING: The importance of corrosion control and prevention is well known in Alaska's energy, power, and utility industries. Materials must be designed to perform well in our unique environmental conditions. A space would need to provide safety for the handling of chemicals needed for studying metal grain structure and behavior. Close access to a water supply is also needed.

ELECTRICAL ENGINEERING (EE): Every EE program should have a laboratory that enables the teaching of the fundamentals inclusive of the following: elementary circuit analysis, network theorems, steady-state and transient analysis of DC circuits with resistors, and one energy storage device. This emphasis also includes the steady-state analysis of AC circuits with resistors, capacitors, and inductors using complex number and phasor representation. Power in DC and AC circuits, transformers, meters, and applications of simple electrical components and circuits are all taught in an electrical engineering laboratory.

ELECTRICAL UTILITY POWER/GENERATION & TRANSMISSION ENGINEERING: Responsible development of Alaska requires engineers who are well-trained to design electrical power generation facilities that transmit power to communities. There is a strong demand for electrical power engineers from industry, governmental agen-



MODULE STUDY DIAGRAM

cies, and utility companies. This laboratory provides the necessary facilities for preparing electrical power engineers to enter the workforce and includes load forecasting, generation planning, production simulation, power plant reliability characteristics, generation systems reliability, power flow control, power interruption, voltage variations, and distributed generation.

EQUIPMENT MAINTENANCE: This is an electronics and mechanical shop dedicated to the departments within the SoE, used to repair computers and instrumentation associated with the SoE's laboratories.

FOUNDATION ENGINEERING: All major construction requires knowledge of foundation design. This laboratory enables the study of concepts, principles, and procedures related to slope stability, shallow foundations, pile foundations, drilled shafts,

lateral earth pressure, retaining walls, sheet pile walls, braced cuts, soil improvement, and reinforced earth structures are investigated and taught in this lab.

FLUIDS ENGINEERING: Fluid dynamics and engineering is a fundamental aspect of civil and mechanical engineering. This laboratory focuses on the study of the physical properties and behaviors of fluids, hydrostatics and dynamics of liquids and gases, dimensional analysis, fluid forces on immersed bodies, pipe flow, fluid machinery, and open channel flow. The SoE's open channel flume would be utilized in this lab.

HEAT & MASS TRANSFER ENGINEERING: Fundamental to mechanical engineering programs, this laboratory provides the core concepts students need to apply heat and mass transfer concepts to engineering problems, including steady-state and transient conduction, laminar and turbulent free and forced convection, evaporation, condensation, ice and frost formation, black body and real surface radiation, and heat exchangers.

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) ENGINEERING: Buildings and other structures with controlled climate areas require well-trained HVAC en-

gineers. This laboratory provides an area for the necessary equipment to study and apply design in developing air controlling systems.

KINEMATICS & MACHINE DESIGN ENGINEERING: Fundamental for mechanical engineers, this laboratory focuses on the core concepts of kinematics, and the use of kinematics in the design of machinery. Other areas of focus include analysis of the motions of linkage and cam mechanisms, gear theory, analysis and design of ordinary and planetary gear trains, determination of static and dynamic forces in machines, balancing of machines, flywheel design, dynamics of cam mechanisms and vibration of machines.

LAND SURVEYING: Alaska has a strong demand for surveyors and the SoE has the only accredited surveying program in Alaska. This laboratory teaches students geomatics & survey measurement techniques, including the use of levels, theodolites, total stations, and GPS. Methods of recording and reducing field data are investigated, while in-field projects and computations also take place. Areas for instrumentation storage, preparation, and clean-up will be needed.

MACHINE SHOP: Industry has long recognized the importance of hands-on learning for producing well trained engineers, and for students to produce working models and mechanisms. The shop would provide the fundamental space and equipment for application of engineering software in designing and fabricating mechanical devises, course projects, and projects for professional engineering society student competitions. Industry has already expressed an interest in working with students on projects supported by this sort of facility.

PHOTOGRAMMETRY/CARTOGRAPHY/GIS: Geomatics students, trained in this area of study are in high demand. This laboratory provides the important space to study cartographic methods and techniques, design, map reading, map components, and data symbolization that are fundamental and needed by industry.

SEISMIC & EARTHQUAKE ENGINEERING: Earthquake design is of great importance to all engineering projects, particularly those in an active earthquake zone, such as Anchorage. This laboratory focuses on seismic concepts, design principles, and criteria for design and construction of buildings subject to earthquake ground motions. Also included is the engineering design for reduction of earthquake loads through seismic isolation. The majority of these functions require a high-bay laboratory. A storage and staging area, typically referred to as a "Dirty Yard," will be located

outside of the high-bay lab. This exterior space holds SoE equipment, supplies, and materials for student projects with regards to coursework, as well as professional engineering student competitions.

SOIL MECHANICS ENGINEERING: Civil engineering requires an understanding of soil mechanics. This lab focuses on the concepts, principles, and procedures related to soil formation and classification, soil compaction, flow of water in soils, stresses in a soil mass, soil settlement, shear strength of soil, subsoil exploration, and frost action.

TRANSPORTATION/HIGHWAY ENGINEERING: Development in Alaska requires engineers to be able to design transportation systems, including airports, highways, and marine highway networks. This lab provides the equipment and space needed to teach students the fundamentals of transportation design, construction, operation, and maintenance of facilities for transporting people and goods by highway. The economic, social, and environmental consequences of these aspects are also investigated.

Phase 1: Option B

Option 'B', comprising of 70,000 GSF (42,000 ASF) of programmed space is attached within the Appendix on page 28. It accommodates other specialized teaching areas that are required by the current curriculum. The following teaching areas include descriptions that pertain to Option B.

ENVIRONMENTAL ENGINEERING: In Alaska, responsible development of resources requires a sound understanding of environmental engineering. Consequently industry requires engineering graduates with a strong understanding in environmental design. This lab emphasizes basic and specialized understanding of essentially all fundamental aspects

of the field with a focus on aquatic and terrestrial environments. It also includes the use and application of equilibrium processes, mass and energy balances, processes that occur in natural and man-made systems.

HYDROELECTRIC ENGINEERING: Anchorage and the surrounding areas have great potential for hydroelectric engineering development. Also, small hydroelectric power generation is an alternative for many remote villages needing power for basic everyday necessities. This laboratory provides the facilities for students to learn water power evolution and to design hydroelectric power facilities and devices for industry and communities.

INJECTION MOLDING & RAPID PROTOTYPING ENGINEERING: Application of 3-D engineering software for designing mechanical devices is becoming fundamen-

tal for mechanical engineering students. This laboratory enables students to study topics for injection molding, rapid prototyping and automated fabrication, generation of suitable CAD models, current rapid prototyping fabrication technologies. The rapid prototyping process will be illustrated by the actual design and fabrication of a parts and devices.

MILLING & LATHING MECHANICAL ENGINEERING SHOP: Application of engineering design and engineering software for generating highly precise machine parts and devices is a valuable skill for mechanical engineers and is well recognized by industry. This shop includes CNC programming capabilities, as well as equipment such as lathes and milling machines. Students will learn to operate and use appropriate equipment for use in related class projects, as well as learn about mechanical design and manufacturing.

PORT & COASTAL ENGINEERING: The importance of port and coastal engineering is well known throughout every coastal community in Alaska. This laboratory enables the study of deep and shallow water waves, literal drift, coastal structures, pollution problems, and harbor seiches. The SoE currently owns an open channel flume, over 50 feet in length. If equipment is strategically located within a room, this space could be shared with another teaching area.

WIND GENERATION ENGINEERING: Many coastal regions of Alaska, such as those of the Anchorage area and others, have great potential to develop wind power as an alternative energy. This laboratory provides the facilities for learning basic concepts, including wind capture, transformation and transmission, engineering principles for designing wind towers, turbines, and electrical generators.

WOOD SHOP: Designs for many course related engineering projects and student competitions require wood based prototypes in their development. Some of the equipment for the wood shop would consist of the following: band saw, drill press, lathe, miter saw, planer, radial arm saw, router, sander, table saw, and others.

Program Goals

Considerations

The design team took into account projected enrollment, implementation of new "hands-on" curriculum, and other factors. The facility expansion can be more than just a building—it can be a learning tool of its own by displaying elements of engineering throughout, by being as flexible as possible, and by incorporating sustainable design. The design team should also consider incorporating other important elements, such as creating spaces for interaction and including an inviting approach to the site.

Hands-on Learning

Faculty at UAA's SoE believe that to better prepare students for the profession, incorporating a learn-by-doing approach is the best technique for future graduates. This can be accomplished by creating more teaching spaces in the facility, which allows a smaller student to faculty ratio, as well as adequate laboratories. Also, by providing the teaching areas, as mentioned in the previous section, students can actually partake in experiments instead of just watching or reading about them.

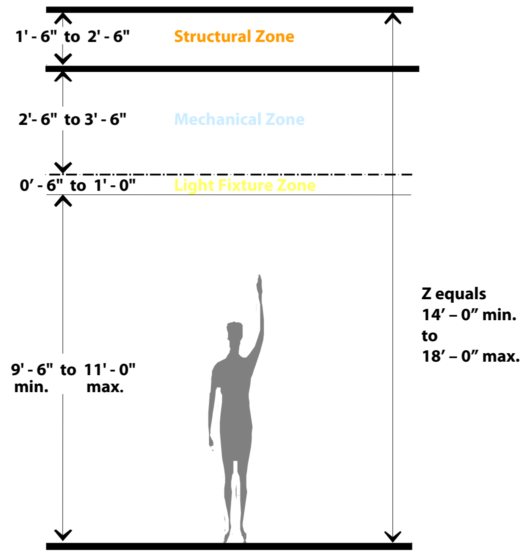
Engineering on Display (Building as a Teaching Tool)

There is ample opportunity to "display engineering," and to use the building as a teaching tool. When the design team suggested this approach to the Steering Committee, there was positive feedback and excitement. One example would be to expose structural members, duct work, and even light fixtures in portions of the building, so professors could actually point out what they may be teaching. Another example would be revealing a portion of the mechanical and electrical rooms with glass panels to provide an opportunity

for students to observe what they may one day design. Interactive models regarding engineering topics relevant to Alaska would also be on display. These features would not only create an enjoyable atmosphere, but could also be used as recruiting tools when students or faculty visit campus.

Flexibility

Designing a building to last is becoming increasingly important, as the cost of construction only continues to rise. Accommodating cycles of change over the years, as well as adaptation and updates, can be done by incorporating flexible spaces in order to increase the life of the building. This programmatic idea also helps with space efficiency, as a room may be used for a larger seminar room, then partitions may allow the room to be divided into smaller spaces. Flexibility can be beneficial in laboratory spaces as the core elements, such as structural, plumbing, mechanical, and electrical amenities, are located in an interstitial zone above the ceiling. This leaves the laboratory or work space below open for possible changes.



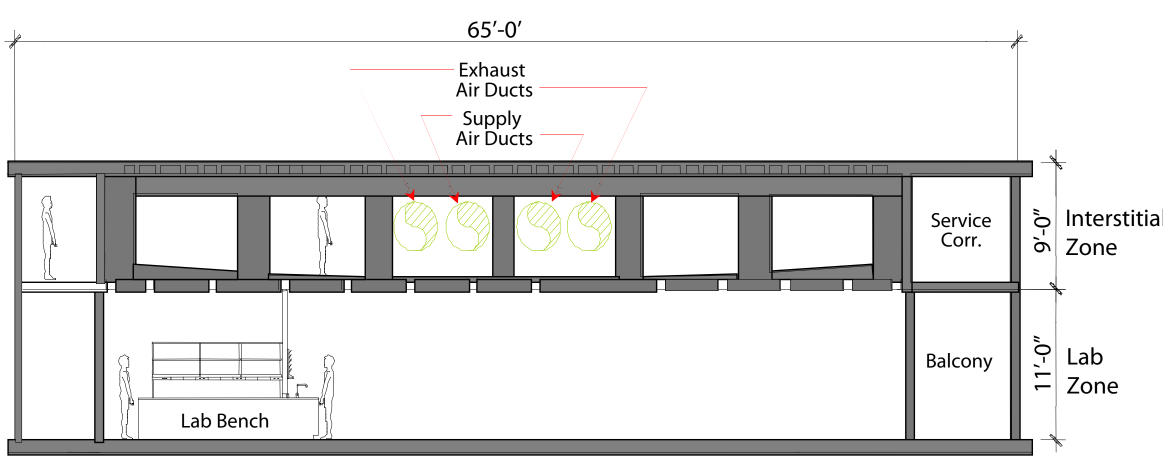
INTERSTITIAL SECTION

Advantages:

- Unobstructed floor plan, infinite adaptability of space.
- Minimum disruption in lab during routine maintenance and alterations.
- Services available from above at any point on planning the module.

Planning Considerations:

- Adds to building height.
- May require additional structure (access floor, catwalk, etc.).
- May require additional fire protection in interstitial floor.
- May add to initial building cost.



Sustainability

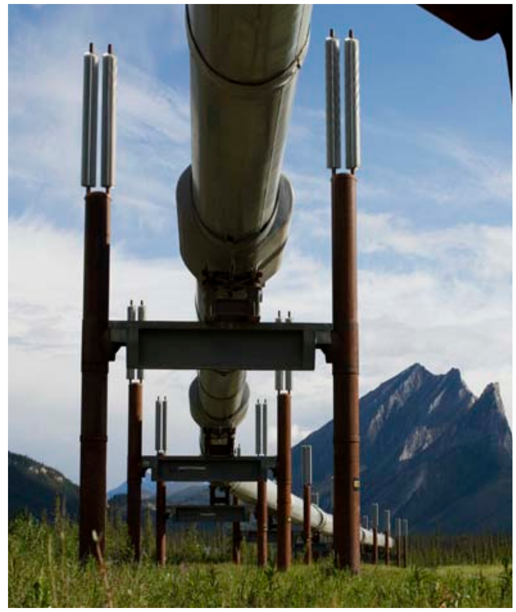
Sustainable design is becoming increasingly important and would provide a competitive edge to other schools. This may also open opportunities for partnering with nearby industries having an interest in energy efficiency. Taking advantage of natural daylight and natural ventilation may be an option. Also, adhering to principles of green design in the selection of appropriate systems (possibly a hybrid system) and materials (using life-cycle costs for analysis) can make a big difference. Another example of sustainable design would be to implement solar panels for energy generation, which could double as a teaching tool for faculty. These are just some of the many possibilities as we move to building with the environment in mind. What a great example for future graduates to take with them—knowledge of the sustainable building they would inhabit.

Interaction

Implementing certain programmatic ideas within the building can provide an opportunity for social interaction or incidental study for people. Creating an atmosphere where people want to congregate is important, as they could conveniently ask a question to a nearby peer or faculty member in the same building. Design of the proposed building will include features that maximize interaction between faculty and students, and also between students and the community.

Education & Industry Collaboration

It is well known that project-based learning is extremely effective in teaching students the skills needed to be prepared for professional work. The unique location of UAA, being at



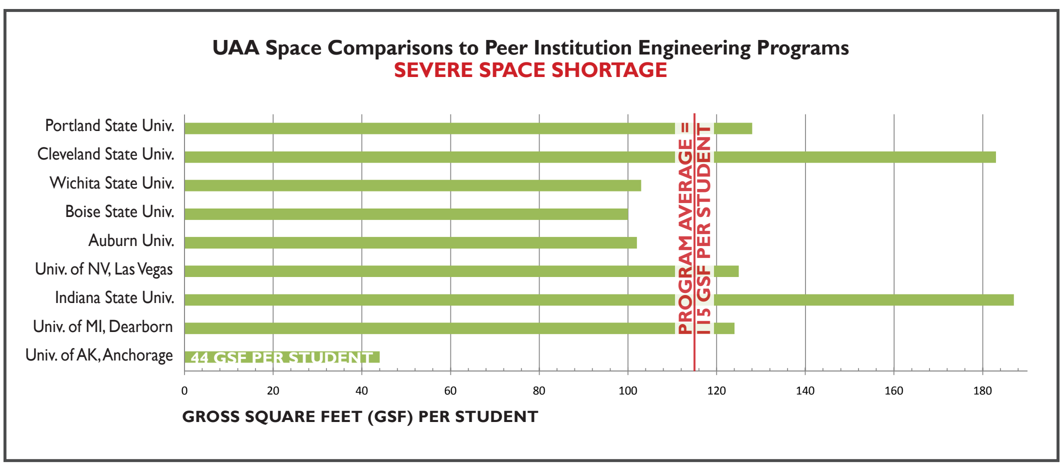
the industry center of Alaska with more than 100 companies and agencies within four miles of campus, provides an outstanding opportunity for both students and industry. Students can work part-time throughout the entire year as interns, on real-life engineering projects. The engineering industry highly supports this type of program because it allows them to work with the students and get to know them before permanently hiring them. Students enjoy the experience and the financial benefits that help make it possible for them to attend school. Furthermore, projects developed within the classroom are often derived from problems that industry needs solved or projects that they need completed. Thus, the new proposed building will be the hub for students to solve problems and work on projects needed by industry. This collaborative effort between UAA engineering students and the many industries in the Anchorage area is a great service for the community with benefits for everyone involved.

Conclusion

"This building would provide the public square for Engineering in Alaska."

– Rob Lang, Dean of School of Engineering

Architecture offers one of the strongest means of conveying the pride and purpose of an institution. University of Alaska's support for the School of Engineering is the lifeline for engineering within the state of Alaska. Meeting the critical need for space with Phase 1 of the Engineering and Industry Building is a stepping stone for building an even stronger SoE for the UA system. This expanded facility will promote collaboration between the disciplines, as well as create a stronger bond to the engineering profession and community.



UAA School of Engineering - Engineering & Industry Building Phase I Option B: 70,000 gross square feet (42,000 assignable square feet)				
Teaching Areas	**Description**	**No. of Modules (363 SF/Module)**		**Square Ft (SF)**
Communications/Antennas Engineering	Specialized equipment; permanent stations	3.5		1,271
Controls/Instrumentation Engineering	Specialized equipment; permanent stations	3.5		1,271
Corrosion/Materials Engineering	Chemical resistant surfaces; corrosives to be separated	5.0		1,815
Electrical Engineering	Dry lab with specialized eqpt.; permanent stations	5.0		1,815
Electrical Utility Power & Transmission Engineering	Specialized equipment; permanent stations	4.5		1,634
Kinematics & Machine Design Engineering	Specialized equipment; permanent stations	3.5		1,271
Fluids Engineering	Use of open channel flume; stationary devices	6.0		2,178
Heat & Mass Transfer Engineering	Specialized equipment; permanent stations	3.5		1,271
Heating, Ventilating, & Air Conditioning Engineering	Use of large eqpt.: air flow channels, wind tunnels, etc.	5.0		1,815
Soil Mechanics Engineering	Use of soil compaction, stability, conduction, etc. eqpt.	4.0		1,452
Photogrammetry/Cartography/GIS	Stations for cartography eqpt., computer stations, lay-out space, flat files, etc.	4.0		1,452
Seismic & Earthquake Engineering	High bay lab: Strong floor & wall, shake table, etc.	6.0		2,178
Foundation Engineering	Large foundational structures; stationary devices	3.0		1,089
Transportation/Highway Engineering	Specialized equipment; permanent stations	5.0		1,815
Land Surveying	Secure area, instrument storage & cleaning space	6.0		2,178
Machine Shop	Use of shaping,cutting,welding eqpt.; stationary devices	6.0		2,178
Equipment Maintenance	Specialized repair equipment; support for all labs	3.0		1,089
Hydroelectric Engineering laboratory	Specialized equipment; permanent stations	3.5		1,271
Environmental Engineering	Specialized equipment; permanent stations	5.0		1,815
Port & Coastal Engineering	Use of open channel flume; stationary devices	7.0		2,541
Wind Generation Engineering	Use of wind mills & other wind catching devices	3.5		1,271
Injection Molding and Rapid Prototyping	CAD computer stations; large 3D printer; product testing	4.0		1,452
Milling and Lathing Mechanical Engineering Shop	Use of large equipment: milling, lathes, etc.	4.0		1,452
Wood Projects Shop	Use of large equipment: planers, sanders, saws, etc.	5.0		1,815
Total				**39,386**
Spaces Adjacent to Teaching Areas	**Description**	**No. of Persons**	**SF/ Person**	**Square Ft (SF)**
Small Adjacent Teaching/Mentoring Areas (10 spaces)	Instructor support, holds long-term experiments	10	140	1,400
Small Seminar Classes (1)	With computers or laptop capable arrangement	34	20	680
Total				**2,080**
Other Spaces	**Description**	**No. of Persons**	**SF/ Person**	**Square Ft (SF)**
Small Conference Room	Staff support; chairs & small table	10	24	240
Large Conference Room	Staff support; chairs & large table	20	22.5	450
Total				**690**
Total Assignable Area				**42,156**
Efficiency	Partitions, Bathrooms, Circulation, MEP		60%	28,104
		SPACE TOTAL		**70,259**

UNIVERSITY of ALASKA ANCHORAGE

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UNIVERSITY OF ALASKA
ANCHORAGE

FORMAL PROJECT APPROVAL

Name of Project:	Engineering Phase 1 – Engineering and Industry Building
Location of Project:	Anchorage, Anchorage Main Campus
Project Number:	TBD
Date of Request:	May 10, 2010

Total Project Cost:	$ 50,000,000
Approval Required:	Board of Regents
Prior Approvals:	Preliminary Administrative Approval

Reference Materials:

1. Project budget
2. Engineering Needs Study – September 2009