SB 107

<TARGET><BILL>SB 107</BILL><SUBJECT>SB 107</SUBJECT><COMM>SEDC27</COMM></TARGET>

SENATE COMMITTEE REPORT
First Committee of Referral

DATE: 3/21/11

Date of 5-Day Notice: 3/31/11
(in accordance with Uniform Rule 23)

FURTHER: Finance

DATE TURNED IN TO OFFICE: 4/8/11

Education Committee considered SENATE BILL NO. 107

SB 107-APPROP: UNIV. ENGINEERING BUILDINGS

"An Act making special appropriations for new engineering buildings for the University of Alaska in Anchorage and Fairbanks."

and recommends:

[ ] be **replaced** with **CS** _____ (_____) *[ ] Same Title [ ] New Title*

[ ] adopt **previous CS** _____ (_____) *[ ] Same Title [ ] New Title*

[ ] attached amendment(s)

[ ] adopt _____Letter of Intent

[ ] further referral to _____Committee

Dept Abbr.	
ADM	LEG
CED	LAW
COR	LWF
CRT	MVA
EED	DNR
DEC	DPS
DFG	REV
GOV	DOT
DHS	UA

NEW FISCAL NOTE(S)				
Dept.	Fiscal	Indet.	Zero	FN #

PREVIOUS FISCAL NOTE(S)				
Dept.	Fiscal	Indet.	Zero	FN #

[X] **APPROPRIATION - no fiscal note**

SIGNATURES AND RECOMMENDATIONS:	PRINTED LAST NAME	DO PASS	DO NOT PASS	NO REC	AMEND
Betty Davis	DAVIS	X			
	French	X			
CO-CHAIR: Joe Thomas	Thomas	✓			
CO-CHAIR: Kelly Meyer	Meyer	✓			

Rules Committee
•
Senate Finance Committee
•
Health & Social Services Committee
•
Community & Regional Affairs Committee
•
World Trade Special Committee
•

ALASKA STATE LEGISLATURE

While in Session
State Capitol, Rm. 119
Juneau, AK 99801
(907) 465-3704
Fax (907) 465-2529
•
While in Anchorage
716 W. 4th Ave, Ste. 500
Anchorage, AK 99501
(907) 269-0169
Fax (907) 269-0172

SENATOR JOHNNY ELLIS
RULES COMMITTEE CHAIR

MEMORANDUM

DATE: **March 25, 2011**

TO: **Senator Kevin Meyer, Senator Joe Thomas**
Co-Chairs, Senate Education Committee

FROM: **Senator Johnny Ellis**

RE: **Hearing Request for Senate Bill 107 – An Act making special appropriations for new engineering buildings for the University of Alaska in Anchorage and Fairbanks.**

I am respectfully requesting that SB 107 be scheduled for a hearing in the Senate Education Committee at your earliest convenience.

SB 107 offers an important opportunity to invest in Alaska's development and progress by supporting new engineering facilities at the University of Alaska Anchorage and University of Alaska Fairbanks.

Included in this packet:

- A current version of SB 107 27-LS0462\M
- Sponsor Statement
- Letters of support
- Supporting Material

Other back up will be provided soon.

Thank you.

Senator Johnny Ellis, State Capitol, Rm. 119, Juneau, AK 99801, Phone: (907) 465-3704, Fax: (907) 465-2529, email: Senator.Johnny.Ellis@akleg.gov

Rules Committee
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Senate Finance Committee
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Health & Social Services Committee
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Community & Regional Affairs Committee
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World Trade Special Committee
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Committee on Committees

ALASKA STATE LEGISLATURE

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SENATOR JOHNNY ELLIS
RULES COMMITTEE CHAIR

SPONSOR STATEMENT – SENATE BILL 107

SB 107 – An Act making special appropriations for new engineering buildings for the University of Alaska in Anchorage and Fairbanks.

SB 107 will keep engineers living and working within our state by appropriating $50 million for the design and construction of new engineering facilities at the University of Alaska Fairbanks and $75 million for the design and construction of new engineering facilities at the University of Alaska Anchorage.

Alaska faces a shortage of qualified engineers and some companies are resorting to sending Alaska's engineering design work outside. Shortages are especially apparent for surveyors and electrical, mechanical, mining and petroleum engineers:

- Many of the engineers working in Alaska now are not Alaska residents, up to 35% in some fields
- Only 18% of engineers working in Alaska have degrees from an Alaska institution
- Alaska is nearly last in the US for graduating engineers

To respond to the state's need, the University of Alaska Board of Regents set a priority to double annual engineering graduates by 2014, to 200 per year. UA baccalaureate engineering majors have grown significantly, nearly doubling from just over 500 in FY03 to more than 1000 in FY10. UA engineering programs are succeeding at recruiting and training more engineers, but are facing daunting shortages of lab and classroom space.

The space shortages UA engineering programs face are severe. Engineering programs across the country offer on average 120 gross square feet (GSF) per student. UAA's program currently has access to only one-third the average at 44 (GSF). The recent UA funded UA Engineering Plan by consultant Ira Fink and Associates details the additional space needs at each of the UAA and UAF campuses. The recommendation was a minimum of 74,968 (GSF) is needed at UAA and 43,058 (GSF) at UAF.

More engineering resources are a critical component of economic development and growing our own Alaskan workforce. Engineers and surveyors play key roles in the planning, design and management of any resource development, construction or development projects. For Alaska to move forward and keep our promise to develop our resources, we will need "Alaska Grown" engineers.

University of Alaska
UA Engineering Plan 2010

DRAFT REPORT (Presented to Regents February 17-18, 2011)
January 24, 2011 (Draft E1)
By UA hired consultant, Ira Fink and Associates, Inc.
See http://www.alaska.edu/bor/agendas/2011/feb17_18/110217rel01.pdf
Extracted Text

Page ES-9

• **Degree Increases:** Based on historical enrollments and projections in the Engineering Plan 2010, baccalaureate engineering degrees are expected to increase to 103 by spring 2014 at UAA and to 99 by spring 2014 at UAF. The Regents' target of 200 undergraduate baccalaureate degrees being awarded at the University of Alaska should be reached in spring 2014.

Page ES-11

• **UAA Engineering Space Needs Projection:** For projection purposes, space needs were projected for both campuses at 1,676 asf per faculty based on a benchmark analysis of ten other schools and colleges of engineering. Based on this benchmark, the UAA School of Engineering should have 64,526 asf (107,543 gross square feet) of space. With its current existing space of 15,309 square feet, and the ability to gain back 4,278 square feet used for other programs in the UAA Engineering Building, the current space deficit for engineering at UAA is 44,939 asf, or about 74,898 gross square feet. Registrar-assigned classroom space used by UAA would add another 2,194 asf (3,657 gross square feet). The total space needs deficit is 78,555 gross square feet.

• **UAF Engineering Space Needs Projection:** At UAF, the 43.5 faculty at 1,676 asf per faculty would lead to a current space need of 72,906 asf. Deducting the current CEM space of 47,071 square feet leaves a CEM space deficit of 25,835 asf, or about 43,058 gross square feet. With the addition of Registrar-assigned classroom space of 6,730 square feet, the total UAF CEM space needs is 32,565 asf, or about 54,275 gross square feet.

Pages R-3 to R-4

RECOMMENDATIONS

1. Bachelor of Science Degrees: UAA and UAF should maintain a minimum of graduating 200 undergraduate trained engineers annually.

. . . . .

2. New Facilities: UAA and UAF should begin detailed facility programming and conceptual design for new engineering buildings on their campuses.

A major challenge to the UAA and UAF programs is the inadequacy of space devoted to engineering in general and engineering teaching laboratories in particular. As the photographs in this report indicate, the engineering laboratories themselves are cramped and full. Providing adequate space for hands-on learning, for the ability to set up and maintain projects, and for the opportunity to be in the laboratory in off hours, constitute opportunities that cannot be had at present because of the lack of space.

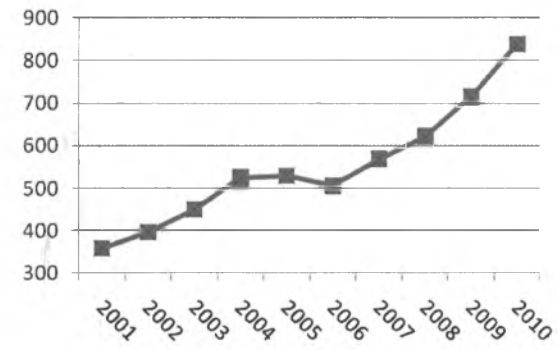
. . . . .

This study calculates the space deficit at UAA SOE to total 44,939 assignable square feet (asf) (74,898 gross square feet). This is in addition to the existing School of Engineering space, which totals 15,309 asf (25,515 gsf) plus an additional 4,278 asf (7,130 gsf) from space in the UAA Engineering Building that is currently assigned to the College of Health and Social Welfare for the WWAMI medical program.

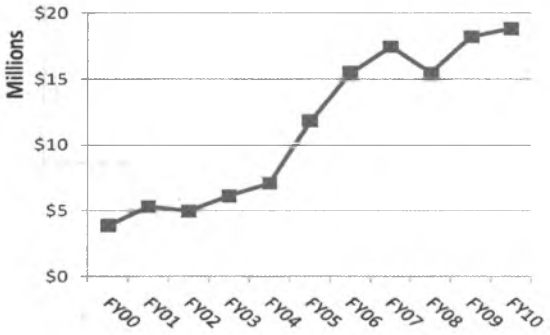
At UAF, the CEM space deficit is computed to be 25,835 asf (43,058 gsf). This is in addition to the 47,071 asf (78,452 gsf) of existing CEM space and 6,730 asf (11,217 gsf) of Registrar-assigned classrooms.

UAF College of Engineering and Mines
Update and Briefing - April 2011

CEM Student Enrollment



INE Research Funding



UAF Engineering Space Projection

Total UAF Engineering Space Need (43.5 UAF Faculty × 1,676 asf/Faculty)	72,906 asf	=	121,510 gross square feet
Existing CEM Space	− 47,071	=	− 78,452
CEM Space Deficit	25,835 asf	=	43,058 gross square feet
Plus Registrar-Assigned Classroom Space	+ 6,920	=	+ 11,533
Total Net Additional UAF CEM Space Needs	32,755 asf	=	54,591 gross square feet
$18 Million Research Income/$200 per sf	90,000 gsf		
GSF to ASF Conversion at 0.60	54,000 asf		
Existing INE Space	35,040 asf		
INE Space Deficit	18,960 asf	=	31,600 gross square feet

Source: Ira Fink and Associates, Inc.

Teaching Need

Research Need

College of Engineering and Mines & Institute of Northern Engineering

The College of Engineering and Mines (CEM) is growing fast, extending its ability to serve Alaska. CEM, formed in 2004, incorporated the resource-based and traditional engineering programs along with the Institute of Northern Engineering (INE - UAF's engineering research arm) into one strong unit.

Program Growth

- In 2006 UA President Hamilton announced the goal of doubling the graduation rate of engineers. CEM is well on the way to achieving that goal with a 70% increase in enrollment since 2006.
- The UAF computer science program joined CEM in 2010.

Research Accomplishments

- INE research funding is on a growth trend toward $24M over the next few years after starting at $6M when the college was formed in 2004.
- The newly formed Alaska Center for Energy and Power is addressing State needs for energy through applied research and testing.

Facilities Needs

- **The recently completed UA Engineering Plan 2010 identified an additional 86,200 gross square feet of additional engineering space needs at the UAF campus in order to accommodate current teaching and research activities.**
- FY10 funding for engineering facilities planning is being used to carry out programming and planning for the new UAF engineering building. The RFP for planning and design services has been issued and proposals are due back mid-April.

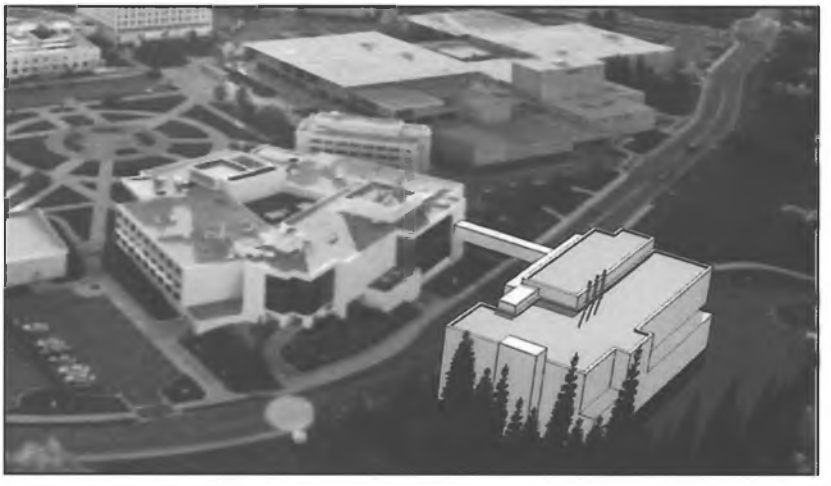
Student Success

- The NASA-funded Student Rocket Project launched its fifth sounding rocket from Poker Flat Research Range in January 2009.
- The UAF ASCE Steel Bridge Team just won the 2011 Northwest Regional Title and will be attending Nationals later this spring.
- UAF's team entered the 2011 Society of Automotive Engineers Clean Snowmobile Challenge and won 1st place in the design competition, unseating U of Wisconsin (first place title winner three years in a row).
- For the last two years, CEM students from the UAF Microgravity project have won flight time on NASA's zero-G aircraft. They are now scheduled to launch a "CubeSAT" in 2013 as part of a NASA-funded program.

SRP-5 is launched from Poker Flat, Jan 2009

UAF to launch its own "CubeSAT" in 2013 as part of a NASA program

Proposed Duckering Building Expansion



AS&T

Established 1980

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akscitec@alaska.net

March 23, 2011

Senator Johnny Ellis
Alaska Senate
State Capitol Room 119
Juneau, AK 99801

Forwarded by email

Dear Senator Ellis:

Funding is urgently needed for a new engineering building at the University of Alaska Anchorage.

Ballooning School of Engineering enrollments have created a space crisis. If funding was available today, the time consuming process of design, procurement, and construction would not allow a new building to be occupied for upwards of 10 years. Enrollments have tripled in the last 10 years. The word **crisis** is well justified.

The UAA School of Engineering (SOE) provides direct ready access to an engineering education for the more than 50 percent of Alaska's population located in Anchorage and Mat-Su. It also draws from the entire state. Enrollments will continue to grow, if faculty and facilities keep pace to accommodate them.

Beginning about 1998, a concentrated seven-year effort resulted in accredited programs in computer, electrical, and mechanical engineering. Prior to 2005, it was necessary to leave the area to obtain this type of higher education. High School graduates and working residents seeking continuing education are only beginning to recognize and take advantage of the new programs. Enrollment demands must be served.

Unfortunately, the UA 2010 Engineering Report initiated by Regents in response to this dramatic enrollment growth is only marginally competent. UAA needs 140,000 sq.ft. of additional engineering classroom and laboratory space by 2015, which is greatly understated in the Report. This is another example of typical regional politics, which have compromised development at UAA since the beginning.

At the UAA SOE, laboratory equipment is now rotated in and out of storage to meet multi-disciplinary class schedules. This compromising handicap is no way to operate a school of engineering. Accreditation is at risk. Hiring and retention of high quality faculty will suffer. Enrollments may have to be capped.

I have helped to push development of higher education in Anchorage and Southcentral Alaska, since Anchorage Community College only existed in evenings at West High School and on Elmendorf Air Force Base. Since the late '90s, my efforts have been focused upon providing local access to contemporary engineering educations. I have a unique perspective about this from long-time engagement as a physical scientist and engineer, and also as a senior official in the Alaska Section of the Institute of Electrical and Electronics Engineers (IEEE). It is extremely important to meet the public demand for higher education where it exists.

If we don't provide ready local access, the majority of our youth seeking an engineering education will attend universities Outside. After graduation, they seek nearby employment and get married, resulting in a lost resource to Alaska. Our youths are one natural resource we cannot afford to keep shipping Outside. Home-grown Alaskan engineering graduates provide a stable workforce that does not constantly transfer in and out of the state. Important economic factors are involved.

A stable engineering workforce contributes to the existing economy, and importantly to a developing economy. There is a need to move away from an economy almost totally based on extraction of natural resources. Resident engineers can also establish new industries based on innovative products. Ready access to a public higher education is necessary to bring this about. The key word is Access!

I am well connected from past service on a number of internal UAA bodies dating to 1980, including Chair of the Chancellor's Advisory Council and founder of the SOE Advisory Board. However at the present time I am not a member of an internal body, which provides latitude to independently represent the public's best interest. My background offers insight about current and future university program needs, and also the legislative process. I am aware of the internal push for funding.

I know you have strongly supported UAA in the past, and unfortunately the UA Administration is only now beginning to utilize $2M of your prior $10M appropriation for additional engineering planning at UAA and UAF. Again, regional politics are at work, and UA President Gamble's unwise Fisher Report is going to greatly complicate matters. Over the many years, this has been highly frustrating.

While contacting you I have felt a need to re-establish credibility, because it has been some time since I've worked directly with the Legislature on university matters. This was ongoing in earlier years. I will be happy to serve as a resource for coordination and in-depth information, on or off the radar. Please support the urgent need to fund a new engineering building at UAA.

Sincerely,

Robert L. Baldwin

/s/ Robert L. (Bob) Baldwin
Managing Principal

From: Fred Millen [mailto:fmillen@uskh.com]
Sent: Friday, February 05, 2010 8:59 AM
To: Sen. Johnny Ellis
Subject: UAA Facility and Funding

Dear Senator Ellis,

It has come to my attention that you submitted legislation that would fund new facilities and infrastructure at the University of Alaska. As a Director of Human Resources at USKH, Inc I often recruit and hire engineers from various disciplines. Too many times I have had to hire individuals from outside of Alaska due to a void in the local applicant pool. An investment in UAA would help remedy this and allow my company and other local firms the opportunity to hire locally and provide graduates with opportunities here in our great state.

Thank you for introducing the legislation. It is my sincere hope that it gains the needed support.

Regards,

Fred S. Millen, SPHR
Director of Human Resources

USKH
SHARED VISION. UNIFIED APPROACH

2515 A St.
Anchorage, AK 99503
t: 907.276.4245
f: 907.343.5217
www.uskh.com

From: Mikal Hendee [mailto:mkhengineering@gmail.com]
Sent: Monday, March 28, 2011 10:21 AM
To: Sen. Johnny Ellis
Subject: Re: Seeking your support for Engineering Facilities - SB107

Dear Senator Ellis,
I am writing to let you know I am in full support of Senate Bill SB107 to fund the construction of new engineering buildings at UAF and UAA. As a 15-year engineer working in Alaska, I have watched the market for engineers increase over the years. The current engineering facilities at UAF and UAA are inadequate to support the demand for engineering graduates in this state.
Thank you for your sponsorship of this bill.
Sincerely,
Mike Hendee

Mike Hendee, P.E.
MKH Engineering
8050 Queen Victoria Drive
Anchorage, AK 99518
907-244-3807
mkhengineering@gmail.com

University of Alaska
UA Engineering Plan 2010

DRAFT REPORT (Presented to Regents February 17-18, 2011)
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Alaska Professional Design Council PO Box 100515 Anchorage AK 99510-0515

LEGISLATIVE LIAISON COMMITTEE
2011 POSITION STATEMENT

MEMBER SOCIETIES

Alaska Society of Professional Engineers

Alaska Society of Professional Land Surveyors

American Congress on Surveying & Mapping Alaska Section

American Institute of Architects Alaska Chapter

American Society of Civil Engineers Alaska Section

American Society of Landscape Architects Alaska Chapter

American Council of Engineering Companies of Alaska

Professional Engineers in Private Practice Alaska Chapter

American Society of Interior Designers

Structural Engineers Association of Alaska

The Alaska Professional Design Council (APDC) is a consortium of professional societies representing architects, engineers, land surveyors, landscape architects and other design professionals. Our member organizations have a combined membership of over 1,500 and represent approximately 5,000 licensed professionals. APDC addresses issues of concern to the various design professions through workshops, seminars, ad-hoc committees, standing committees, and governmental task forces. APDC also receives sustaining member support from 30 Architectural and Engineering firms throughout the State of Alaska.

One component of APDC activity is the Legislative Liaison Committee (LLC). The LLC is a standing committee that has been actively involved in legislation affecting the design community since the 1970's (actually predating APDC).

APDC works very closely with the Architects, Engineers, and Land Surveyors (AELS) Board to further the interests of the regulated design professions in keeping with the protection of the health, safety and welfare of the public. APDC generally supports the efforts of the AELS Board.

The following is a discussion of the primary issues of concern to APDC and our membership this legislative session:

Expand QBS to cover all recipients of state funds (APDC, ACEC) – The State of Alaska currently requires that designers on state funded public works projects be selected using a Qualifications Based Selection (QBS) criteria. This methodology results in the best qualified designer being selected for public projects. Political subdivisions of the state also design and construct public projects, and some of those entities attempt to utilize design fee, or cost as a component of the selection process. Due to the complex nature of design projects, APDC and ACEC strongly believe that it is in the public's interest to utilize QBS for all public projects, and are therefore working to extend the state requirement to use QBS on public works projects to political subdivisions receiving state funding for public works projects.

Specialty contractor exemption provision modification (AELS Board issue) – The AELS Board has expressed a concern that some work is being designed and installed without the appropriate oversight of a registered design professional. The Board is considering legislation that is intended to insure that the work completed by a specialty contractor under the exemption that exists in statute, is appropriately designed, and has the appropriate level of design professional involvement.

Alaska Professional Design Council
PO Box 100515
Anchorage AK 99510-0515

Support a state funded transportation program (APDC) – Alaska's essential transportation infrastructure is highly dependent on federal funding. In order to insure that Alaskans will have a safe, secure transportation system, it is vitally important for the state to implement a stable state funded transportation infrastructure program.

Support capital funding for deferred maintenance and repair of the state's public infrastructure (APDC) – APDC supports state funding for funding of capital projects that decrease the level of deferred maintenance and contribute to the repair of public facilities.

University of Alaska Design Programs and Funding (APDC) – APDC supports state funding for education in the engineering, surveying programs at the University of Alaska. Alaska faces a serious shortage of design professionals, especially in anticipation of major projects that may be occurring in the near future such as a gas line and other such projects. This is an issue of national proportion as evidenced by national professional organizations and major US engineering companies repeatedly emphasizing the declining number of engineering and design profession graduates nationwide. In order to keep the labor supply up with the demand, the University of Alaska system should be graduating about 200 entry level engineers each year. Currently, the University is producing roughly have of that demand. The University of Alaska system has had recent success in recruitment through programs such as the Alaska Native Science and Engineering Program [ANSEP], and the Bachelor of Science in Engineering [BSE] program. The University also has developed an increased number of pathways into engineering programs from all UA campuses. There has been a surge of lower division enrollment in the UA engineering programs, and this trend is expected to continue. The University also has a growing Geomatics (Surveying) program that needs additional support. The program has had to turn away applicants in recent years due to lack of space. There is also an interest in developing a School of Architecture in Alaska, and increasing technical support program offerings such as drafting, construction technology, and project management. While no specific proposal for a School of Architecture exists, APDC supports ongoing discussions between architects and University officials regarding establishment of an architectural program that can respond to growing demand in Alaska.

A steady supply of engineers, architects, surveyors and related design professionals into the Alaska workforce will have a multiplying effect on economic development in the State. This requires an increased investment in the UA design programs, and a look to the future for development of new programs.

During the last session of the State Legislature funds were provided for the University of Alaska to accomplish a Planning Study and Design for engineering facilities at the Fairbanks and Anchorage campuses. With the engineering planning study concluding and the designs for the two facilities about to begin, construction funding is the next step to assure that funds are available for continuous of our much needed investment into future.

Convert Landscape Architect position on AELS Board from non-voting, to full voting member (ASLA) – The Alaska Society of Landscape Architects supports the conversion of the current non-voting position on the AELS Board to full voting status. The current position requires a significant commitment of time and energy for the individual appointed to the position, but provides no ability to impact the decisions of the AELS Board.

Richard S. Armstrong, PE, LLC
Mechanical/Electrical Engineer

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Anchorage AK 99504

Phone 907-222-3000
Fax 907-222-3001
Cell 907-229-0331
Email darmstrong@rsa-ak.com

March 31, 2011

Senator Bettye Davis
State Capitol Room 30
Juneau, Ak 99801

Re: SB 107: UAA Engineering Building

Dear Senator Davis:

I have been on the University of Alaska Anchorage School of Engineering Advisory Board since its inception. Since our involvement, we have seen engineering enrollments increase exponentially at UAF, especially in the mechanical and electrical engineering areas since the introduction of the BSE program in engineering. The program has attracted so many students that the classrooms and labs are totally overwhelmed, and not adequate to properly provide the instruction needed for the program.

I understand that you are a champion of education, so I urge you to support SB 107 which addresses appropriation of $75 million for the design and construction of a new engineering building at the UAA campus, in addition to $50 million for engineering facilities at the UAF campus.

The building will enable many of our students to get their engineering education right here in Anchorage, so they do not have to move elsewhere, or abandon their desire to become engineers. Additionally, the graduates of the engineering programs at UAA will fill open jobs that are presently going to out of state engineers because there are not enough people to fill the engineering positions.

Thank you in advance for your support of this essential bill.

Very truly yours,

Richard S. Armstrong, P.E.

Cc: Senator Johnny Ellis

March 9, 2011

Senator Kevin Meyer
State Capitol Room 103
Juneau, AK 99801

RE: Support for UAA and UAF Engineering Facilities Construction Funding

Honorable Senator Meyer,

I am writing you today to request your support in meeting the critical needs for engineering related professionals in Alaska. As you may be aware, there is a tremendous demand for engineering professionals not only in our state, but nationwide. As a resource development state, Alaska must recognize the vital role that engineers, architects, surveyors and construction managers play in the development of our state. With many high profile Alaska projects planned for the future, combined with the critical need to address vital infrastructure upgrades throughout the state, the demands on our professional industry are so great that we must often look outside of the state to find professional and technical resources needed to perform the work.

I am proud to state that I am a lifelong Alaskan, having been born, raised and educated in Alaska. I earned my civil engineering degree from UAF and my MBA degree from UAA, and I have been working on engineering projects in Alaska for well over 30 years. As I advanced in my engineering and management career, I recognized the value that graduates from either UAF or UAA engineering programs had over other out-of-state graduates. Many of the projects that I have been involved with are rural in nature since I am Inupiaq from Barrow, Alaska and I have worked for Alaska Native Corporations or the North Slope Borough throughout my career. Graduates from either UAF or UAA have a fundamental understanding of the challenges of working in a rural community, whether it has to do with awareness of Alaska Native cultures, environmental extremes, permafrost or logistical challenges in construction.

Unfortunately, the University of Alaska (UA) is not meeting the current or projected needs of our engineering industry. A recent study was commissioned by the UA to look at the overall UA engineering program and it made the recommendation that both the UAA and UAF engineering programs require additional facilities to meet the demands of industry. I have heard that a Bill may be introduced soon for supporting the construction of engineering facilities at both UAA and UAF. I strongly support this effort and as one of your constituents, I would request your assistance by co-sponsoring this proposed Bill and supporting it too.

Respectfully,

Richard S. Reich

Richard S. Reich, P.E.
8310 Barnett Drive
Anchorage, AK 99518
Email: Richard.Reich@UICUMIAQ.com
Phone: (907) 273-1808

-----Original Message-----
From: John.Aho@CH2M.com [mailto:John.Aho@CH2M.com]
Sent: Monday, April 04, 2011 9:48 AM
To: Sen. Johnny Ellis
Subject:

Senator Ellis:

As a life-long Alaskan and having practiced engineering in the State for 40 years I wish express my support for SB107 and thank you, again, for your efforts in this area. The facilities are long overdue-the situation is critical.

Dr. John L. Aho

6771 Lauden Circle
Anchorage, AK 99502-3973

April 2, 2011

Senator Lesil McGuire
State Capitol, Room 125
Juneau, AK 99801-1182

RE: In support of construction of University of Alaska Engineering facilities:

Dear Senator McGuire:

I have been involved with the history of this particular project for many years now, first through my actions on the Board of the Alaska Chapter of the American Institute of Architects, and now also as a member of the Alaska Professional Design Council and the UAA School of Engineering Advisory Board.

I encourage you to support legislation for building funds for new Engineering facilities at ***BOTH*** UAA and UAF. Construction funds are needed almost immediately since lack of space and adequate technology in existing spaces is making it hard for students to graduate in a timely fashion, even threatening the accreditation of the UAA program. The existing buildings at both UAA and UAF are more than 30 years old, are under sized, and do not contain appropriate laboratories for undergraduate programs.

The UA Board of Regents recognized the need for expanding engineering education in the state and set objectives for the programs in 2007. This included the annual graduation of 200 undergraduate trained engineers, 20 baccalaureate construction manager graduates and 40-60 certificate and construction technology graduates by 2012. The UA Engineering Report 2010 prepared by Ira Fink and Associates cites industry demand for 200 Bachelor of Science engineering graduates per year by 2014. In the past five years both programs together have graduated between 50 and 100 students each year. It will take both programs to meet industry need.

Enrollment in the newly accredited UAA programs (accredited in 2009) has sky rocketed from under 10 in 2004 to over 70 in 2010. There are currently almost 200 seniors with engineering majors trying to graduate, but they can't get the courses they need. The Fink report found that 75,000 square feet of building are needed at UAA to meet current enrollment requirements for accreditation, and 54,000 square feet for the UAF program. This is to meet current need, not some projection of future growth.

Alaska is a developing state, with a large demand for engineers and other design and construction professionals to build the infrastructure and access the state's resources. Student and industry demand exists for the programs. Please support this growth industry through funding education facilities to meet the need, facilities adequate to the task, meeting national standards for accreditation, student and faculty retention.

Sincerely,

Catherine Call, AIA

Sent by fax: 907.465.6592

Cc: Senator Ellis
by fax 907 465.2529

From: Mikal Hendee [mailto:mkhengineering@gmail.com]
Sent: Monday, March 28, 2011 10:21 AM
To: Sen. Johnny Ellis
Subject: Re: Seeking your support for Engineering Facilities - SB107

Dear Senator Ellis,
I am writing to let you know I am in full support of Senate Bill SB107 to fund the construction of new engineering buildings at UAF and UAA. As a 15-year engineer working in Alaska, I have watched the market for engineers increase over the years. The current engineering facilities at UAF and UAA are inadequate to support the demand for engineering graduates in this state.
Thank you for your sponsorship of this bill.
Sincerely,
Mike Hendee

Mike Hendee, P.E.
MKH Engineering
8050 Queen Victoria Drive
Anchorage, AK 99518
907-244-3807
mkhengineering@gmail.com

From: Fred Millen [mailto:fmillen@uskh.com]
Sent: Friday, February 05, 2010 8:59 AM
To: Sen. Johnny Ellis
Subject: UAA Facility and Funding

Dear Senator Ellis,

It has come to my attention that you submitted legislation that would fund new facilities and infrastructure at the University of Alaska. As a Director of Human Resources at USKH, Inc I often recruit and hire engineers from various disciplines. Too many times I have had to hire individuals from outside of Alaska due to a void in the local applicant pool. An investment in UAA would help remedy this and allow my company and other local firms the opportunity to hire locally and provide graduates with opportunities here in our great state.

Thank you for introducing the legislation. It is my sincere hope that it gains the needed support

Regards,

Fred S. Millen, SPHR
Director of Human Resources

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907 562 2482
fax 907.561.2482
akscitec@alaska.net

March 23, 2011

Senator Johnny Ellis
Alaska Senate
State Capitol Room 119
Juneau, AK 99801

Forwarded by email

Dear Senator Ellis:

Funding is urgently needed for a new engineering building at the University of Alaska Anchorage.

Ballooning School of Engineering enrollments have created a space crisis. If funding was available today, the time consuming process of design, procurement, and construction would not allow a new building to be occupied for upwards of 10 years. Enrollments have tripled in the last 10 years. The word **crisis** is well justified.

The UAA School of Engineering (SOE) provides direct ready access to an engineering education for the more than 50 percent of Alaska's population located in Anchorage and Mat-Su. It also draws from the entire state. Enrollments will continue to grow, if faculty and facilities keep pace to accommodate them.

Beginning about 1998, a concentrated seven-year effort resulted in accredited programs in computer, electrical, and mechanical engineering. Prior to 2005, it was necessary to leave the area to obtain this type of higher education. High School graduates and working residents seeking continuing education are only beginning to recognize and take advantage of the new programs. Enrollment demands must be served.

Unfortunately, the UA 2010 Engineering Report initiated by Regents in response to this dramatic enrollment growth is only marginally competent. UAA needs 140,000 sq.ft. of additional engineering classroom and laboratory space by 2015, which is greatly understated in the Report. This is another example of typical regional politics, which have compromised development at UAA since the beginning.

At the UAA SOE, laboratory equipment is now rotated in and out of storage to meet multi-disciplinary class schedules. This compromising handicap is no way to operate a school of engineering. Accreditation is at risk. Hiring and retention of high quality faculty will suffer. Enrollments may have to be capped.

I have helped to push development of higher education in Anchorage and Southcentral Alaska, since Anchorage Community College only existed in evenings at West High School and on Elmendorf Air Force Base. Since the late '90s, my efforts have been focused upon providing local access to contemporary engineering educations. I have a unique perspective about this from long-time engagement as a physical scientist and engineer, and also as a senior official in the Alaska Section of the Institute of Electrical and Electronics Engineers (IEEE). It is extremely important to meet the public demand for higher education where it exists.

If we don't provide ready local access, the majority of our youth seeking an engineering education will attend universities Outside. After graduation, they seek nearby employment and get married, resulting in a lost resource to Alaska. Our youths are one natural resource we cannot afford to keep shipping Outside. Home-grown Alaskan engineering graduates provide a stable workforce that does not constantly transfer in and out of the state. Important economic factors are involved.

A stable engineering workforce contributes to the existing economy, and importantly to a developing economy. There is a need to move away from an economy almost totally based on extraction of natural resources. Resident engineers can also establish new industries based on innovative products. Ready access to a public higher education is necessary to bring this about. The key word is Access!

I am well connected from past service on a number of internal UAA bodies dating to 1980, including Chair of the Chancellor's Advisory Council and founder of the SOE Advisory Board. However at the present time I am not a member of an internal body, which provides latitude to independently represent the public's best interest. My background offers insight about current and future university program needs, and also the legislative process. I am aware of the internal push for funding.

I know you have strongly supported UAA in the past, and unfortunately the UA Administration is only now beginning to utilize $2M of your prior $10M appropriation for additional engineering planning at UAA and UAF. Again, regional politics are at work, and UA President Gamble's unwise Fisher Report is going to greatly complicate matters. Over the many years, this has been highly frustrating.

While contacting you I have felt a need to re-establish credibility, because it has been some time since I've worked directly with the Legislature on university matters. This was ongoing in earlier years. I will be happy to serve as a resource for coordination and in-depth information, on or off the radar. Please support the urgent need to fund a new engineering building at UAA.

Sincerely,

Robert L. Baldwin

/s/ Robert L. (Bob) Baldwin
Managing Principal

From: Ben Walker [mailto:benjamin.walker.ieee@gmail.com]
Sent: Monday, April 04, 2011 11:36 AM
To: Sen. Lesil McGuire
Cc: Sen. Johnny Ellis
Subject: Support for SB107: Engineering Building at UAA

Hello Senator Lesil McGuire. I am a resident in the Sand Lake Area and a student at UAA in the School of Engineering. I ask that you support this bill. After 4 years it is very clear that we need better facilities for engineering education.
There is a lack of proper lab space and insufficient/inappropriate classrooms available. For example, having a programming course in a room without computers to learn/practice on.

Thank you for your consideration.

Ben Walker

Joe Hardenbrook

From: Michael Golub [migolub@alaska.edu]
Sent: Wednesday, April 06, 2011 10:00 AM
To: Sen. Joe Thomas
Subject: SB107 engineering building yesterday

Please share my comments with others on the committee...

We recently competed in this competition:
http://www.newsminer.com/view/full_story/12475090/article-Fairbanks-engineering-students-compete-in-12th-Annual-Clean-Snowmobile-Challenge?

We could not work on the snow machine in our current UAF Engineering Building due to not having adequate work space and there is no space that meets current fire codes for vehicles.

Currently we have to do this work off-campus with team member's private garages.

Compared with other schools at this competition we are embarrassed to have this lack of support.

As the story illustrates we finished 8th out of eleven teams. If we had a convenient and dedicated work space I promise you we would have done much better.

I believe it is important to compete and do well in these academic competitions because it inexpensively adds value to the UAF diploma.

This would be direct consequence in funding an engineering building in Fairbanks.

--
Michael Golub
University Alaska Fairbanks

Support new
UA Engineering Buildings
SB107

Economic Stimulus and Powerhouse for Alaska

April 2011

Alaska Department of Labor
February 2011 - Economic Trends

Engineering graduates important to Alaska's Future

http://labor.alaska.gov/trends/feb11.pdf#cover

Alaska Business Monthly
February 2011

ENGINEERING
SPECIAL SECTION

On the Front Lines:
Engineers Critical to Alaska's Development
Huge potential for local graduates

By Vanessa Orr

In a state as underdeveloped as Alaska, the need for engineers is crucial. From developing natural resources to building infrastructure to creating communications systems that link remote villages, the jobs that engineers perform are required to move Alaska forward.

"Only one and a half percent of the state is fully developed, and it is critical that engineers be on the front lines of that process," explains Architects, Engineers and Land Surveyors Board Chair Richard Heieren, PS, RCH Surveys, Ltd. "There is a big push for the continued creation of infrastructure to develop our natural resources, and telecommunications are critical because we have so many isolated communities. Whether you are talking about electrical engineers, civil engineers or environmental engineers, they are all critical in the whole process."

To this end, universities within the state are working to educate the next generation of engineers. And the State's Architects, Engineers and Land Surveyors Board, which licenses all engineers within the state, is considering changing its licensing structure to add to the number of branches of engineering for which it provides examinations.

"Alaska presently licenses six branches of engineering: chemical, civil, electrical, mechanical, mining and petroleum, and three of the branches are comprised of several disciplines," explained Richard V. Jones, executive administrator, Architects, Engineers and Land Surveyors Board. "The board is considering going to a general license structure, which would add all of the branches of engineering that the National Council of Examiners for Engineers and Surveyors (NCEES) has an examination for. There would then be a total of 16 branches licensed by Alaska." This idea is currently out for public comment.

The State currently licenses engineers in civil engineering, which includes construction, geotechnical, structural, transportation, water resources and environmental; electrical engineering, which includes control systems, computer, electrical and electronics and power; and mechanical engineering, which includes HVAC and refrigeration, mechanical systems

Left: Richard Heieren, PS RCH Surveys Ltd., Chairman of Architects, Engineers and Land Surveyors Board

Engineers are Critical to Alaska's Development

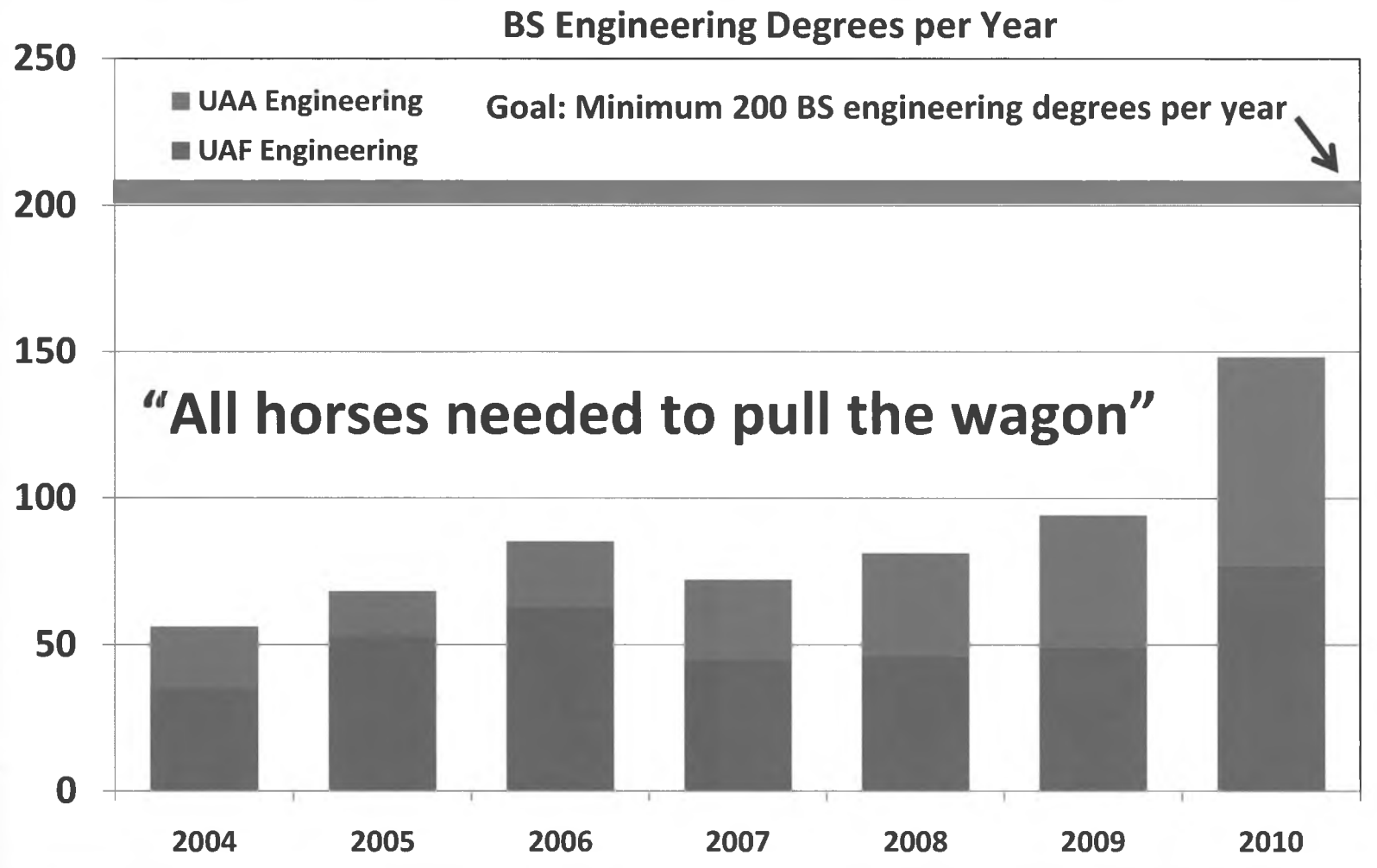
http://engraccred.uaa.alaska.edu/Engineering_Alaska_Business_Monthly_Feb_2011.pdf

SB 107 – Economic Engine for Alaska

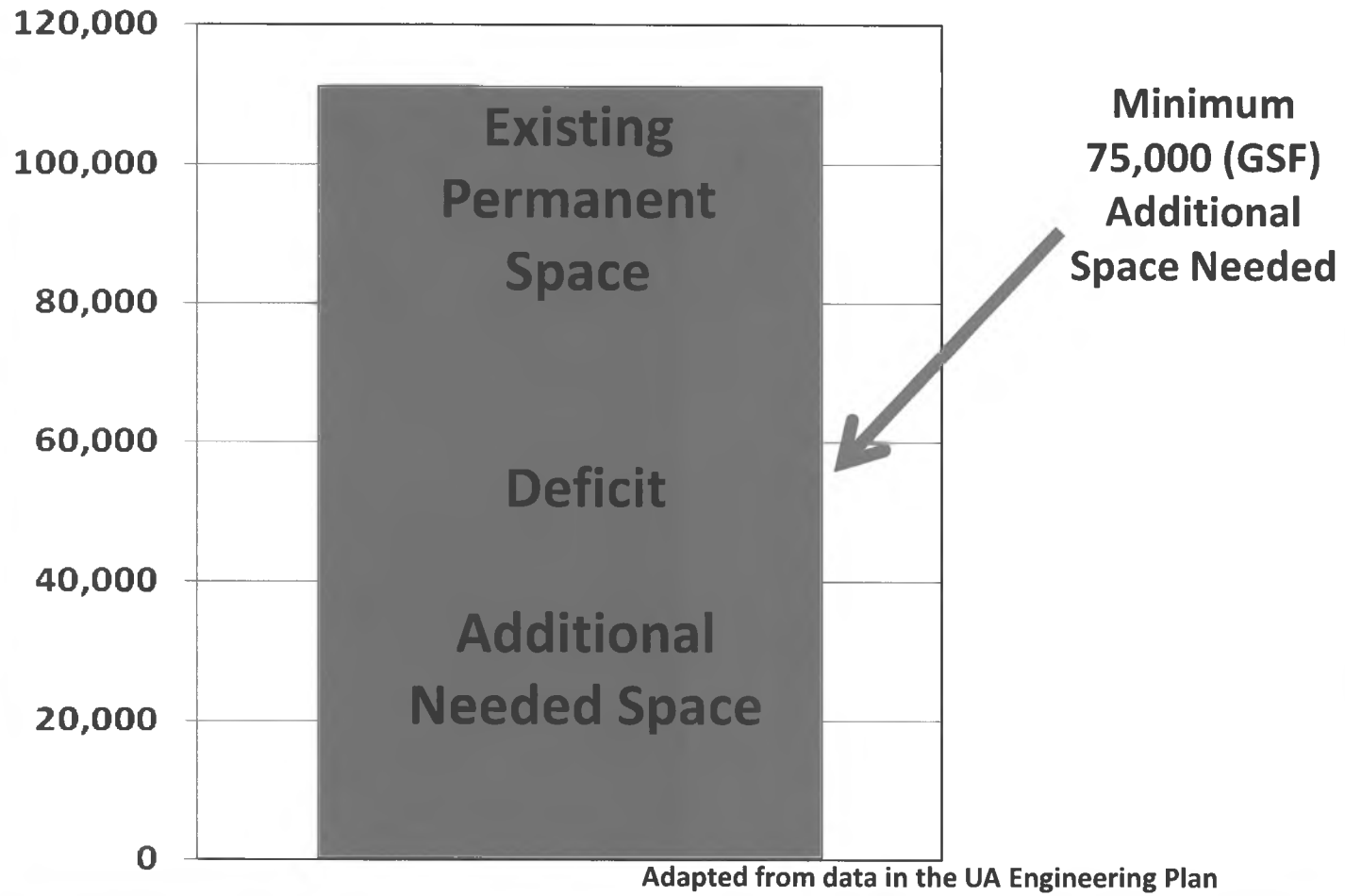
- SB 107 – Supports funding for new UA Engineering Buildings
- An *additional* minimum of 75,000 Gross Square Feet (GSF) building needed immediately at UAA & 43,000 GSF at UAF (UA Engineering Plan - approved by Board of Regents)
- UA Engineering Plan is to double the number of engineering graduates per year for UA system

UA Engineering Plan - http://www.alaska.edu/facilities/

Both UAA and UAF Engineering Programs needed to meet Demand



UAA Engineering Space Shortage



Adapted from data in the UA Engineering Plan

Summary

- Engineering is an Economic Engine for Alaska
- Need to "Grow Our Own" engineering workforce that keeps jobs in Alaska
- An Alaskan grown workforce attracts & keeps projects from leaving Alaska

University of Alaska Engineering Plan 2010

Ira Fink and Associates, Inc.

University Planning Consultants, Berkeley

February 17, 2011

Regents Engineering Initiative

primary goal

"by 2012, UAA and UAF will produce 200 undergraduate trained engineers annually"

UA engineering enrollment

increased dramatically since 2006

UAA from 606 to 949 total students

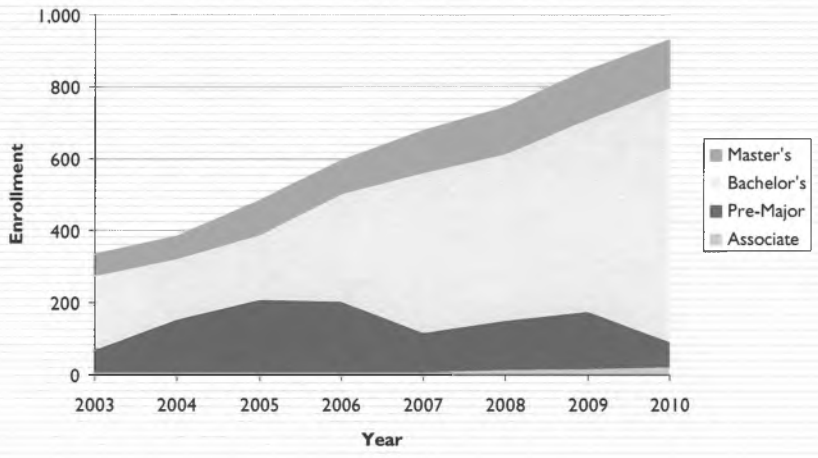
UAF from 506 to 748 total students

almost all freshman are from Alaska

nearly as many transfers as freshmen

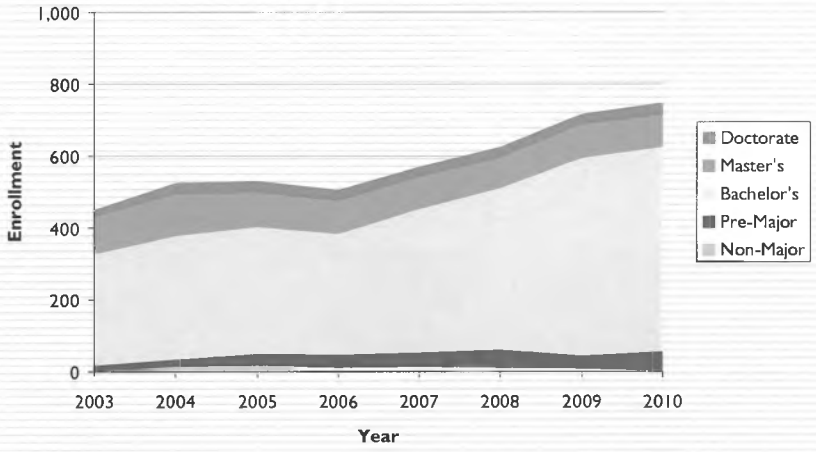
Ira Fink and Associates, Inc., University Planning Consultants, Berkeley, California

UAA engineering enrollment



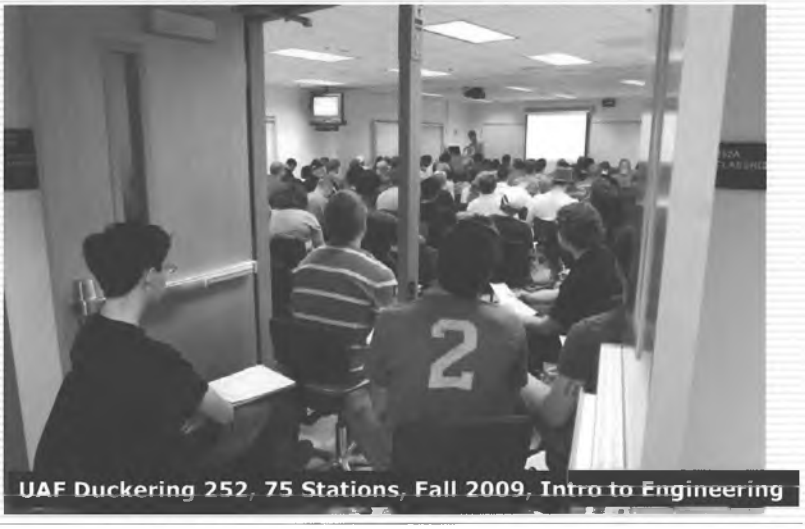
Ira Fink and Associates, Inc., University Planning Consultants, Berkeley, California

UAF engineering enrollment



Ira Fink and Associates, Inc., University Planning Consultants, Berkeley, California

UAF engineering classroom



Ira Fink and Associates, Inc., University Planning Consultants, Berkeley, California

Alaska Engineering Academies Plan – Overview v1

What is the Alaska Engineering Academies Plan?
Alaska Engineering Academies Plan is a comprehensive mechanism for improving STEM (Science, Technology, Engineering, and Math) performance in high schools across Alaska. It focuses on empowering students to become engineers. However, the pathway to engineering is built upon learning science, technology, and math. So, it is an effective plan for improving student performance in all STEM fields. Also, the PLAN is an excellent mechanism for better preparing students for entering the workforce particularly in areas dependent upon having solid skills in STEM. The Plan includes a procedure for implementing Engineering Academies in secondary schools throughout Alaska in rural and urban areas.

Why are Engineering Academies important?
Engineering is one of the unique professions directly tied to generating economic income. Every construction project for new developmental or infrastructure support depends upon engineers. Thus, it is important to the future of Alaska to keep engineering jobs in the State. It is also important to produce enough home grown engineers to keep entire projects from leaving the State and attract new projects to the State. Increasing the number of students taking STEM courses and improving performance in STEM areas is important to the future of Alaska and our students. A major goal is to improve the competiveness of Alaska and to improve and diversify its ability to compete in the world marketplace.

How was the Engineering Academies Plan created?
The Alaska Engineering Academies Plan resulted from a Memorandum of Understanding agreement titled "Alaska Secondary Engineering Academies" signed on November 17, 2009 by the Alaska Department of Education and Early Development, Alaska Department of Labor and Workforce Development, the Chancellors of UAA, UAF, and UAS, and industry (represented by APICC-Alaska Process Industry Career Consortium). A working group comprised of many representatives including from all signing groups, and from K12 schools districts and programs, developed the Plan over a period of more than a year.

What is an Engineering Academy?
An Engineering Academy is a group of teachers within a school, usually around four or five, that teach a curriculum with an engineering focus. Specific engineering courses are taught each year in grades 9 through 12 that are outcomes based with a high level of quality control. One national model used successfully in Alaska is the Project Lead the Way (PLTW) program. As its name suggests, students learn and apply technical skills to design and construct projects.

How do Engineering Academies attract students to STEM areas and enhance performance?
Obtaining college credit is a major incentive for high school students to take more math and science. Because of the high level of quality control, the engineering courses can be articulated to count for college credit courses for an engineering degree. Often, the engineering courses can be bundled with other courses, such as math and physics, that is then articulated for college credit. Thus, the Engineering Academy becomes a wonderful mechanism for encouraging student to enter STEM areas and empowers them to perform better. In addition to engineering and math, an Engineering Academy can include technical writing course which enables students to write professional communications as well as effective prepare resumes.

What are the Components of an Engineering Academy?
The desired components of an Engineering Academy are listed Table 9 in the Plan (also see below). A few of key elements are the following: 1) attracts students to engineering and other STEM fields, 2) enhances student performance in STEM areas, 3) open to all students, 4) includes current teachers-empowers not replace, 5) provides specialized teacher training, 6) develops capacity for turnkey-operation expandable and adoptable in rural and urban areas, 7) offers a sequence of high quality controlled courses which address state and national standards, 8) articulates standardized courses which are eligible for college credit or transferable between high schools, 9) uses model which is cost efficient per student, and 10) monitors progress toward outcomes based with procedures for national standardized testing and measurement of performance.

What is an example high School course sequence for an Engineering Academy?

9th Grade		10th Grade		11th Grade		12th Grade	
Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
English 9	English 9	English 10	English 10	English 11	English 11	English 12	English 12
Integrated Science or Biology	Integrated Science or Biology	Biology or Chemistry	Biology or Chemistry	Chemistry or Physics	Chemistry or Physics	Physics or Advanced Science	Physics or Advanced Science
World History	World History	U.S. History	U.S. History	AK Studies	Economics	U.S. Government	Elective Social Studies
Algebra I or Geometry or Algebra II	Algebra I or Geometry or Algebra II	Geometry or Algebra II or PreCalculus	Geometry or Algebra II or PreCalculus	Algebra II or PreCalculus or Calculus	Algebra II or PreCalculus or Calculus	PreCalculus or Calculus	PreCalculus or Calculus
Physical Ed	Physical Ed	Physical Ed	Lifetime Personal Fitness	Elective / Technical Writing	Elective / Technical Writing	Elective	Elective
Principles of Engineering*		**Introduction to Engineering Design***		**Digital Electronics***		**Civil Engineering and Architecture or Computer Integrated Manufacturing***	

*Project Lead the Way (PLTW) designed course (see www.PLTW.org)

What are the desired components and characteristics of an Engineering Academy?

Desired components and characteristics of an Engineering Academy (as derived from literature review, national academies model and experience of Engineering Academies Working Group)
Attracts & Empowers Students
Attracts students to enter engineering and other STEM fields
Enhances student performance in STEM Areas
Availability
Available to all students regardless of race or financial status
Work with existing educational structure and teachers - empowerment of teachers, not replacement
Can be implemented in rural and urban areas
Quality Controlled
Curricula include standards, learning outcomes, sequence and schedule, problems, projects, integrated activities, assessments, and support
Quality controlled to enable articulation for college credit
National standards for quality control and assessment testing
Adoptability & Expandability
Adoptability - can be adopted by schools with a clear pathway for how to proceed
Expandable: can increase student capacity to accommodate large numbers
Summer Camps: adoptable and applicable model for summer camps
Collaborative integration with existing programs: Offered full year and multi-year for middle and high schools with tracks dovetail with current class offerings
Scalable - can be expanded to large number of participating students and teachers in a cost efficient manner
Cost efficient per student compared with other programs i.e. best bang for the buck
Curricula include standards, learning outcomes, sequence and schedule, problems, projects, integrated activities, assessments, and support
Turnkey type program that is comprehensive with a quick implementation ability and support for smooth and efficient operation
Transferability: Quality control in place to enable tranferability of credit from other states to Alaska or between high schools within Alaska
Sufficient number of courses to span across several years of curriculum in a continuous and coordinated manner so that implementation is uninterrupted throughout high school and with ability to span across middle school and reach K6 schools
Measurable Outcomes
Measureable outcomes: Improved GPA, higher performance in STEM areas than non-academy students, higher probability to enter STEM employment fields than non-academy students, higher probability to enter STEM degree programs than non-academy students
National Standardized testing & Assessment
Teacher and Counselor Participation & Training
Teachers receive comprehensive training from a partner university
Training gives teachers full proficiency regardless of previous experience
Professional Development updates for teachers assessible repository of information and references.
Counselor conferences to provide high school guidance counselors with a clear understanding of the program and how it fits within a student's scholastic/academic career path
Integrates teachers and counselors as part of the Academy
Support Network
Affiliated with State and/or National Organization with access to information, support, sourcing, and purchasing
Affiliated with a university degree program
Involvement and participation of teachers and counselors

For additional information, see the APICC web site at
http://www.apicc.org/servlet/content/alaska_engineering_academies.html

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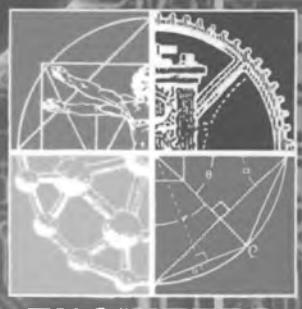

ENGINEERS WEEK® 2011

On the Front Lines:

Engineers Critical to Alaska's Development

Huge potential for local graduates

By Vanessa Orr

In a state as underdeveloped as Alaska, the need for engineers is crucial. From developing natural resources to building infrastructure to creating communications systems that link remote villages, the jobs that engineers perform are required to move Alaska forward.

"Only one and a half percent of the state is fully developed, and it is critical that engineers be on the front lines of that process," explains Architects, Engineers and Land Surveyors Board Chair Richard Heieren, PS, RCH Surveys, Ltd. "There is a big push for the continued creation of infrastructure to develop our natural resources, and telecommunications are critical because we have so many isolated communities. Whether you are talking about electrical engineers, civil engineers or environmental engineers, they are all critical in the whole process."

Photo courtesy of Richard Heieren

To this end, universities within the state are working to educate the next generation of engineers. And the State's Architects, Engineers and Land Surveyors Board, which licenses all engineers within the state, is considering changing its licensing structure to add to the number of branches of engineering for which it provides examinations.

"Alaska presently licenses six branches of engineering: chemical, civil, electrical, mechanical, mining and petroleum, and three of the branches are comprised of several disciplines," explained Richard V. Jones, executive administrator, Architects, Engineers and Land Surveyors Board. "The board is considering going to a general license structure, which would add all of the branches of engineering that the National Council of Examiners for Engineers and Surveyors (NCEES) has an examination for. There would then be a total of 16 branches licensed by Alaska." This idea is currently out for public comment.

The State currently licenses engineers in civil engineering, which includes construction, geotechnical, structural, transportation, water resources and environmental; electrical engineering, which includes control systems, computer, electrical and electronics and power; and mechanical engineering, which includes HVAC and refrigeration, mechanical systems

Left: Richard Heieren, PS RCH Surveys Ltd., Chairman of Architects, Engineers and Land Surveyors Board

and materials, and thermal and fluids systems. It also licenses chemical, mining and petroleum engineers.

If a general licensing structure is approved, the board will begin licensing engineers in 10 other branches including agriculture; architectural; control systems; environmental; fire protection; industrial; metallurgical and material; naval architecture; marine, nuclear and petroleum; and structural.

Engineering as a Career

As the need for engineers in a variety of disciplines continues to grow, so does the need for students interested in an engineering career. Fortunately, that number continues to increase. "Schools that provide engineering and surveying programs are seeing enrollments increase, which is very promising," said Heieren. "And for every engineer who gets through the system here in Alaska, there's another engineer outside the state who wants to move to Alaska. I'd estimate that half of the engineers currently working in the state are from Alaska, and half have come from Outside."

Students looking for a career in the field don't have to look very far. The University of Alaska Anchorage (UAA), for example, offers both undergraduate and graduate programs in the field. "On the undergraduate level, we offer degrees in civil, electrical, mechanical, computer systems and geometrics," explained Rob Lang, Ph.D., PE, dean and professor of civil engineering at UAA. "On the graduate level, we offer master's programs in civil engineering, Arctic engineering, engineering management and project management."

According to Lang, the university's civil engineering program concentrates on basic infrastructure needs such as roads, bridges, buildings, water treatment and wastewater treatment. Its electrical engineering degree focuses on power generation and transmission, and its mechanical engineering degree focuses mainly on HVAC systems for Alaska.

"The computer systems degree concentrates on software programming with an emphasis on hardware utilized, and the geomatics program focuses on land surveying on a broad scale from property boundaries to construction

Photo courtesy of UAA

Rob Lang, Ph.D., PE
Dean and Professor of Civil Engineering
University of Alaska Anchorage

surveys to route alignment surveys," explained Lang. "Being able to create and interpret maps utilizing satellite and aerial photography is very important in Alaska, where there is such a large expanse of area to cover."

One program relatively unique to Alaska is Arctic engineering, which focuses on how to design and build in specific conditions of the Arctic environment, such as frozen ground, snow loads, ice loads and Arctic utilities.

In addition to graduate Arctic engineering and civil engineering degrees, UAA also offers an engineering management degree that teaches students how to manage large engineering projects. "This has become increasingly important as more multinational engineering companies begin working in Alaska," said Lang. "Engineers increasingly find themselves working on teams and on projects that span across states."

The school's popular project management degree focuses on the design, execution and tracking of individual projects such as gas pipelines or power plants, which have a finite beginning and end. "Students learn how to muster all of the available resources and control costs and schedules on an individual project," said Lang.

Since expanding its engineering programs five years ago to include electrical, mechanical and computer systems degrees, UAA has seen a huge spike in enrollment, going from 450 students in 2002 to close to 1,000 now. About half of its students come straight out of high school, and half are nontraditional students who have already been out in the work force. Through the Alaska Native Science & Engineering program (ANSEP), a longitudinal model that works with students from the time they are in middle school all the way through to a Ph.D., more than 100 students from villages throughout the state are enrolled at the university in engineering and science programs.

Approximately 90 percent of its engineering students are from Alaska, and a high percentage stay in the state to work.

"In Alaska, there is a continuous backlog of projects and a great demand for people with technical skills," said Lang. "When you compare Alaska with other states, there is still so much development of basic infrastructure that needs to happen. In Juneau, there are no roads that lead out, and there are a number of cities in that same situation. In some areas, the amount of bandwidth available for Internet connections is very limited, and many of the villages still need access to clean water and sanitation. These are perennial problems that have challenged Alaska from statehood and even before, and they are not tackled easily."

Becoming an Engineer in Alaska

To become an engineer in Alaska, all applicants must be approved by the Architects, Engineers and Land Surveyors Board, who review applications at quarterly meetings in February, May, August and November. Applicants can apply by examination or, if they're already licensed in another jurisdiction, by commity for reciprocity.

"The board compares how they were licensed in the other jurisdiction to our regulations at the time they obtained licensure in the other jurisdiction," explained Jones. "If they are equal to or exceed our requirements, we issue them a license; if not, we let them know what they need to do to meet our requirements." All applicants must also pass a board-approved Arctic engineering course, which covers the extreme conditions in Alaska and dealing with permafrost.

To qualify by examination, applicants need to pass the NCEES Fundamentals of Engineering (FE) examination and the NCEES Principles and Practice of Engineering (PE) examination for the branch in which they want to be licensed. Once the FE is passed, the applicant is considered an engineer in training (EIT).

"Once the EIT has accrued the required experience under a licensed engineer, he or she can apply for the PE exam," explained Jones. "The amount of experience required depends on the amount of education the applicant has. With a Bachelor of Science, it would be four or five years, depending on the degree. A Master of Science would take a year off of the required experience."

To date, approximately 5,400 engineers have been licensed by the board and more are expected to join the ranks as the need for qualified engineers continues to grow. "I would anticipate that the gas line could create quite a few jobs, and I feel that there's about a 50/50 chance that it's going to happen," said Heieren. "If we're lucky, it will happen in the next 10 years, though it could be 20 years.

"There are actually other things happening across the state that will have a bigger impact," he continued. "Right now, one of our biggest problems is energy needs; it's ironic that we are the richest energy state in the U.S., but the per capita expenses are also the greatest for individuals. Engineers and surveyors have a huge role to play in the state's infrastructure, and since housing prices have dropped, there's a need for residential development. There also been a positive upswing in military spending, which will help sustain jobs."

As Alaska continues to grow, so does the opportunity for those who seek a career in the engineering field. "As an engineer or surveyor in Alaska, you have the ability to do little better than in other states and to make decent money," said Heieren. "There's such huge potential here, but it can't be realized without engineers."

Alaska Universities Engineer the Economy

Statewide entrepreneurship programs foster change

Photo courtesy of College of Business & Public Policy at UAA

Dean of the College of Business & Public Policy at the University of Alaska Anchorage Elisha R. "Bear" Baker IV welcomed and introduced a presentation by Hong Kong Commissioner, Donald Tong, "Hong Kong: A Destination & Gateway to China for the U.S." last September.

By Heidi Bohi

As big oil saddles up and starts making its way into the sunset, leaving Alaska with memories of "back in the day," the state is learning a painful lesson on the importance of what happens when there is a lack of economic diversification.

The University of Alaska system is investing in developing a statewide entrepreneurship program, with hopes that it will become a critical contributor to part of the solution. Efforts ranging from business plan competitions to adding curriculum that teaches an entrepreneurial way of thinking are being promoted so the public and private sectors can start to see how they can cooperatively develop opportunities in business ventures that may lead to the development of new industries, marketplaces and sectors.

About two years ago, an informal group of faculty from all three major campuses began meeting to talk about how the university could better apply its resources to foster economic and business development in Alaska. Last spring, it became an official statewide economic development work force that started by inventorying the university's activities in economics and business development.

50-Year Plan

Elisha R "Bear" Baker, dean of the College of Business and Public Policy at the University of Alaska Anchorage (UAA) said, "First, even within the university system, we had to get people talking to each other. In many cases, people don't know what others are doing." Efforts such as the business plan competition and the Arctic-innovation competition were a way to link the various campuses.

But economic development takes time, especially in a state that is relatively young, geographically isolated, has no manufacturing, a small population base, and has been dependent on mostly the petroleum industry and federal government for most of its existence. While university faculty and staff remain optimistic about the long-term possibilities, the reality is that measurable results will take decades to realize.

"It is a problem of generations," says Jim Collins, University of Alaska Fairbanks director of entrepreneurship. "It's not something that will be solved in 10 years and it will not happen by waving a governmental wand. It will happen by creating a context in which private individuals invest on their own." He estimates it could take 25 to 50 years to develop an alternate economic base equal in scale to the oil industry.

In the meantime, he adds, if in the next decade the university can point to a handful of firms the university's efforts helped start or grow, then that will be a measure of success.

Some progress has been made to make the business community aware of the university's $123 million research effort, which Collins says, most people are not aware of, resulting in valuable research "that ends up in binders stuck on shelves and never transitions into the private sector." In the past year, though, local entrepreneurs have started paying attention to what faculty is doing and in a few cases decided to invest in the university's efforts to grow and diversify the economy.

Academic Exercises

In one case, an investor who learned about the university's work in the mining industry, invested in a sizeable chunk of land that the State's geological data and UAF's satellite imaging resources suggest may have valuable mineral deposits. This is a classic case of how public and private resources resulted in an entrepreneurial venture.

The Alaska Peony Growers Association also is working with the Alaska Division of Agriculture and the university to gather research data and information to help develop international markets for peonies and expand Alaska's agricultural export industry. Peonies bloom at a time when they are not available elsewhere and, because of the state's geographical location, allows fresh flowers to be quickly air-freighted to U.S., European and Asian markets. Currently, peony growers are working with the university and its land grant mission to see if the idea is feasible.

All three campuses of the university are, in varying degrees, starting to implement entrepreneurship efforts on their respective campuses. Rick Wolk, assistant professor of marketing and entrepreneurship at the University of Alaska Southeast (UAS), teaches classes in this discipline and is involved in the annual system-wide business plan competition, which is entering its 11th year. The idea behind the program is to give students the chance to practice being an entrepreneur and make mistakes when there is no money on the table, while also helping them decide if they have the entrepreneurial spirit, Wolk says. Although some of the ideas in the competition lead to the development of actual businesses, to date most of them have simply been academic exercises.

Entrepreneurial Thinking

Matthew McDaniel and Krag Johnsen were part of a team that entered the business plan competition in 2001 as MBA students at Alaska Pacific University (APU). Their idea was to develop a distribution channel for selling Alaska Native arts and crafts so more of the profits stayed with the artist, creating more wealth in rural communities. At the time, developing a website to do this was considered an innovative way

to broker the artwork. The business model also included a way to supervise production and collect raw materials in the communities such as baleen, bone, fur and ivory.

Local investors expressed interest and Johnsen believes there still might be potential for the idea, but nothing ever happened with the business venture as he and the other participants were launching successful careers at the time and have since started families, making the risk factor that goes with being an entrepreneur less appealing.

Still, McDaniel and Johnsen agree, the competition left both of them with an entrepreneurial mindset they have used in previous and current professional capacities. McDaniel is finance director for the Pebble Partnership and Johnsen is rural broadband development director for GCI.

"We need to keep creating an environment where new business start ups can happen in Alaska and we're not just relying on the oil industry," Johnsen says, adding that GCI, today the third-largest employer in the state, was started in 1979 by Ron Duncan and a few others who were committed to increasing competition in Alaska's telephone business. Today Alaskans are benefiting from greater service, lower costs and the statewide jobs created by the company born from entrepreneurial thinking.

Both Johnsen and McDaniel continue to support efforts like these by donating money and participating as judges. "What I loved about the experience was we created something out of nothing," McDaniel says. "As I moved on in my career, the experience was a big light bulb for me. It got me to the point where I thought of every single angle and could answer investors' questions before they had them, which is useful for a business start-up or a transition."

Angel Investors Needed

As part of his role teaching entrepreneurship at the UAA campus, Al Hermann is working on several entrepreneurship programs within the College of Business and Public Policy, including establishing Alaska Angel Investors, an angel-investing group that assists companies in their efforts to start doing business in Alaska, which is the only state without an Angel Network.

Photo courtesy of Grant Baker

Grant Baker
Associate Dean
School of Engineering
University of Alaska Anchorage

The group recently completed the funding of Bare Distillery, the first of six to 12 companies the network expects to fund in the next two years as it grows the number of angel investors to about 70 people who are current or former entrepreneurs. Typically, these individuals invest between $25,000 and $250,000 into a business with hopes of making a return on their money, or simply because they are interested in the project, Hermann says. To qualify, "angels" need to have between $200,000 and $1 million in assets.

In the case of Bare Distillery, started by two Alaskans, the product line will be spirits that are made with 100 percent Alaska water and other ingredients. Although the project started about three years ago, by the time the company was ready to start producing it had run out of money and needed $400,000 to go into operations. The Small Business Administration referred them to the Angel Network and currently the company is in product development and final marketing stages and expects spirits to be on the shelves by April. There will be a board of directors and an advisory board, Hermann says, and investors are hoping to make back five to seven times their investment within a five-year timeframe.

Innovation, Support, Marketing

Entrepreneurial efforts rely on three components to be successful: innovation, which can come from any program within the university although perhaps most often from engineering, science and agricultural programs, which develop ideas for commercialization; private industry support; and the School of Business, which heads up marketing efforts. One of the newest additions to advance the university's entrepreneurship efforts is through UAA's Engineering Department, which recently completed the Rapid Prototype and Manufacturing (RPM) Lab at its School of Engineering. The lab includes computers, scanners, milling machines, a laser engraver and other manufacturing equipment, allowing students to build prototypes of surgical instruments, personalized joint replacements, model aircraft and vehicles, buildings, bridges and pipelines.

A special 3D printer also allows students to take computer-aided drawings to create 3D prototypes using the latest technology available for civil, computer, electrical or mechanical engineering assignments. The lab reduces the amount of time required to design and manufacture a new, patentable prototype from weeks or months to hours, says Grant Baker, associate dean of the School of Engineering. At the same time, the multiplier effect is very significant in terms of the economic impact: there is about five support staff for every engineer working on a project. Several designs show great potential for being patented and marketed and are in the process of being advanced through the university system, he says. A robotic hand, operated by remote control, can be used during surgery and other processes, and can also be used as a prosthetic. Also in the health care industry is a nonintrusive sensor used in dentistry to measure gum thickness. Rather than using a probe to measure pockets that may indicate periodontal disease, a sensor is run along the gum line. A spinal rod bender is another invention in the industry. Titanium rods are typically used to treat ailments such as curvature of the spine, by bending them to fit the patient's back during surgery. The university's invention is a one-handed device that allows physicians to bend the rod with one hand instead of two.

Alaska Research Potential

Engineering plays a critical role in the university's entrepreneurship efforts because prototypes that are patented through the school and marketed may be profitable for both the student and the university, while also adding prestige to the campus, Grant Baker says. In general, research is big business for higher learning institutions and Anchorage is especially well situated for these opportunities with about 100 companies and agencies within just a few miles of the university, allowing academics and industry to work in tandem. This is critical in advancing entrepreneurial efforts because receiving federal funding is contingent on also having partnerships with private industry in areas ranging from technology, to health care and alternative energy.

Photo by Grant Baker

UAA Mechanical Engineering student Andrew Cochran and the Baja competition vehicle entered into 2010 National Baja design competition shown at the biannual UAA Engineering Design Competition.

Currently, UAA alone brings in about $15 million a year in research funds. "There is no reason we cannot bloom that to $200 million a year from federal government and industry," he says, adding that the government has billions of dollars in research funding available. "Alaska's portion has been small, which is why there is such big potential."

Although the entrepreneurship efforts at the university are just beginning, Grant Baker says faculty and administration in the Engineering Department and the College of Business and Public Policy are committed to developing projects-based curriculum that apply theory to help develop projects that create an environment of innovation similar to a think tank.

"Although they are not massive projects, they all need engineers, which keeps a lot of high paying jobs and projects in the state," Grant Baker says.

ALASKA ECONOMIC TRENDS

FEBRUARY 2011

Science, Technology, Engineering, and Math

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The aurora borealis shimmers over Bear Lake near Eielson Air Force Base. Photo by Joshua Strang

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STEM occupations help grow Alaska's economy

By Commissioner Click Bishop

This month's Trends focuses on STEM occupations — those requiring specialized skills in science, technology, engineering, and math. The list is varied, from surveyors to engineers and auditors to computer programmers.

STEM jobs generate products and services that have become part of our everyday lives, such as airplanes, smart phones, CT scans, and — especially convenient in Alaska — remote starters for your favorite auto.

Workers in STEM jobs require more formal education — 75 percent require a bachelor's degree or higher. But STEM workers are also among the highest paid, averaging $73,000 a year while non-STEM workers average about $45,000.

In 2008, almost 25,000 of Alaska's nearly 322,000 jobs were STEM-related jobs. The Alaska Department of Labor and Workforce Development predicts that by 2018, we'll see more than 2,700 new STEM jobs and nearly 5,400 more openings as workers retire or change occupations.

Alaska Performance Scholarship

One way we're preparing Alaskans to fill these 8,000-plus projected vacancies is through an Alaska Performance Scholarship. This new program, approved by the Alaska Legislature, would invest in Alaska's students who are attending in-state university or vocational programs. Gov. Parnell has proposed a sustainable funding mechanism for the scholarship program based on recommendations from the Legislature's Joint Higher Education Scholarship Funding Task Force.

"The Alaska Performance Scholarship will lead to increased academic rigor in our high schools as students earn these scholarships," Parnell has said. "The scholarship helps a variety of students — those who seek career and technical training as well as university-level studies — to realize their dreams through their own hard work."

The graduating class of 2011 will be the first eligible for this opportunity.

Alaska Education Tax Credit

The Alaska Legislature expanded the Alaska Education Tax Credit to include more institutions and also for capital projects. The credit provides tax incentives and rewards for businesses that make contributions for vocational courses, programs, and facilities, including those offered at AVTEC: Alaska's Institute of Technology, the University of Alaska, some of Alaska's regional training centers, and Alaska's K-12 schools.

Companies that pay corporate, fisheries business, fisheries landing, insurance premium/title insurance premium, mining license, oil and gas production, and transportation or oil and gas property taxes are eligible.

Donors can receive a credit equal to 50 percent of contributions up to $100,000, and an additional 100 percent for donations between $100,000 and $300,000. Cash donations greater than $300,000 and up to $10 million earn tax credits of 50 percent, with a maximum Alaska state tax credit of $5 million.

In addition to the state tax credit, businesses may qualify for federal tax savings by making charitable cash donations. Business representatives should contact their tax consultants to determine the tax credit benefit of any donation.

Unemployment benefits

Also in this issue is a report on Alaska's unemployment insurance program. More than 63,000 claimants in 2009 received about $130 million in federal and state benefits, which were directly injected into Alaska's economy. This doesn't include the "trickle-down" effect of those dollars in our economy. The U.S. Department of Labor estimates that every dollar paid in UI benefits generates an additional 60 cents of local economic activity.

By ERIK STIMPFLE, Research Analyst; and TODD MOSHER, Economist

Science, Tech, Engineering, and Math

Knowledge-based workers in Alaska

Science and engineering are embedded into the fabric of our lives, from improving everyday activities to developing our economy.

Even during the coldest winter days, we remain warm in comfortably heated buildings and connected to the outside world by television, Internet, and cell phones. Science and technology operate behind the scenes, quietly and efficiently providing most of the comforts of modern living.

This article focuses on the state's scientists, engineers, surveyors, mathematicians, computer programmers, architects, and other workers who need highly specialized skills to do their jobs. These science, technology, engineering, and math occupations are collectively referred to as STEM occupations.

STEM workers' contributions to Alaska's economy are numerous. Geologists search for mineral deposits, and environmental scientists obtain permits before a new mine can operate. In the fishing industry, biologists research ways to raise king crab in hatcheries and determine how many salmon can be harvested each year while ensuring their return in the years ahead. These are just a few examples of STEM activities; science and technology are everywhere in Alaska's industries.

1 STEM Occupations

Categories and 2008 Alaska employment numbers

ARCHITECTS, SURVEYORS, AND CARTOGRAPHERS (1,554)	
Architects, Except Landscape and Naval (321)	Landscape Architects (<50)
Architectural and Civil Drafters (236)	Mechanical Drafters (<50)
Cartographers and Photogrammetrists (82)	Surveying and Mapping Technicians (187)
Drafters, All Other (154)	Surveyors (464)
Electrical and Electronics Drafters (53)	
BUSINESS AND FINANCE (4,212)	
Accountants and Auditors (1,860)	Financial Analysts (244)
Budget Analysts (226)	Financial Specialists, All Other (1,470)
Cost Estimators (138)	Logisticians (257)
Credit Analysts (<50)	
COMPUTER AND MATH SCIENCE (4,385)	
Actuaries (<50)	Database Administrators (121)
Computer and Information Scientists, Research (58)	Mathematical Scientists, All Other (<50)
Computer Programmers (680)	Mathematical Technicians (<50)
Computer Software Engineers, Applications (326)	Mathematicians (<50)
	Network and Computer Systems Administrators (541)
Computer Software Engineers, Systems Software (290)	Network Systems and Data Communications Analysts (191)
Computer Specialists, All Other (375)	Operations Research Analysts (139)
Computer Support Specialists (1,124)	Statisticians (58)
Computer Systems Analysts (465)	
ENGINEERS (6,145)	
Aerospace Engineering and Operations Technicians (<50)	Engineers, All Other (1,223)
	Environmental Engineering Technicians (249)
Aerospace Engineers (71)	Environmental Engineers (247)
Agricultural Engineers (<50)	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors (226)
Biomedical Engineers (<50)	
Chemical Engineers (<50)	Industrial Engineering Technicians (94)
Civil Engineering Technicians (449)	Industrial Engineers (83)
Civil Engineers (700)	Marine Engineers and Naval Architects (<50)
Computer Hardware Engineers (74)	Materials Engineers (<50)
Electrical and Electronic Engineering Technicians (310)	Mechanical Engineering Technicians (<50)
	Mechanical Engineers (288)
Electrical Engineers (282)	Mining and Geological Engineers, Including Mining Safety Engineers (150)
Electro-Mechanical Technicians (100)	
Electronics Engineers, Except Computer (234)	Nuclear Engineers (0)
Engineering Technicians, Except Drafters, All Other (678)	Petroleum Engineers (482)
LIFE AND PHYSICAL SCIENTISTS (4,739)	
Agricultural and Food Science Technicians (<50)	Foresters (*)
	Geological and Petroleum Technicians (616)
Animal Scientists (<50)	Geoscientists, Except Hydrologists and Geographers (331)
Astronomers (<50)	
Atmospheric and Space Scientists (86)	Hydrologists (<50)
Biochemists and Biophysicists (<50)	Life Scientists, All Other (<50)
Biological Scientists, All Other (194)	Life, Physical, and Social Science Technicians, All Other (327)
Biological Technicians (480)	
Forest and Conservation Technicians (*)	

(continued on the next page)

Defining the STEM workforce

Describing Alaska's STEM workforce is a challenge. There is no accepted national list of STEM occupations, and definitions vary depending on the source and the purpose of the research.

For this article, the Research and Analysis section of the Alaska Department of Labor and Workforce Development created a working definition for STEM occupations as a contribution to the ongoing discussion.

For an explanation of our criteria, refer to the methodology on page 12. Based on these criteria, we identified 135 STEM positions, 132 of which had employment in Alaska in 2008. (See Exhibit 1.)

We organized STEM occupations into eight broad categories: business and finance; computer and math science; architects, surveyors, and cartographers; engineers; social scientists; life and physical scientists; and postsecondary teachers. STEM occupations that did not fit into any of these categories were grouped into "all other."

Forecasted STEM openings

In 2008, Alaska had roughly 24,441 STEM-related jobs, and this number is projected to increase to 27,174 by 2018. (See Exhibit 2.)

An estimated 2,748 new STEM-related positions will be created during the forecast period, and an additional 5,376 will open as workers retire, change occupations, or leave the labor force. All together, more than 8,100 projected STEM openings will need to be filled.

In 2008, the highest STEM employment was in engineering, life and physical sciences, and computer and math science, in that order. (See Exhibits 2 and 3.) Occupations in these categories, as well as in business and finance, are each expected to generate more than 1,000 openings by 2018, and taken together will account for over 77 percent of STEM openings. Engineering-related occupations are expected to produce slightly more than 2,000 openings — the highest of any category.

STEM Occupations (continued) 1

Alaska, 2008

LIFE AND PHYSICAL SCIENTISTS (continued)	
Chemical Technicians (141)	Materials Scientists (<50)
Chemists (112)	Medical Scientists, Except Epidemiologists (<50)
Conservation Scientists (210)	Microbiologists (<50)
Environmental Science and Protection Technicians, Including Health (189)	Nuclear Technicians (0)
Environmental Scientists and Specialists, Including Health (595)	Physical Scientists, All Other (126)
Epidemiologists (<50)	Physicists (<50)
Food Scientists and Technologists (<50)	Soil and Plant Scientists (<50)
Forensic Science Technicians (<50)	Zoologists and Wildlife Biologists (635)

POSTSECONDARY TEACHERS (834)[1]	
Agricultural Sciences Teachers (*)	Engineering Teachers (*)
Anthropology and Archeology Teachers (*)	Environmental Science Teachers (*)
Architecture Teachers (*)	Forestry and Conservation Science Teachers (*)
Atmospheric, Earth, Marine, and Space Sciences (*)	Geography Teachers (*)
Biological Science Teachers (*)	Mathematical Science Teachers (*)
Chemistry Teachers (*)	Physics Teachers (*)
Computer Science Teachers (*)	Sociology Teachers (*)
Economics Teachers (*)	

SOCIAL SCIENTISTS (478)	
Anthropologists and Archeologists (<50)	Social Science Research Assistants (<50)
Economists (70)	Sociologists (<50)
Geographers (<50)	Survey Researchers (75)
Industrial-Organizational Psychologists (0)	Urban and Regional Planners (220)
Market Research Analysts (<50)	

ALL OTHER (2,094)	
Audio and Video Equipment Technicians (144)	Film and Video Editors (<50)
Audio-Visual Collections Specialists (<50)	Fire Inspectors and Investigators (<50)
Broadcast Technicians (75)	Graphic Designers (172)
Chemical Plant and System Operators (<50)	Multimedia Artists and Animators (<50)
Commercial and Industrial Designers (<50)	Museum Technicians and Conservators (53)
Computer and Information Systems Managers (397)	Natural Sciences Managers (264)
Construction and Building Inspectors (234)	Numerical Tool and Process Control Programmers (<50)
Desktop Publishers (<50)	Sales Engineers (<50)
Embalmers (<50)	Sound Engineering Technicians (<50)
Engineering Managers (426)	Statistical Assistants (54)
Farm, Ranch, and Other Agricultural Managers (<50)	Traffic Technicians (<50)
Farmers and Ranchers (<50)	

[1]There are no employment estimates for individual postsecondary teachers.
An asterisk (*) indicates suppressed data.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

Help wanted: Seeking skilled workers

Over the next ten years, STEM workers will be in demand for a range of occupations. Exhibit 4 lists the STEM occupations forecasted to generate the most job openings from growth and replacements.[1] Accountants and auditors top the list with about 580 total openings. STEM postsecondary teachers

[1]Growth openings are equal to the positive change in employment (i.e., new jobs). Replacement openings are vacancies left by workers who choose another occupation or exit the workforce.

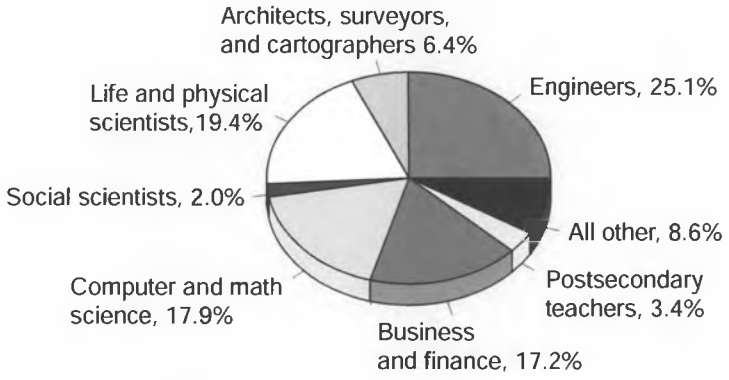
2 Projected STEM Employment by Category
Alaska, 2008 to 2018

	Employment			Openings, 2008 to 2018		
Occupational Categories	2008	2018	Percent change	Growth[1]	Replacement[2]	Total
Business and Finance	4,212	4,681	11.1%	469	763	1,232
Computer and Math Science	4,385	4,945	12.8%	560	607	1,167
Architects, Surveyors, and Cartographers	1,554	1,757	13.1%	203	520	723
Engineers	6,145	6,755	9.9%	610	1,430	2,040
Social Scientists	478	537	12.3%	59	160	219
Life and Physical Scientists	4,739	5,273	11.3%	535	1,244	1,779
Postsecondary Teachers	834	959	15.0%	125	208	333
All Other[2]	2,094	2,267	8.3%	187	444	631
Total for All STEM:	24,441	27,174	11.2%	2,748	5,376	8,124

[1]Growth openings are equal to the positive change in employment (i.e., new jobs).
[2]Replacement openings are vacancies left by workers who choose another occupation or exit the workforce.
Note: Data for individual occupations are at: http://labor.alaska.gov/research/occs/alaskaoccs/OccList.htm.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

3 Makeup of STEM Employment[1]
Alaska, 2008

Total STEM Employment: 24,441



[1]Excludes self-employed workers, private household workers, most agricultural workers, fishermen, and others not covered by the state's unemployment insurance program.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

are next, with estimated job vacancies of 300-plus.

Engineering-related occupations accounted for eight of the 30 occupations on the list. Civil and petroleum engineers are expected to generate more than 200 openings each, and both professions pay excellent annual wages. Openings for civil engineering technicians may exceed 160 positions, and these workers often train to become fully licensed engineers.

Seven computer science-related occupations made the list, and taken together they account for more than 1,000 job openings. Of this group, computer support specialists topped the list at more than 260 potential openings.

Education is essential

An estimated 95 percent of STEM workers need more than a high school diploma for their positions, compared to just 47 percent of non-STEM workers.[2] About 75 percent of STEM workers need a bachelor's or graduate degree, compared to only 20 percent of non-STEM workers. (See Exhibit 5.)

College degrees that prepare workers for STEM occupations require more math and science courses, and preparation for those classes begins in grade school.

Because an educated workforce is fundamental to STEM jobs, emphasis at the national level is on improving math and science education for students in kindergarten through 12th grade. This push includes getting kids interested in math and science careers as well as maximizing teacher and student performance.

Americans have known for some time that our high

[2]Based on O*NET surveys of occupation incumbent workers, applied to Alaska 2008 employment estimates.

school students lag behind other countries in math and science. Every three years, the Program for International Student Assessment reports test scores in math and science for 15-year-olds, and the 2009 results are not much different from previous years. In math, students in 17 of 33 countries performed better than Americans, and in science, 12 of 33 countries outranked the U.S.

One encouraging sign for Alaska is that more high school students are taking STEM-related courses at the University of Alaska. These dually enrolled students receive high school and college credits for attending college classes.

Between 2002 and 2010, the number of dually enrolled students in STEM-related classes increased from 35 to 417.[3] In 2010, there were 203 students enrolled in math and 101 students taking engineering technology courses. The remainder were enrolled in a variety of STEM-related disciplines such as computer science, biology, biomedical science, physical science, and natural resource management.

STEM jobs pay well

The average annual wage for STEM workers is $73,251 — almost $28,000 higher than for non-STEM workers. As in most professions, STEM occupations that require a higher level of education typically have more earning power.

Workers in STEM occupations earn higher average wages than their non-STEM counterparts at every level of education. (See Exhibit 6.) The difference is greatest at the lower levels of education attainment, where STEM-related technical certificates apparently trump general associate degrees and other certificates.

The wage gap between STEM and non-STEM occupations diminishes with higher levels of education. Still, on average, STEM jobs requir-

[3] Source: University of Alaska, Statewide Planning and Institutional Research

Highest Projected STEM Occupation Openings 4

Alaska, 2008 to 2018

Occupation	2008 Employment	Growth Openings[1]	Replacement Openings[2]	Total Openings
Accountants and Auditors	1,860	225	356	581
STEM Postsecondary Teachers	834	125	208	333
Zoologists and Wildlife Biologists	635	70	213	283
Computer Support Specialists	1,124	136	132	268
Surveyors	464	68	198	266
Geological and Petroleum Technicians	616	67	157	224
Petroleum Engineers	482	50	172	222
Civil Engineers	700	100	114	214
Environmental Scientists and Specialists, Including Health	595	82	107	189
Computer Programmers	680	15	154	169
Civil Engineering Technicians	449	63	104	167
Biological Technicians	480	60	79	139
Computer Systems Analysts	465	75	57	132
Network and Computer Systems Administrators	541	69	59	128
Engineering Managers	426	36	83	119
Urban and Regional Planners	220	27	86	113
Computer Software Engineers, Applications	326	64	48	112
Surveying and Mapping Technicians	187	28	83	111
Computer and Information Systems Managers	397	35	74	109
Computer Software Engineers, Systems Software	290	60	43	103
Mechanical Engineers	288	17	83	100
Geoscientists, Except Hydrologists/ Geographers	331	39	60	99
Architectural and Civil Drafters	236	24	72	96
Environmental Engineering Technicians	249	40	52	92
Mining and Geological Engineers, Including Mining Safety Engineers	150	30	62	92
Architects, Except Landscape and Naval	321	49	37	86
Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	226	20	66	86
Electrical and Electronic Engineering Technicians	310	15	67	82
Conservation Scientists	210	21	61	82
Construction and Building Inspectors	234	26	53	79

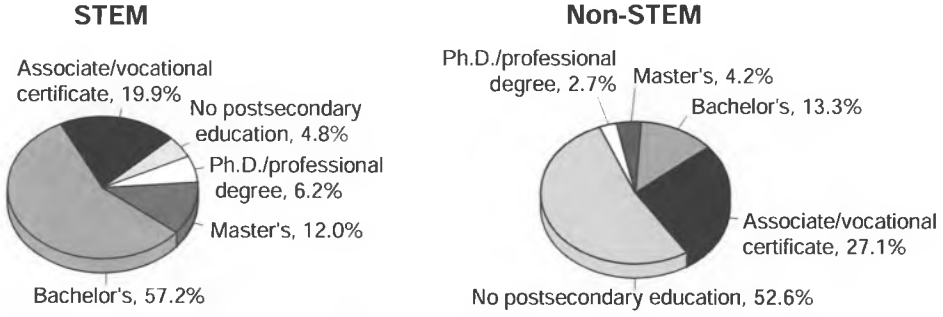
Note: Excludes residual ("all other") occupations.

[1]Growth openings are equal to the positive change in employment (i.e., new jobs).

[2]Replacement openings are vacancies left by workers who choose another occupation or exit the workforce.

Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

5 Required Education Levels[1]
Alaska, 2008



[1]Based on required education data from O*NET database, weighted by employment.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

6 Average Earnings by Education Level
All Alaska jobs, 2009

Education Level	STEM	Non-STEM	Difference
Associate degree, certificate, or some college	$63,192	$49,059	28.8%
Bachelor's degree	$75,499	$62,732	20.4%
Master's degree	$79,733	$70,731	12.7%
Doctorate or professional degree	$86,052	$82,751	4.0%

Note: Based on O*NET required education data and an employment weighted average of May 2009 OES wage estimates. Excludes residual ("all other") occupations.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

7 Ten Highest-Paying STEM Jobs
Alaska, 2009

Occupation	Annual Wages
Petroleum Engineers	$154,500
Chemical Engineers	$125,820
Engineering Managers	$118,440
Materials Engineers	$108,180
Geoscientists, Except Hydrologists and Geographers	$104,410
Electrical Engineers	$100,250
Industrial Engineers	$98,790
Mechanical Engineers	$98,790
Mining and Geological Engineers, Including Mining Safety Engineers	$95,200
Natural Sciences Managers	$92,340

Note: Based on May 2009 OES wage estimates.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

ing a bachelor's degree pay 20 percent more than those in non-STEM categories, and those needing a master's degree pay 13 percent more.

As a group, STEM postsecondary teachers had the highest wages, with an average salary of about $92,000. (See Exhibit 8.)

For individual occupations, petroleum engineers top the list with average earnings of $154,500, and eight of the ten highest paying occupations are engineering-related. (See Exhibit 7.)

Engineers typically earn a bachelor's degree and spend several years gaining on-the-job experience before they can take an exam to become fully licensed and start earning top-dollar wages.

An aging STEM workforce

There are relatively few young STEM workers. In 2008, only about 9 percent were under the age of 25 (see Exhibit 9), compared to 20 percent of non-STEM workers. This is likely because it takes time to obtain the necessary postsecondary education or training for STEM employment.

Alaska's STEM workforce is aging, and replacements will be needed as these workers retire. About 41 percent of Alaska's STEM workers were ages 45 to 64 in 2008, and many of these workers will retire in the near future. It will be a challenge to replace them, because these workers typically have many years of experience, education, knowledge, and skills built up over a career. However, the large number of aging workers also means continued opportunities for younger workers just starting their careers, provided they have the required education and training.

Most STEM workers are men

STEM workers in Alaska are predominately male, a long-time trend that mirrors the rest of the nation. Business and finance was the only category with significantly more women than men. (See Exhibit 10.) Social sciences had an almost even split of males and females. But in nearly every other category, there were significantly more men.

Engineering had the highest difference, with four males to every female.

However, data from the National Science Foundation suggest that the number of women choosing STEM careers is on the rise. Women made up 27 percent of the nation's science and engineering workforce in 2007, compared to only 12 percent in 1980.[4]

Despite the apparent gender gap in science and engineering, Alaska's women are closing the gap in some individual occupations.

Eight of the top 15 STEM occupations with the highest percentage of females require a background in science. (See Exhibit 11.) Four of those are in the environmental sciences. Conservation scientists are 52 percent female, followed by environmental technicians (48 percent), environmental scientists (47 percent), and environmental engineers (36 percent). In contrast, only 20 percent of engineers overall are women.

Finding qualified workers

Employers who can't find workers locally have to look outside the state. In 2008, about 16 percent of workers in STEM-related jobs were nonresidents, compared to 20 percent nonresidency for non-STEM positions.

Finding qualified Alaska residents is a challenge for employers in a variety of industries. Because most STEM workers need a bachelor's degree or higher, short-term training programs are less likely to provide a quick fix for any worker shortages.

Among STEM occupations, the life and physical sciences category had the highest percentage of nonresidents; about 23 percent of its workers were from outside the state. However, rates for individual occupations can vary widely.

For residency information for specific occupations, refer to the Alaska Occupations Web site, which provides data on more than 500 occupations.[5]

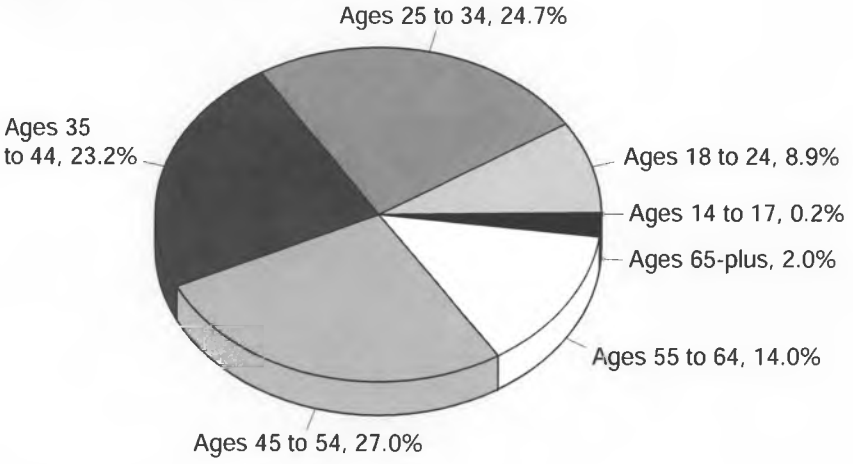
[4]Source: The National Science Foundation's Science and Engineering Indicators 2010 Report
[5]See http://labor.alaska.gov/research/occs/alaskaoccs/home.htm.

Average Wages by Category 8
All Alaska jobs, 2009

Occupational Category	STEM Wages	Non-STEM Wages
Postsecondary Teachers	$91,968	$71,259
Engineers	$89,053	*
Architects, Surveyors, and Cartographers	$69,335	*
Computer and Math Science	$66,853	*
Business and Finance	$65,046	$63,390
Life and Physical Scientists	$62,895	*
Social Scientists	$61,503	$70,863
All Other[1]	$78,266	$44,790

[1]For a list of occupations see Exhibit 1.
*All occupations in this category are STEM.
Note: Based on an employment weighted average of May 2009 OES wage estimates.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

9 Age of STEM Workers
Alaska, 2008



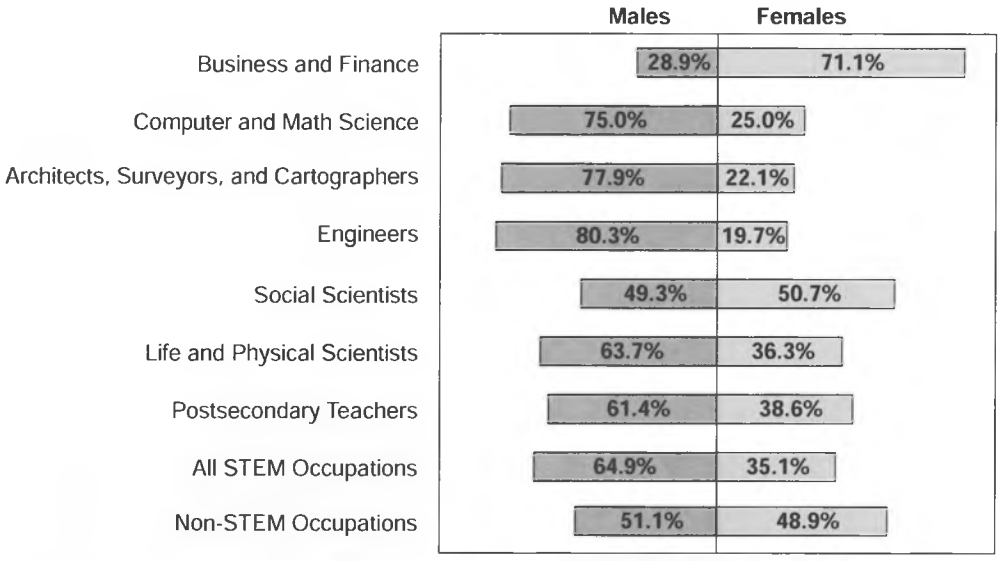
Note: Based on 2008 Alaska Permanent Fund Dividend data.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

The national push for STEM

In 2007, Congress passed the America Competes Act, with the goals of promoting scientific research and development and helping the U.S. stay competitive. The act was partly in response to a 2007 federal report titled "Rising Above the Gathering Storm."

The report concluded that although the United

10 Gender Makeup of STEM Categories
Alaska, 2009



Note: Based on 2008 Alaska Permanent Fund Dividend data.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

11 Highest Percentages of Women
Alaska STEM jobs, 2008

Occupation	Percent female
Budget Analysts	77.9%
Accountants and Auditors	72.7%
Graphic Designers	57.9%
Financial Analysts	54.7%
Conservation Scientists	51.7%
Environmental Science and Protection Technicians, Including Health	47.5%
Environmental Scientists and Specialists, Including Health	47.1%
Urban and Regional Planners	45.6%
Operations Research Analysts	45.5%
Natural Sciences Managers	44.2%
Biological Technicians	42.7%
Chemists	41.6%
STEM Postsecondary Teachers	38.6%
Environmental Engineers	35.5%
Database Administrators	35.4%

Note: Only includes occupations with 100 or more jobs. Excludes residual ("all other") occupations. Gender percentages are based on 2008 Alaska Permanent Fund Dividend data.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

States was still among the world's leaders in scientific research, discovery, and innovation, it was in danger of losing its global technological edge.

The act increased funding for scientific research and development, promoted STEM-related education, and extended tax credits for companies engaged in scientific research.

In late December of 2010, the America Competes Act was reauthorized with bipartisan support and was signed into law on Jan. 4. The act includes research and development tax credits for private companies and more than $40 billion in funding for the National Science Foundation, the Department of Energy, and the National Institute of Standards and Technology.

The America Competes Act is just one example of U.S. efforts to promote STEM-related education. One of the largest is led by a nonprofit group called Change the Equation. This umbrella organization's 110 corporate partners have pledged millions of dollars worth of funding and in-kind contributions to promote STEM-related education.

Research dollars for Alaska

It is difficult to obtain data on the research expenditures of private companies, but information on government funding awarded to the University of Alaska is quantifiable and a good example of how these dollars filter into the state economy.

In 2009, the National Science Foundation awarded $40.5 million for research and $162.2 million for major research equipment to the University of Alaska Fairbanks.[6] Most of the equipment funding was for the construction of a new research vessel, the R/V Sikuliaq, which is scheduled to begin operations in 2014 and will port in Seward.

UAF will operate the 254-foot, $123 million ship, which will be owned by the National Science Foundation and is under construction in Marinette, Wisc. Scientists from Alaska and

[6]Source: The National Science Foundation's Budget Internet Information System, http://dellweb.bfa.nsf.gov/

around the world will have a new platform to study climate change, sea ice, fisheries, and sub-sea volcanic activity.

Research resembles an industry

Scott Goldsmith, an economics professor at the University of Alaska Anchorage, has studied the benefits of scientific research and development conducted by the university. He wrote that research is an economic enterprise comparable to mining, seafood, timber, or oil and gas.[7] Research brings money into Alaska and creates jobs.

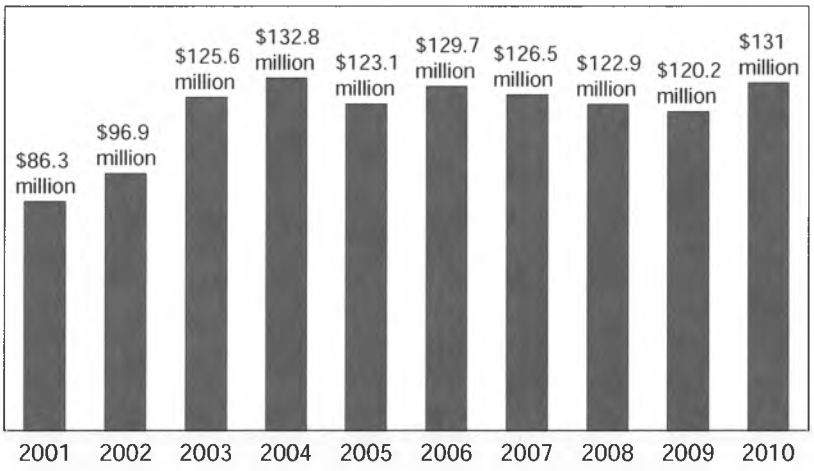
Goldsmith estimated that in 2006, university research money helped fund $52.6 million in payroll — or 1,292 jobs — within the university and an additional 1,100 jobs in Alaska's private sector, or $39.5 million in wages. Research expenditures have increased since these 2006 data.

Research dollars support more than just science. During fiscal year 2010, the University of Alaska spent $131 million on research-related activities. (See Exhibit 12.) These expenditures include wages for employees and the purchase of goods and services from local businesses. The university spends additional money when building new science labs, which provides jobs for construction workers.

Most of the university's research budget comes from nonstate funds. According to the University of Alaska in Review 2010 Report, the university system leveraged $5.70 in external funding for every dollar of state funding provided during fiscal year 2009.

A large portion of that funding came from the federal government, but private grants and donations also contributed significantly. During FY 2009, the federal government provided roughly 86 percent of the funding for UA research; private, local, and other sources funded 12 percent; and 2 percent came from state government.[8]

University Research Expenditures **12**
U of A, fiscal years 2001 to 2010



Note: Includes activities directly related to scientific and academic research, including capital expenditures.
Source: University of Alaska Statewide Planning and Institutional Research

STEM for Alaska's future

The contributions that engineers, scientists, and other STEM workers make to the state are multifaceted, as they solve problems and bolster the economy throughout Alaska's industries. As we move into the future, we need an educated and highly skilled STEM workforce to provide solutions for short-term and long-term challenges of life in Alaska.

[7]Source: Scott Goldsmith, "University of Alaska Research: An Economic Enterprise," UAA Institute of Social and Economic Research, http://iser.uaa.alaska.edu/Publications/ua_econent.pdf
[8]Percentages are based on data from Table 5.07 of the University of Alaska in Review 2010 Report.