Board of Regents
SPECIAL MEETING AGENDAS AND MATERIALS
September 20, 2011

Academic & Student Affairs Committee Agenda ........................................... 2
Facilities & Land Management Committee Agenda ...................................... 4
UA Program Resource Planning (PRP) Chart .................................................. 11
UA Engineering Plan 2010 and Update (MAA, SON, SOR) ............................ 13
UAA Project Program ....................................................................................... 51
UAA Cost Projection Summary ....................................................................... 64
UAA Campus Master Plan Amendment ............................................................ 66
UAF Project Program ....................................................................................... 84
UAF Campus Master Plan Amendment ............................................................. 95
UAF Cost Projection Summary ....................................................................... 100
I. Call to Order

II. Adoption of Agenda

MOTION
"The Academic and Student Affairs Committee adopts the agenda as presented.
I. Call to Order
II. Adoption of Agenda
III. Acceptance of UA Engineering Plan 2010 Program Resource Planning
IV. Status Report on UAF’s Partnership with Colorado State University for a Veterinary Medicine Program Option for Alaskans
V. Adjourn
This motion is effective September 20, 2011."

III. Acceptance of UA Engineering Plan 2010 Program Resource Planning

The President recommends that:

MOTION
"The Academic and Student Affairs Committee accepts the joint UAA and UAF presentation on meeting the targets and recommendations set forth in the UA Engineering Plan 2010 in compliance with the requirements for completing the Program Resource Planning Process Mission Area Analysis, Statement of Need, and Statement of Requirements, and recommends that the Facilities and Land Management Committee consider project approvals as specified in Regents’ Policy. This motion is effective September 20, 2011."

RATIONALE/RECOMMENDATION
The Board of Regents approved a limited formal project approval in June 2010 and at the February 2011 meeting, accepted the UA Engineering Plan 2010 and authorized the university administration to proceed with comprehensive planning, programming, concept design, and site evaluation and selection for the respective MAU engineering facilities not to exceed a total cost of $1,000,000 per campus.
The presentation asks the Academic and Student Affairs Committee to accept the plan in compliance with the Program Resource Planning Process. Acceptance will be conveyed to the Facilities and Land Management Committee who will then consider a recommendation to the Full Board for full formal project approval. This action will permits the MAUs to proceed to Schematic Design.

IV. Status Report on UAF’s Partnership with Colorado State University for a Veterinary Medicine Program Option for Alaskans

Provost Henrichs will provide an overview of the steps being taken to develop the 2+2 program option in partnership with Colorado State University. Program approval for this partnership offering will be requested from the Board of Regents at its December 2011 meeting.

About two years ago at the request of the Board of Regents, administration began investigating options to address Alaska’s veterinarian shortage. A feasibility study for veterinary program options including costs and market analysis, looking at demand for, and supply of, veterinarians throughout Alaska was completed. The analysis showed that a 4-year Doctor of Veterinary (DVM) school in Alaska was not feasible, but an articulated program with Colorado State University would be a cost-effective method to provide Alaska students with DVM opportunity that are currently very restrictive based on competing as an out-of-state student for any available program. This approach also complements existing biomedical and large animal research at UAF while allowing for increased community engagement. The results of the study were reviewed with the Board of Regents in September 2010, and the program was discussed throughout the Academic Master Plan process.

UAF arrangements with Colorado State University have since the beginning focused on a Fall 2013 entering class, who would graduate from CSU in 2017. This timeline is tied to the accreditation process of the American Veterinary Medical Association. To meet this date, the program needs to be part of the Board of Regents’ FY13 budget increments request.

V. Adjourn
Agenda
Board of Regents
Special Meeting
Facilities and Land Management Committee
Tuesday, September 20, 2011, 2:00 p.m. – 4:00 p.m.
1815 Bragaw Street, Room 205
Anchorage, Alaska

Committee Members:
Carl Marrs, Committee Chair
Mary K. Hughes
Robert Martin, Committee Vice Chair
Kirk Wickersham
Timothy Brady
Fuller Cowell, Board Chair

I. Call to Order

II. Adoption of Agenda

MOTION

"The Facilities and Land Management Committee adopts the agenda as presented.

I. Call to Order
II. Adoption of Agenda
III. Full Board Consent Agenda
   A. Amended Formal Project Approval for the University of Alaska Engineering Facility Projects for University of Alaska Anchorage and University of Alaska Fairbanks

IV. Adjourn

This motion is effective September 20, 2011."

III. Full Board Consent Agenda

A. Amended Formal Project Approval for the University of Alaska Engineering Facility Projects for UAA and UAF

The President recommends that:

MOTION

“The Facilities and Land Management Committee recommends that the Board of Regents approve the amended Formal Project Approval for the University of Alaska Engineering facilities at the University of Alaska Anchorage and University of Alaska Fairbanks, as well as the associated UAA and UAF campus master plan amendments as presented, and authorize the university administration to proceed with development of the projects through schematic design, not to exceed a total project cost for all project components which is $123.2 million for UAA and $98.6 million plus $9.9 million in UA Bonds for UAF. This motion is effective September 20, 2011.”
POLICY CITATION

In accordance with Regents’ Policy 05.12.042, Formal Project Approval (FPA) represents approval of the Project including the program justification and need, scope, the Total Project Cost (TPC), and funding plan for the project. It also represents authorization to complete the development of the project through the schematic design, targeting the approved scope and budget, unless otherwise designated by the approval authority.

An FPA is required for all projects with an estimated TPC in excess of $2.5 million in order for that project’s inclusion of construction funding to be included in the university’s capital budget request, unless otherwise approved by the Board.

The level of approval required shall be based upon TPC as follows:

TPC > $4 million will require approval by the Board based on recommendations from the Facilities and Land Management Committee (F&LMC).

Background

The Board of Regents approved a limited FPA for these projects in June 2010. At the February 2011 meeting, the board accepted the UA Engineering Plan 2010 and authorized the university administration to proceed with comprehensive planning, programming, concept design, and site evaluation and selection for the respective MAU engineering facilities not to exceed a total cost of $1,000,000 per campus.

The September 20 presentation will cover the completed planning, architectural program development and the site evaluation and selection outcomes. This motion grants full FPA and permits the MAU’s to proceed to Schematic Design. The FPA data that follows has been updated from the one presented and partially approved at the June 2010 meeting.

Planning and design funding for the construction of UAA and UAF Engineering facilities enables the university to expand engineering programs to address the state need for additional engineers and the growing student demand for engineering study. Improved retention and graduation rates in engineering programs will contribute to achieving the targets of the 2007 Engineering Initiative and provide research and job training to benefit Alaska’s construction, gas, oil, mining, and other industries. The existing engineering buildings are more than 30 years old, undersized for the increased enrollment and do not contain appropriate labs for undergraduate programs. A critical need exists for expanded teaching and research laboratory space as programs on both campuses continue to grow.
A parallel joint program statement was developed for these facilities, which sets forth the space needed at each campus to accomplish the academic priorities for engineering in compliance with the 2007 Engineering Initiative and the UA Engineering Plan 2010. Separate project agreements will be developed for each campus’s project and separate SDA requests will be submitted to the board by each MAU once construction funding is authorized.

A report will be made to the Facilities and Land Management Committee at every meeting on the progress of this project development.

BACKGROUND FOR UAA
New baccalaureate engineering and related associate and certificate programs were created to meet industry demand and have been one of the driving forces for the enrollment increases. The existing engineering building was built in the early 1980s and is undersized for current student demand. Two sites are being considered. One site is north of the existing Engineering Building and would require the realignment of Mallard Lane into its existing right of way. The other site is directly south of the Bookstore and would connect with the new Health Sciences Building across Providence Drive. Both sites have been investigated and analyzed as part of the planning process. (See Campus Master Plan amendment for full discussion.)

The UAA Master Plan approved by the Board of Regents in June 2004 called for an additional 21,600 gsf of space to meet the needs of the Engineering Program as it was configured at that time. Based on the UA Engineering Initiative 2010, the programmatic need for the School of Engineering calls for space in addition to the campus master plan requirement. This additional space would be comprised of classrooms, instructional laboratories, student support space, educational shops and office space to accommodate the high demand for engineers in Alaska.

This project would accommodate current program requirements and allow for the consolidation of Engineering Programs currently being taught elsewhere on and off campus.

Project Scope
UAA’s request is for building design and construction of an Engineering facility, structured and temporary parking to meet the building requirements, and for backfill costs. See reference materials for more detail about scope.

Proposed Total Project Cost and Funding Plan
FY11 State of Alaska Capital Appropriation $4,000,000
State of Alaska Capital Appropriation (request) $119,200,000
Total project cost: $123,200,000
Estimated Annual Maintenance and Operating Costs (O&M)
Based on the new square footage only, the O&M costs are estimated for a 2015 building opening. (This includes full O&M cost for shell space.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities</td>
<td>$195,000</td>
</tr>
<tr>
<td>Grounds &amp; Landscaping</td>
<td>$52,500</td>
</tr>
<tr>
<td>M &amp; R</td>
<td>$821,500</td>
</tr>
<tr>
<td>Administrative</td>
<td>$52,500</td>
</tr>
<tr>
<td>Custodial</td>
<td>$67,500</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td><strong>$1,189,000/year</strong></td>
</tr>
</tbody>
</table>

Consultant(s)
Livingston Sloan with Ayers Saint Gross and Research Facilities Design (RFD).

Other Cost Considerations
The School of Engineering uses two 1,000 gsf portable buildings located north of the Engineering Building, leased warehouse space off campus for use as a design studio, and the temporarily reallocated University Lakes Building (ULA) Annex to accommodate Engineering program needs. These dispersed facilities (on and off campus) provide about 14,000 gsf to help meet the current program needs, but are extremely inefficient for effective program delivery. These spaces can be eliminated or re-assigned to meet other critical space needs.

Backfill Plan
This project includes remodel of the existing Engineering Building to accommodate departments assigned to that space. See reference materials for additional detail.

Proposed Schedule for Completion of New Construction

<table>
<thead>
<tr>
<th>Stage</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROGRAMMING</strong></td>
<td></td>
</tr>
<tr>
<td>Development of program statement</td>
<td>August 2011</td>
</tr>
<tr>
<td><strong>DESIGN</strong></td>
<td></td>
</tr>
<tr>
<td>Formal Project Approval – Limited</td>
<td>June 2010</td>
</tr>
<tr>
<td>Full Formal Project Approval</td>
<td>September 2011(Pending)</td>
</tr>
<tr>
<td>Conceptual Design</td>
<td>October/November 2011</td>
</tr>
<tr>
<td>Schematic Design</td>
<td>January 2012</td>
</tr>
<tr>
<td>Schematic Design Approval</td>
<td>February 2012</td>
</tr>
<tr>
<td>Construction Documents</td>
<td>December 2012</td>
</tr>
<tr>
<td><strong>BID &amp; AWARD</strong></td>
<td></td>
</tr>
<tr>
<td>Advertise and Bid</td>
<td>January/February 2013</td>
</tr>
<tr>
<td>Construction Contract Award</td>
<td>March/April 2013</td>
</tr>
<tr>
<td><strong>CONSTRUCTION</strong></td>
<td></td>
</tr>
<tr>
<td>Start of Construction</td>
<td>May 2013</td>
</tr>
<tr>
<td>Date of Beneficial Occupancy</td>
<td>June 2015</td>
</tr>
</tbody>
</table>
Procurement Method for Construction
UAA is analyzing the construction procurement to determine the delivery method that provides the best value for the university on such a high value and complex project. A preferred procurement method will be identified early in the design phase and reported on to the FLMC.

Affirmation
This project complies with Regents’ Policy and the 2004 campus master plan as it will be amended by this approval.

Action Requested
Approval to develop the UAA project documents through schematic design.

Supporting Documents
Program Statement Summary
Cost Projection for all components, including annual operating costs
Campus Master Plan Amendment

BACKGROUND FOR UAF
As one of two of the oldest degree programs in the state, UAF’s College of Engineering and Mines has a proud history of teaching and research in Alaska, pioneering many of the projects that benefit every Alaskan. Preparing today’s engineers for tomorrow’s jobs is key to keeping local talent employed during construction of major infrastructure projects such as the new gas line. This much-needed engineering facility project will provide space for labs and classrooms to facilitate teaching and research.

Duckering is also the home of the Institute of Northern Engineering, the research leg of the engineering programs on campus. Over the last eight years, research revenue has grown by 400% with no growth of the building. Lab space for environmental and petroleum research is over taxed and not adequate to provide the latest innovations for the oil and gas industry.

Project Scope
A critical need exists for expanded teaching and research laboratory space as both programs continue to grow. Completion of a new engineering facility project will address the needs of continued growth in engineering academics, research, and job training for future engineers to benefit Alaska’s construction, critical infrastructure, and the oil, mining, and gas industries. See reference materials for more detail about scope.
Using the current and projected growth figures in the UA Engineering Plan 2010, a space program was developed to fully utilize the current facility and develop the scope for new construction.

After presenting various components of this information to CEM and the UAF Administration, and based on the goals of the academic plan, the preferred solution for accommodating the space requirements is:

- Construct a single “legacy” type facility for Engineering adjacent to the current engineering building.
- Reallocate space in the existing Duckering building, with cost associated for critical renovations and change of use included within the total project cost of the expansion.

Site planning has been completed and adheres to the goals and objectives of the UAF Master Plan 2010 (Site E). See reference materials for details.

**Variance Report**
None.

**Proposed Total Project Cost and Funding Source(s)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY11 State of Alaska Capital Appropriation</td>
<td>$4,000,000</td>
</tr>
<tr>
<td>State of Alaska Capital Appropriation (request)</td>
<td>$94,600,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$98,600,000</td>
</tr>
<tr>
<td>UA Bonds (request)</td>
<td>$ 9,900,000</td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$108,500,000</td>
</tr>
</tbody>
</table>

**Estimated Annual Maintenance and Operating Costs (O&M)**

Based on the new square footage only, the O&M costs are estimated for a 2015 building opening. (This includes full O&M cost for shell space.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities</td>
<td>$ 692,000</td>
</tr>
<tr>
<td>Trash/Grounds</td>
<td>$  76,000</td>
</tr>
<tr>
<td>M&amp;R</td>
<td>$1,240,000</td>
</tr>
<tr>
<td>Custodial</td>
<td>$ 220,000</td>
</tr>
<tr>
<td>Administrative (included above)</td>
<td>$ 0,000</td>
</tr>
<tr>
<td>Total Cost (approx $19/SF)</td>
<td>$2,228,000/year</td>
</tr>
</tbody>
</table>

**Consultant(s)**

ECI/Hyer Architecture and Interiors of Anchorage teamed with NBBJ of Seattle

**Other Cost Considerations**
None.
Backfill Plan
Backfill project costs for a portion of Duckering are included, with additional remodeling to be planned once the new facility is occupied. The cost for possible additional backfill remodeling is currently estimated at $17,000,000.

Schedule for Completion
PROGRAMMING
Development of program statement August 2011
DESIGN
Formal Project Approval - Limited June, 2010
Full Formal Project Approval September 2011(Pending)
Conceptual Design September/October 2011
Schematic Design March 2012
Schematic Design Approval April 2012
Construction Documents February 2013
BID & AWARD
Advertise and Bid February/March 2013
Construction Contract Award April 2013
CONSTRUCTION
Start of Construction April 2013
Date of Beneficial Occupancy of New Construction November 2014

Procurement Method for Construction
UAF is analyzing the construction procurement to determine the delivery method that provides the best value for the University on such a high value and complex project. A preferred procurement method will be identified early in the design phase and reported on to the FLMC.

Affirmation
This project complies with Regents’ Policy and the campus master plan as amended with this motion.

Action Requested
Approval to develop the UAF project documents through schematic design.

Supporting Documents
Program Statement, Executive Summary
Cost Projection for all components, including annual operating costs
Campus Master Plan Amendment

IV. Adjourn
University of Alaska Program Resource Planning
Academic, Budget and Project Planning Process
Rev. 9-8-11

Source Documents:
- UA Strategic and Academic Plans
- MAU Strategic and Academic Plans
- MAU Department Program Proposal
- MAU Campus Master Plan
- MAU Housing/Campus Life Strategic Plan

Will this proposal require approval by President or BOR?

1. MAU produces an Academic Mission Area Analysis (MAA) & a Statement of Need (SON) (should be contained in the MAU Program Proposal)
2. MAU produces a Program Action Request (PAR) Formerly a HEX Form
3. MAU Submits to SAC for review and concurrence
4. MAU develops a Preliminary Administrative Approval Request (PAA) Not required until after MS #3 unless MAU needs authority to spend to develop the SOR and Business/Finance Plan. Skip to step 6.
5. President approves PAA
6. MAU produces a Statement of Requirements (SOR)
7. Is this an Academic Program?
   - YES
     - MAU submits MAA, SON and SOR to BOR Academic and Student Affairs Committee for approval
   - NO
     - Follow MAU internal evaluation process
7a. MAU submits MAA, SON and SOR to BOR Academic and Student Affairs Committee for approval
8. MAU Develops Business and Financing Plan
10. President, FLMC and BOR approval of operating and capital budgets, and LRP
11. Governor and Legislature Action
12. UA BOR accepts Appropriated Budgets
13. Board of Regents Project Approval Processes
14. Project Agreement Formal Project Approval Schematic Design Approval Change Requests Project Bid/Award Reports Final Project Report

Statement of Requirements Components
- Faculty/Staff
- FF&E
- Infrastructure
- Backfill, Other Second Order Impacts
- New Space, Remodeling
- Building Operations and Maintenance

Time Frames
- Steps 1-3 may require 1-9 months
- Steps 4-7 may require 1-3 months
- Steps 8-13 generally require 7-8 months
- Step 14 will vary depending on the size of the project (a few weeks to several years.)

Project Type
- Construction – New or Expansion, Large R&R
- Infrastructure – New or Expansion
- Deferred Maintenance and Small R&R projects

Process Ends
**Purpose of the Program Planning: Academic, Budget and Project Planning Process** is to demonstrate the integration of academic program, institution budgeting, and facilities project planning and development processes. This process flow chart is meant to inform the various institution participants and stakeholders concerning the integration of these processes.

**Definitions**

MS #0 **Mission Area Analysis (MAA)**: a quantitative and qualitative analysis of a proposed mission area, creation, expansion or substantive change, aligned with appropriate plans and policies. (This may be analogous to the MAU Program Proposal approved by local Faculty Senate, summarized and submitted to SAC by the MAU.) The MAA, or Program Proposal, records how the need for change was triggered along with the convincing and compelling arguments for the proposed action.

Program Proposal (PP): part of current academic process, it is the academic analysis for a program of study, including course descriptions, which accompanies the Program Action Request (formerly called HEX form). This document could be analogous to the Mission Area Analysis.

Program Action Request (formerly HEX form): (need this definition) This document could be analogous to the Statement of Need.

Statement of Need (SON): a concise summary of the compelling facts derived from the MAA/PP, and submitted with the Program Action Request (aka HEX form) to SAC for review and approval.

MS#1 Preliminary Administrative Approval Request (PAA): the first step in the Board Policy project approval requirement. In part it grants authorization to spend MAU funds to fully investigate the requirements for moving forward and is required to include a facilities project in the UA capital plan.

MS#2 **Statement of Requirements (SOR)**: the detailed solution set (options) that can satisfy the SON. It includes: identification of program personnel requirements; facility needs; furnishings, fixtures and equipment (FF&E) requirements; operations and maintenance (O&M) costs; and second order effects, such as backfill planning, personnel consolidation, opportunity gained or lost. This is the document that identifies all the potential impacts and potential costs associated with a mission expansion and is submitted to the Board for review and acceptance. It identifies the issues that will need to be addressed in detail in a business plan if approvals to proceed are acquired.

Business (and Financing) Plan: this document is the administrative guidance and management tool utilized during the budgeting, project delivery and program operation phases. (Program operation and accountability process is not addressed in this chart.)

Long Range Plan (LRP): the document required by Board Policy and Governor’s Office of Management and Budget. It projects university capital planning for ten years.

Project Cohort: a priority listing of projects intended to be completed from a funding source, such as a deferred maintenance appropriation.

MS#3 **Formal Project Approval and Schematic Design Approval**: the second and third steps in the Board Policy project approval requirement.
University of Alaska

UA Engineering Plan 2010

FINAL REPORT
March 2011
Recommendations
UAF, Duckering Building, Room 434. This room is the UAF Petroleum Engineering Department's gas hydrate lab. This laboratory is capable of conducting gas hydrate core studies and measurement of thermodynamic and kinetic properties of gas hydrates. The equipment shown in this photograph includes: gas hydrate coreholder, RTE 4- Neslab refrigerated bath circulator, temperature controller, gas compressor, air compressor, Jergson liquid level gauges (2), vacuum pumps (2), Beckman conductivity meter, steam generator, Omega temperature readout device, Heise pressure gauges (5), transfer cell, Zeiss scope, Extroll controller/programmer, wet test flowmeter, freezer chest, Crycool CC100 immersion cooler, rocker with controller and methanol-insulated bath.
RECOMMENDATIONS

While there has been success and accomplishment in meeting the objectives of the Regents' Engineering Expansion Initiative, a number of challenges still exist. The following recommendations, if accepted and adopted, will form the basis for a plan for engineering at the University of Alaska for the following decade.

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

While the target number of 200 Bachelor of Science degree engineers annually will vary from year to year, it is a realistic target given the likelihood of a decline in high school graduates in the State of Alaska and the continued projected demand for engineers in the State.

From 2004 to 2006, UAA and UAF combined graduated an average of 70 Bachelor of Science students in engineering annually. From 2007 to 2009, this increased to 82 Bachelor of Science degrees in engineering annually. In 2010, 148 BS degrees in engineering were awarded.

The number of Bachelor of Science degrees in engineering is expected to reach 200 per year in 2014 at current enrollment levels and stay at or above that level through the end of the decade. This would result in approximately 2,000 undergraduate engineering degrees being awarded through the year 2020. This is consistent in meeting workforce needs for engineers in Alaska, with the State of Alaska occupational forecast of 1,610 new and replacement job openings for engineers in the State from 2008 to 2018.

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.

The facility needs in engineering for both UAA and UAF are well documented throughout the study. Although total engineering enrollments have increased between 2006 and 2010 at both UAA and UAF by more than 53 percent, and undergraduate baccalaureate engineering degree enrollments have increased by 260 percent at UAA and 70 percent at UAF, neither campus has had an increase in new, permanent facilities. The facilities situation has become critical at both campuses.

UAA operates in a single on-campus engineering facility as well as using classroom space throughout the campus and student project space in leased buildings two miles from campus. UAA needs better facilities and dedicated engineering class laboratories. The UAF facility, also in a single building, is shared with its research enterprise. While this allows undergraduate engineering students the opportunity to see and participate in research firsthand, the
equipment required for an engineering education means the class laboratories themselves are crowded and need 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 6,920 asf (11,533 gsf) of Registrar-assigned classrooms.

Both campuses need to develop comprehensive programmatic statements of their facilities needs by further defining instructional spaces to be provided in the new facilities, the student capacity of these spaces, and their size (area) based on the equipment or furniture needed in the instructional spaces. At the same time, both campuses need to chart their expected utilization of the instructional spaces in these facilities based on the number and type of course offerings that could be conducted in each of the teaching spaces to assure they are adequately utilized.

Because of the complexities of engineering instructional spaces and laboratory buildings, these programmatic studies need to be entered into conceptual design to assure code, cost, and operational issues are analyzed.

In addition, neither of the currently developed facility program statements by UAA or UAF provide much public or student free-time, drop-in space. More detailed programmatic analyses of the types and configuration of both in- and out-of-classroom and class laboratory instructional and free-time space is needed.

Neither the UAA nor the UAF current facility program statements fully define the types and sizes of the spaces or their individual room station capacity. The facility programming documents for the UAA and UAF engineering buildings should provide details and document not only the individual space needs of the buildings, but how these needs can best be met for both undergraduate and graduate programs. Both documents should include construction and project cost totals and cost details.

UAA and UAF need to thoroughly review the programs proposed for their new engineering facilities. Both campuses need to test the facility programs against the number of students that can be accommodated in the laboratories they are proposing. Both need to illustrate how technology can be used in the laboratory setting and even dedicate space for lecture capture and recording. Both facility programs need to be revisited in view of what this study has illustrated to the Steering Committee and Advisory Boards regarding an engineering education. Both campuses need to examine more closely what is needed to support an engineering education well into the future. This future look must also serve to overcome unmet current needs and translate these needs into specific building programs, based in part on the equipment and furniture needed in the class laboratories, and based in part on the average class size enrolled in the laboratory courses.

Both the UAA and UAF facility programming studies need to include existing space that is to be reused and perhaps reassigned, as well as new space. This includes a review of what program spaces are best suited to new facilities and those that can best be accommodated in existing space. The existing space analysis needs to include building code review as standards and requirements have changed since the existing facilities were first put into use. In other words, the programmatic studies need to be comprehensive, as well as opportunistic, to ensure efficiency and effectiveness in the use of new space and the reuse of existing space.
3. Retention Rate: UAA and UAF should work diligently to reduce the dropout rate of students entering engineering with a target of 50 percent of students entering into baccalaureate engineering degree programs graduating in engineering at UAA and 60 percent at UAF.

Historically from 2000 to 2005, approximately 50 percent of the first-time, full-time freshmen entering the engineering programs at UAA and UAF dropped out. Some left after their first year, some after their second year, and some throughout the continuation of their academic stay at the University of Alaska often extending into years seven and beyond. During this time, the retention rate from first to second year among these students was approximately 75 percent, with 25 percent dropping out. Likewise, among first-time, full-time freshmen engineering students entering the program from 2006 to 2010, the freshmen to sophomore retention rate has remained in the 75 percent range, with approximately 25 percent of the students dropping out. However, if past performance is an indication, then approximately 25 percent more of these students will drop out within the next two to seven years and not complete their degree. Of the 50 percent who drop out of engineering, approximately 10 percent transfer to another program at the University and graduate with a non-engineering degree and the other 40 percent leave UA.

Increasing the graduation rate of engineering students from 50 percent to 60 percent would have the dual effect of reducing the burden on other programs of the UAA and UAF campuses since one-half of the dropouts occur during the freshman year. During the freshman year, engineering students take only about one-third of their required coursework in engineering, while other departments on campus are responsible for much of the instruction of freshmen engineering students, in courses including math, English, chemistry, and physics.

Increasing the retention and graduation rate of engineering students would also have the benefit of increasing the number of engineering graduates per class cohort, both as a percentage of students in the cohort and as an absolute number of students graduating, thus allowing program growth to occur with less need to add yet more new facilities. Studies of engineering student success have also shown that the availability of engineering facilities, which allows entering students the opportunity to work on projects while problem solving, increases their opportunity for educational success.

Research has shown that undergraduate success in engineering is enhanced by undergraduates engaged in research projects, students active in engineering-based activities and organizations, and attention being paid to individual students’ academic needs. Providing these activities requires both facilities and funding.

A 10 percent year over year reduction in students dropping out would, within five years, have the same net effect as enrolling 50 more undergraduate at UAA and 100 more at UAF.

4. Time to Graduate: UAA and UAF should make internal changes necessary to minimize the time to graduation for students entering the Bachelor of Science in Engineering programs at the campuses.

Currently, about one-half of the students entering engineering programs at UAA and UAF graduate within four to eight years of their enrolling. Of the remaining 50 percent, about 10 percent transfer into other degree programs at UAA and UAF and graduate. And, as noted above, the remaining 40 percent of students who enter engineering drop out.

Additional academic support services to students in engineering, including tutoring, would assist students in completing their engineering degree in five years, or six years at the outset. The major impact of decreasing the time
to graduation would primarily be seen in a significant reduction in the size of the senior classes at both UAA and UAF, where currently there are two to three times as many senior level students in comparison to first-time freshmen. As the engineering enrollments have increased dramatically over the past few years, the number of seniors who do not graduate has grown disproportionately.

Some of the growth in senior class level students is due to a need for the student to complete a specific required course or courses before graduating. For others, they are employed while going to school, and completing their degree on a part-time basis keeps them enrolled for a longer period of time.

The more efficient progress toward graduation of students entering engineering would have multiple impacts: first, it would reduce the number of students in the engineering program and lessen the long-term facilities needs and faculty and staffing demands of programs that take longer than six years for many student to graduate. Second, it would assist students by allowing them to enter the full-time workforce earlier. Third, it would assist students who borrow money to complete their education by reducing the length of time they are in school and thus the amount of money they are borrowing.

The combined reduction in time to degree, with a corresponding potential leveling in enrollments, would have the win-win impact of more engineering students graduating within a smaller class cohort. This in turn would lessen the long-term facilities demand created by students both dropping out and taking an inordinate length of time to complete their degree and graduate.

5. Program Size: UAA and UAF should recognize that their baccalaureate program enrollments will not expand indefinitely and will begin to level off.

At UAA, baccalaureate degree engineering enrollments increased from 255 majors in fall 2006 to 663 in fall 2010. While this undergraduate enrollment more than doubled, the number of entering first-time engineering freshmen enrollment at UAA also doubled from 59 in fall 2006 to 120 in fall 2010. During the same time, the number of seniors enrolled in the UAA engineering program increased by 111 from 89 in fall 2006 to 200 in fall 2010.

At UAF, baccalaureate degree engineering enrollments increased from 335 majors in fall 2006 to 570 in fall 2010. During this time, first-time freshmen engineering enrollments at UAF increased by 30 students from 58 in fall 2006 to 88 in fall 2010. At the same time, seniors in the Bachelor of Science engineering programs at UAF increased by 89 students from 120 in fall 2006 to 209 in fall 2010.

With high school enrollments in the State of Alaska starting to peak, before leveling off and likely declining, the enrollments at the two engineering schools will follow suit, especially when senior enrollments decrease as a result of students graduating within four, five, or six years of entering, rather than in seven or eight years. Currently, 30 percent of the Bachelor of Science engineering enrollment at UAA are seniors. At UAF, 37 percent of the Bachelor of Science engineering enrollment are seniors. As these students graduate and are not replaced by substantial increases in total program enrollments, the total baccalaureate engineering degree enrollments will begin to level off in the range of 600 to 700 or more students at each campus, despite recent surges in total Bachelor of Science enrollment in engineering. Program offerings, number of faculty, and facility needs should be geared to this reality, recognizing that becoming a senior does not necessarily mean that all required coursework is completed.
6. Graduate Programs: UAA and UAF should recognize that enrollments in their masters degree programs and Ph.D. programs may be at peak levels and in some cases have begun to slip. While graduate degrees awarded at UAA have been increasing, they may begin to decline as the result of the decline in graduate enrollment. Graduate degrees awarded at UAF have already reached a peak and are declining in number.

Unlike undergraduate engineering degree programs where enrollments have soared in the past few years, graduate engineering degree program enrollment at UAA has been in the range of 120 to 140 students annually, and at UAF in the range of 115 to 125 students annually.

These enrollments for full-time engineering graduate students at UAF are directly tied to level of financial support, which in turn is a result of the amount of incoming research income. At UAA, it is likely the part-time engineering graduate students are employed, so the UAA graduate enrollment is less tied to research funding. The expansion of UAF research, particularly in the area of energy research, may mark the beginning of a new growth in graduate students in engineering.

At UAA, the average number of years to complete a two-year engineering masters degree program is about four years. The same is true at UAF. Much of the recent increase in engineering graduate enrollments is the result of length of time to graduate. The engineering graduate courses at both campuses are offered daytime, evening, and online. At UAA, the engineering masters degree program in Project Management has accounted for approximately 50 percent of engineering graduate enrollments and nearly 60 percent of engineering graduate degrees awarded. At UAF, Petroleum Engineering accounts for approximately one-third of engineering masters degree enrollments and a similar percentage of engineering masters degrees awarded. Since engineering graduate admissions are competitive and controlled by the campus, the recent peaks in engineering enrollment and graduates may be an indication that the engineering graduate programs are reaching a steady state enrollment due to a leveling of extramural research funding. New opportunities for funding for engineering research would result in an upswing in engineering graduate students.

7. Two-Year Degree Programs: UAA and UAF should continue to work closely with their two-year community college programs in engineering-related disciplines and provide leadership to improve graduation rates and increase the number of graduates.

Two-year degree program students in engineering-related areas, as well as those who have started the engineering program and stopped out, constitute an important aspect of the engineering workforce in Alaska. According to data prepared for this report by the State of Alaska, Department of Labor and Workforce Development, approximately one-half of those who graduated in engineering from the University of Alaska in the past ten years and are currently employed in engineering in the State are employed in engineering support activities. Community college enrollment in engineering-related fields is burgeoning. Yet, the number of students who graduate these UA engineering-related programs is small in comparison to those who enter.

While the two-year engineering-related Associate of Science degree programs are long standing at UAA and relatively new at UAF, they have yet to be productive in terms of the number of students who graduate. On average, only 25 to 30 percent of these students graduate within three years of entering these two-year degree programs.
The enrollment in two-year engineering-related programs has been steady. Enrollments in the two Associate of Applied Science degree programs at the UAA Community and Technical College have stayed in the 80 to 90 student range annually, and have increased from 9 to 38 at UAF CTC in the four years. The four-year program in Construction Management at the UAA CTC has grown from 27 to 118 students in the past four years.

The employment opportunities in Alaska for students with associate degrees in engineering-related fields is equal to the employment opportunities for engineering students who graduate with bachelors degrees. However, the number of students with associate degrees in engineering from UAA and UAF is not very large for the number of students enrolled in these programs.

8. Alaska High Schools: UAA and UAF should continue to work with high schools in their catchment area and throughout the State, particularly those schools with Academies of Engineering, to encourage and assist students who have an interest in entering engineering programs at the University.

Approximately 75 percent of the first-time freshmen entering engineering at UAA are from high schools in the Anchorage high school district. This is approximately 30 to 40 students annually from Anchorage high schools that graduate around 2,700 students per year, although there were 76 entering freshmen from Anchorage high schools who entered engineering at UAA in fall 2010, out of a class of 120 first-time freshmen. At UAF, with a historically broader catchment area statewide, approximately 25 percent of its first-time engineering freshmen are from high schools in the Fairbanks district. This also is 30 to 40 first-time freshmen engineering students annually from Fairbanks high schools that graduate about 800 students per year. Overall, over the past ten years, 87 percent of first-time engineering freshmen at UAA and 81 percent of UAF first-time engineering freshmen have been graduates of Alaska public high schools.

Of all spring 2000 public high school graduates in Alaska, 0.8 percent enrolled in engineering at UAA or UAF in fall 2000. By spring 2010, 2.1 percent of Alaska high school graduates enrolled in engineering at UA in fall 2010.

To overcome the effect of a potential decrease in students graduating from Alaska high schools, and a potentially similar decline in freshmen engineering enrollment, both UAA and UAF will need to continue to work with high schools, both in their catchment area and throughout the State, to increase the participation rate of high school graduates electing to enter the engineering programs at UAA and UAF.

Providing open houses to students interested in engineering, allowing qualified high school students to take courses at the University, and assisting engineering faculty to visit the high schools and work with students are all mechanisms for encouraging students considering engineering to take the required courses while in high school to be prepared for an engineering education at the university.

9. Engineering Education: UAA and UAF should examine each course in their engineering curriculum and how it is delivered. This goes beyond hands-on education and extends to what the individual can do for themselves in their education, both in person and online.

Another challenge to the engineering programs is that of engineering education itself. UAF is beginning to offer online engineering courses. More may be needed.
It has been said that engineering education may be one of the most thoroughly studied topics in the U.S. The core of the discussion about engineering education reform occurs as a result of many factors. As noted by UC Berkeley, changes will result from evolving technology, from the redefinition of traditional engineering disciplines and from the multi-disciplinary future of the sciences.\footnote{1} At the core of much of this change is the profound use of the computer and the ability for students to have access to vast information sources on the web. This has changed the way students think, learn, and visualize, as well as what they expect from life and from an education.\footnote{2}

10. Continuing Education of Engineers: UAA and UAF should become actively engaged in providing continuing education courses and services.

There is a need for and requirement of continuing education of engineers in Alaska. Thus far, the University of Alaska has had some involvement in the continuing education of engineers. The new requirement that professional licensed engineers achieve 24 hours of continuing education credit prior to their biennial re-licensing in Alaska will create more opportunities for UAA and UAF to be involved. The campus should increase their activities in this area.

William Wulf, when he was President of the National Academy of Engineering, stated “the half-life of engineering knowledge – the time in which half of what an engineer knows becomes obsolete – varies by field, but is estimated to be in the range of 2.5 to 7.5 years.”\footnote{3} He states that the notion of lifelong learning has not been part of the engineering culture, either among individual engineers or in engineering schools. He notes that unlike business schools, where the best of the best have embraced executive training and where the best faculty vie to teach these courses, the best faculty at engineering schools studiously avoid involvement in continuing education.

11. Internships for Engineering Students: UAA and UAF should continue to provide more opportunities for internships and more involvement of the profession in engineering education.

It is likely that many of the students advance through an engineering curriculum at UAA or UAF without ever having been exposed to an engineering workplace or knowing exactly what an engineer actually does. Working closely with their employer and industry-based advisory boards, UAA and UAF should continue to seek their assistance in increasing internship opportunities.

A challenge occurs in finding internships for engineering students. One large corporation in Alaska that employs 2,500 and has approximately 500 engineers in their employ indicated that they would have three internships in 2010. This is a cost to their company but something they want to do. Another company of 70 employees indicated they support three engineering school interns annually as a mechanism to find students who later might become their employees and in the process offer to provide tuition support. There are likely other employers who might hire engineering interns, but it will take organized leadership by the campus to make this happen.

\footnote{1} “New Directions in the College of Engineering,” UC Berkeley College of Engineering Facilities Master Plan, page 1, no date.

\footnote{2} H. Baruh, Professor, Department of Mechanical and Aerospace Engineering, Rutgers University, “A Need for Change in Engineering Education,” no date. http://coewww.rutgers.edu/~baruh/pdffiles/baruh2.pdf, accessed November 11, 2010

12. **Cost of an Engineering Education:** UAA and UAF should review methods to find efficiencies and economies in engineering education, including perhaps the use of distance education, to provide education to more students without an increase in cost.

An additional challenge is the cost of an engineering education itself. Students who drop out are most likely a lost investment. Students who prolong their education because they are working or because they cannot achieve the necessary threshold course accomplishment, primarily calculus, also constitute an expense.

The recently enacted Alaska Performance Scholarship proposed by Governor Parnell and passed by the legislature will certainly be one catalyst for students to enroll in engineering. The pathway requirements for high school students requires and encourages students to take math and science courses, which are also the foundation requirements for engineering.

The Performance Scholarship will be a benefit to qualifying students seeking to enroll in the UAA and UAF engineering programs. It will reward them for their efforts to date, encourage them to be diligent in completing their degree work, and support them during an important period in their life.
Executive Summary

Introduction

Facilities

Progress Report on the Regents' Engineering Expansion Initiative

Summary of Major Findings

What Engineers Do
UAA, Engineering Building, Room 101B, Crews Laboratory. This laboratory houses the MTS and Instron equipment for stress and strain testing and measurement. In 2006, the laboratory was named after supporter Paul Crews, a long-time mechanical engineer in Alaska and one of the first licensed professional engineers in Alaska. This room is not used as a scheduled class laboratory.
EXECUTIVE SUMMARY

The Executive Summary describes the Engineering Plan 2010. It also provides a summary progress report card on how well each of the objectives of the Board of Regents' 2007 Engineering Expansion Initiative has been met. Lastly, a summary of the major findings of the study is provided.

A. INTRODUCTION

What is the University of Alaska Engineering Plan 2010?

The University of Alaska Engineering Plan 2010 is a report that is:

- An analysis of how well the objectives outlined in the Board of Regents of the University of Alaska Engineering Expansion Initiative adopted in 2007 have been met.
- An omnibus indicators report bringing together many details about engineering enrollment, engineering education, and engineering employment in the State of Alaska.
- A summary of projected engineering enrollments and graduates and the resultant critical need for facilities to support meeting the Regents' goals in engineering education.
- A statement of the importance that engineers have in the economic vitality of the State of Alaska and the vital role the University of Alaska has in helping to meet the demand for engineering employment in the State.

The surge in demand for an engineering education at the University has resulted in a 50 percent increase in engineering enrollments at the University of Alaska Anchorage and the University of Alaska Fairbanks in the past four years. This rapid growth has not been accompanied by any increases in permanent facilities for engineering at either campus. This growth has taxed the existing facilities and resulted in significant engineering program space deficits at both campuses that needs to be resolved.

The percentage of Alaska high school graduates who now enter UAA and UAF as first-time freshmen majoring in engineering has more than doubled since 2005. Both campuses work with their local high schools to encourage students to enroll in engineering and these efforts are paying off.

Employers of engineers in Alaska interviewed for this study consistently stated their preference to hire engineers educated in Alaska. They indicate that those who have grown up in Alaska or who have gone to school in Alaska understand what it is like to work in the State. In contrast, they state that others often come to work in Alaska, but many leave after a year or two.
B. FACILITIES

Unstated Outcome

An unstated, but understood, outcome of the Engineering Expansion Initiative was to make the connection between the Board of Regents approved initiative and the facilities that would need to be constructed to meet the Initiative goals. This includes:

- Provide data about facilities that supports campus needs.
- Develop metrics that show any deficiencies that need to be overcome to reach the target of 200 trained engineers and 140 engineering-related graduates.
- Identify what has to be in the “growth” pipeline (faculty, students, staff) to reach the target set in the Regents’ Engineering Initiative.
- Identify if there should be unlimited growth in the engineering programs, beyond the stated goals.

Existing Facilities

As noted in the University of Alaska Request for Proposals for the UA Engineering Plan 2010 study, the existing engineering buildings, at both UAA and UAF, are more than 30 years old, are under sized, and do not contain appropriate laboratories for undergraduate programs. A critical need exists for expanded teaching and research laboratory space as programs on both campuses continue to grow. Changes to successful instructional methods place a greater emphasis on “hands-on” opportunities for undergraduate students.

New Facilities

At the June 4, 2010 Board of Regents meeting, the Board approved requests for two University of Alaska engineering building projects that were in compliance with the UAA and UAF Campus Master Plans and authorized the university administration to proceed with project development in compliance with the University of Alaska Academic Master Plan through schematic design.

Both UAA and UAF envision construction of new facilities for engineering that will allow their respective engineering programs to provide space adequate to educate students to meet the State of Alaska’s need for additional engineers.

The University has stated that before the major academic units proceed with design and construction of their new buildings, the Engineering Plan 2010 will confirm the statewide facility need to accommodate delivery of current engineering programs at each campus and the Board of Regents approved targets for graduates. Moreover, the Engineering Plan 2010 must comply with the draft University of Alaska Academic Master Plan (AMP), which is in the final stage of being adopted, and also comply with the adopted Campus Master Plans.
The Importance of Engineers

While much of this study provides data and indicators about historical engineering enrollments and projections of future enrollments at the University of Alaska, the untold story of this study is the importance of a trained engineering workforce to the economy of the State of Alaska. Engineers are needed to fill both new positions in the State due to growth and to replenish an existing labor force that changes due to retirement, death, and new job opportunities. The State of Alaska’s occupational forecast for engineers from 2008 to 2018 shows more than two replacement job openings for every new engineering job opening. In engineering-related fields, there are nearly three job openings due to replacement for every new job created due to growth.

The three largest expected areas of engineering growth in Alaska to 2018 are: civil engineering, with 100 new positions and slightly more than 100 replacement positions for a total projected employment in 2018 of 800; petroleum engineering, with a growth of 50 positions and replacement of nearly 200 for a total 2018 employment of slightly more than 500; and, mechanical engineering, projected to grow by 17 throughout the State with another 33 replacement jobs. Overall, the State estimates there will be slightly more than 300 mechanical engineers employed in the year 2018.

And, despite the increases in the number of students who are receiving engineering degrees, and thus an increase in supply, the demand for those in engineering outstrips the supply. The National Association of Colleges and Employers (NACE) winter 2010 survey issued in March 2010 showed eight of the top ten college degrees by highest starting salary to come from engineering. Topping the list were students with degrees in petroleum engineering.¹

C. PROGRESS REPORT ON THE REGENTS’ ENGINEERING EXPANSION INITIATIVE

The following is a report card on how well each of the objectives in the Board of Regents’ 2007 Engineering Expansion Initiative has been met. The complete Engineering Expansion Initiative is contained in the appendix to this study.

- Objective: By 2012, UAA and UAF will produce 200 undergraduate trained engineers annually.

In spring 2007, the year the Regents’ Initiative was adopted, 72 students with baccalaureate engineering degrees graduated from the University of Alaska. UAA graduated 27 students with baccalaureate engineering degrees and UAF graduated 45 students. By spring 2010, engineering graduates at UAA had increased to 71 and at UAF to 77, for a total of 148 graduates. While the campuses combined will not quite meet the Regents’ target of 200 graduates per year by 2012, the Regents’ target of 200 undergraduate trained engineers will be achieved by the year 2014.


Ira Fink and Associates, Inc.
• Objective: By 2012, produce 20 baccalaureate construction manager graduates and train 40 to 60 certificate and two-year construction technology program graduates annually.

In spring 2010, there were no baccalaureate degrees awarded by the University of Alaska in construction management. While there were 118 students enrolled in the BS degree in construction management at UAA in fall 2010, the program has not been in existence long enough to produce any graduates. The newly approved UAF BS degree in construction management has just started and also has not yet produced any graduates. Although there have been no baccalaureate graduates to date, it is possible by the year 2012 that UAA will produce 20 construction management students in this program based on current student enrollment.

In fall 2010, there were 42 students enrolled in the associate's degree program in construction management at the UAA Community and Technical College and 38 in the Associate of Applied Science degree in construction management program at the UAF Community and Technical College (Tanana Valley Community College). By spring 2010, there were three graduates in the UAA program and six in the UAF program. While enrollments in the program have increased, and nine graduates completed the program in spring 2010, it is likely there will be at least that many graduates in 2012, but perhaps not the 40 to 60 certificate and two-year degree students identified in the Regents' objective.

• Objective: By 2012, including the 200 undergraduate trained engineers, produce a total of 340 graduates in engineering-related programs from certificate and associate to Ph.D. level programs.

In spring 2010, UAA granted three one-year certificates, two two-year AAS associate's degrees, and 41 master's degrees. Also in spring 2010, UAF granted 24 master's degrees and three Ph.D.'s. Altogether, there were a total of 74 engineering-related certificates, associate's degrees, master's, and Ph.D.'s awarded at UA in 2010. If 60 to 80 construction management and certificate degree program graduates can also be achieved, then it is likely the remaining 60 to 80 degree students needed to meet the Regents' targets for graduates of engineering-related programs will be met by 2012.

• Objective: Increase the number of project management certificate and master's degree recipients.

The number of project management master's degrees awarded at UAA has increased from 14 in spring 2007 to 27 in spring 2010. Other master's degrees awarded declined slightly during the same period from 21 in 2007 to 14 in 2010. At UAF, the number of master's degrees awarded declined from 28 in spring 2007 to 24 in spring 2010.

• Objective: Increase the number of students graduating from Alaska high schools who desire a career in engineering.

At UAA, the number of first-time baccalaureate degree-seeking freshmen increased from 43 in fall 2007 to 120 in fall 2010, including 100 who were graduates of public high schools in Alaska and 16 who were graduates of non-public high schools. At UAF, the number of first-time baccalaureate
degree-seeking freshmen declined from 97 in fall 2007 to 88 in fall 2010. Among the 88 students were 71 graduates of public high schools in Alaska and four who graduated from non-public Alaska high schools. In addition, many Alaska high school graduates who leave the State to start their higher education degree program return to Alaska to complete the degree. On average, over the past ten years, 12 percent of students entering engineering at UAA and 14 percent at UAF had started their higher education elsewhere and transferred to UA. More than one-half of these transfer students were Alaska high school graduates.

- **Objective:** Expand engineering research capacity and over the next four years increase engineering-related research by 50 percent from $18 million to $27 million per year annually.

The Regents have indicated that UAF is the UA campus for which sponsored research is a primary mission. The Institute of Northern Engineering (INE), the research wing of the UAF College of Engineering and Mines, has reached a plateau in research at approximately $18 million per year. A major limitation on expanding research is the lack of additional research facilities.

UAA faculty also compete for research grant funding. UA grant fund research totaled $447,000 in 2008-09 and $762,000 in 2009-10.

Space for faculty research as a component of their workload, at both UAA and UAF, is included in the space projections contained in this study.

- **Objective:** Expand professional development opportunities for existing professionals as required for the maintenance of their professional engineering (PE) license.

Neither UAA nor UAF currently offer continuous continuing education programs providing CEU credits for the professional engineering license in Alaska, although CEU credit courses are offered on an irregular basis. Some faculty are guest speakers at the professional engineering association’s meetings for which attendees receive partial CEU credit. Much of the engineering CEU credits are generated online by agencies, organizations, and employees themselves who provide the for-credit CEU programs in Alaska.

- **Objective:** Develop 1+3 programs in Juneau, Mat-Su, Kenai, and other UA community campuses as first-year feeder programs.

Currently, only the Juneau campus has developed a 1+3 program as a feeder program. In fall 2009, there were seven students enrolled in this program and one faculty at UA Southeast. At the same time, over the past ten years, 81 students have transferred from a UA community college to an engineering program at UAA or UAF.
- **Objective:** Increase the number of scholarships available to engineering students reaching senior status in time to graduate within five years.

There have been few new scholarships since the 2007 UA Engineering Expansion Initiative was approved. The scholarships are not near enough to provide any significant help in students graduating in less time. More needs to be done.

- **Objective:** Develop centers of excellence in niche disciplines such as energy, arctic engineering, and transportation through establishing ten named professor positions.

There have been no named professorships or endowed chairs created since 2007.

At the University of Alaska Fairbanks, The Alaska Center for Energy and Power (ACEP) was created in January 2008 with the goal of addressing energy issues important to Alaska. ACEP receives 95 percent of its funding through competitively awarded research grants. ACEP is an applied energy research program spanning a range of fossil and renewable energy technologies. ACEP has 14 staff and six student employees.

**Reaching the Regents' Engineering Initiative Objectives**

Overall, UAA and UAF have done an outstanding job in increasing undergraduate engineering enrollments leading to more students completing a BS degree in engineering. At the same time, while the persistence rate of these students has improved, it is likely that up to 50 percent of students entering or transferring into engineering will drop out and not complete a degree in engineering. Some of the students, approximately ten percent, will transfer to other University of Alaska programs and graduate from them. Others will choose a different career path.

As a result of the increased interest in engineering and using conservative estimates of combined increases in enrollment, the University will be graduating a total of 200 Bachelor of Science engineering graduates per year by the year 2014. Due to the impending decline in the number of Alaska high school graduates, the engineering programs at UAA and UAF may begin to level off in undergraduate enrollment based on projecting current rates of enrollment and retention.

Another important item has occurred since passage of the Regents' Engineering Expansion Initiative. ABET, Inc. (formerly the Accreditation Board for Engineering and Technology) has indicated to the University of Alaska Anchorage that faculty and facility shortages threaten UAA engineering accreditation.

**D. SUMMARY OF MAJOR FINDINGS**

Listed below is a summary of the major findings of the UA Engineering Plan 2010 study. For organizational purposes, the findings are organized into the following topical areas: enrollments, graduates, community colleges, employment, faculty, space, and retention.
Enrollments

- **Baccalaureate Enrollments:** Baccalaureate enrollments at the University of Alaska have surged since the passage of the Regents' Engineering Expansion Initiative in 2007. At UAA, BS engineering degree enrollments have increased from 405 in fall 2007 to 663 in fall 2010. At UAF, BS enrollments have increased from 401 in fall 2007 to 570 in fall 2010.

- **Graduate Degree Enrollments:** Graduate degree enrollments have also increased. At UAA, master's degree enrollments increased from 121 in fall 2007 to 136 in fall 2010. At UAF, master's degree enrollments have decreased from 89 in fall 2007 to 87 in fall 2010. Doctorate enrollments at UAF increased from 26 to 35 during the same period.

- **Engineering-Related Enrollments:** Enrollments in licensure programs, certificates, associate degree programs, and pre-majors also increased substantially. At UAA, enrollments in these areas declined from a total of 124 in fall 2007 to 107 in fall 2010, primarily due to reclassification by UAA of engineering pre-majors to engineering majors. At UAF, engineering-related enrollments increased slightly from a total of 53 in fall 2007 to 56 in fall 2010.

Projected Baccalaureate Enrollments

- **Projected Enrollments:** At UAA, baccalaureate degree enrollments have increased an average of 21 percent per year from fall 2002 to fall 2010. Using a conservative estimate of a ten percent per year average increase, baccalaureate enrollments in engineering at UAA could increase to 729 in fall 2011, 802 in fall 2012, and 882 in fall 2013. At UAF, baccalaureate enrollments have increased at an average of eight percent per year from fall 2002 to fall 2010. Using a conservative average annual increase of five percent per year, baccalaureate enrollments at UAF could increase to 599 in fall 2011, 628 in fall 2012, and 660 in fall 2013. The increases in enrollment do not of themselves necessarily represent program growth. Accompanying the recent increases in enrollments was a substantial increase in the number of students classified as seniors. At UAA, between 2006 and 2010, the number of seniors in the engineering baccalaureate programs increased by 111 students, or one-quarter of the enrollment increase. At UAF, during the same time, the number of seniors increased by 89 students, or slightly more than one-third of the total BS enrollment growth.

Graduates

- **Baccalaureate Engineering Degrees:** The number of students graduating in University of Alaska engineering programs has increased substantially since fall 2007. At UAA, baccalaureate engineering degrees increased from 35 in spring 2008 to 71 in spring 2010. At UAF, baccalaureate engineering degrees increased from 46 in spring 2008 to 77 in spring 2010. There were a total of 148 baccalaureate engineering degrees in spring 2010 at UA.

- **Degree Increases:** Based on historical enrollments and projections in the Engineering Plan 2010, baccalaureate engineering degrees are expected to increase to 118 by spring 2014 at UAA and to 96 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.
• **Engineering-Related Degrees:** Increases in degrees and certificates in engineering-related fields, including master’s degrees, have not had the same surge as bachelor’s degrees. At UAA, engineering-related degrees increased from 49 in spring 2008 to 52 in spring 2010. At UAF, engineering-related degrees and certificates declined from 41 in spring 2008 to 27 in spring 2010.

**Community Colleges**

• **Community College Engineering-Related Enrollments:** Engineering-related major enrollment at the UA Community and Technical Colleges increased dramatically since passage of the Regents’ Engineering Expansion Initiative. Engineering-related enrollment at the UAA Community and Technical College increased from 103 in fall 2007 to 209 in fall 2010. At the UAF Community and Technical College (Tanana Valley Community College), engineering-related enrollments increased from nine in fall 2007 to 38 in fall 2010.

• **Community College Engineering-Related Degrees:** Engineering-related degrees awarded at the UA Community and Technical Colleges have not yet matched the growth in enrollment. At the UAA Community and Technical College, degrees awarded in Architectural and Engineering Technology and in Construction Management remained flat at 17 in spring 2008 and 17 in spring 2010, after increasing to 22 in spring 2009. At the UAF Community and Technical College, associate degrees in Construction Management increased from one in spring 2008 to six in spring 2010.

**Employment**

• **Projected Engineering Employment Increases:** Based on data from the State of Alaska Department of Labor and Workforce Development, the number of engineers in Alaska is expected to increase from 3,782 in 2008 to 4,121 in 2018, or a ten percent change.

• **New and Replacement Engineering Jobs:** The State projections indicate that in addition to the nearly 340 new engineering jobs projected over the next ten years, there will also be 877 replacement job openings for a total of 1,217 projected jobs in engineering. This amounts to approximately 120 engineering job openings per year to the year 2018.

• **Projected Engineering-Related Jobs:** In engineering-related jobs, including drafting, technicians, cartography, the State estimates there were 3,128 employed in these areas in 2008. The State projects this employment could increase to 3,470 by 2018, or a growth of 342 new engineering-related jobs.

• **Replacement Engineering-Related Jobs:** The State projects that in engineering-related fields, there will also be a demand for 900 replacement workers in the next ten years.

• **Total Engineering-Related Jobs:** Taken together, with new jobs and replacement jobs, there will be approximately 1,242 engineering-related job openings in the State between 2008 and 2018. This amounts to approximately 120 jobs per year.
Faculty

- **UAA Engineering Faculty:** At the UAA School of Engineering, there are currently 27 full-time, regular-rank headcount faculty, five full-time temporary or term faculty, and 29 part-time faculty. This is equivalent to 38.5 FTE faculty.

- **UAF Engineering Faculty:** At the University of Alaska Fairbanks, there are 44 full-time, regular-rank headcount faculty, one part-time headcount faculty, five full-time temporary or term faculty, and nine part-time headcount faculty. This amounts to 43.5 FTE faculty.

Facilities Space

- **UAA Engineering Space Total:** The University of Alaska Anchorage School of Engineering occupies 40,664 assignable square feet in seven separate buildings. Of this space, 14,996 square feet is in the Engineering Building on the UAA campus, 313 square feet is in an Engineering Greenhouse on the UAA campus, and 10,297 square feet of the remaining 25,355 assignable square feet is leased space, some of which is approximately two miles from the UAA campus.

- **UAA Engineering Space Net:** When the temporary lease space is reduced from the UAA School of Engineering space, the School has 15,309 assignable square feet, or approximately 25,500 gross square feet.

- **Distribution of UAA Engineering Space:** Of the UAA space, both on-campus and in leased buildings, the current distribution of School of Engineering space is approximately 39 percent class laboratories, 39 percent office space, and the remainder in study space, special use, support, and research.

- **UAF Engineering Space Total:** At the University of Alaska Fairbanks, the primary space for the College of Engineering and Mines is in the Duckering Building. There is a small amount of space in the MIRL Building as well. Altogether, the UAF College of Engineering and Mines has a total of 47,071 assignable square feet, or approximately 78,452 gross square feet.

- **Distribution of UAF Engineering Space:** Of the UAF space, the current distribution of College of Engineering and Mines space is approximately 63 percent class laboratories, 30 percent offices, and remainder in study space, special use, support, and research.

- **UAA Existing Space per Faculty:** With a faculty headcount of 38.5 FTE, UAA has, including campus space and leased space, approximately 1,056 assignable square feet per faculty.

- **UAF Existing Space per Faculty:** With a faculty of 43.5 FTE, UAF has currently an average of 1,082 assignable square feet per engineering faculty.

- **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 6,920 square feet, the total UAF CEM space needs is 32,755 asf, or about 54,591 gross square feet. [These figures exclude space assigned to and needed by the UAF Institute of Northern Engineering (INE).]

Retention

• **Graduating in Engineering:** Not all students who enter engineering complete their degree. Based on historical data, it is estimated that approximately 50 percent of students entering engineering programs over the past ten years have or will graduate in engineering. Another ten percent will change their majors and graduate with another degree from the University of Alaska. About 40 percent of engineering students will drop out.

• **Time to Degree, UAA Engineering:** The time needed to complete a degree for engineering is longer, in general, than the four years that it would minimally take. At the University of Alaska Anchorage, from the years 2000 to 2002, six percent of entering first-time, full-time freshmen baccalaureate engineering students who could have graduated in four years did so. By five years, 14 percent had graduated and by eight years, 20 percent had graduated.

• **Time to Degree, UAF Engineering:** At the University of Alaska Fairbanks, from the years 2000 to 2002, 11 percent of entering first-time, full-time freshmen baccalaureate engineering students graduated in four years. By five years, 21 percent had graduated and by eight years, 28 percent had graduated.

E. WHAT ENGINEERS DO

What Engineers Do

According to the U.S. Bureau of Labor Statistics, the nature of the work that engineers do is the application of the principles of science and mathematics to developing economical solutions to technical problems. It is work that serves as the link between scientific discoveries and the commercial applications that meets societal and consumer needs.²

As noted by the Bureau of Labor Statistics, many engineers develop new products. In addition to their involvement in design and development, other engineers work in testing, production, or maintenance. Engineers in management are responsible for major components for entire projects. Engineers may also work in an industry, such as oil and gas, or in a type of technology, such as turbines or semiconductor materials.³

---


Most engineers specialize. The federal government's Standard Occupational Classification (SOC) system identifies 17 separate identifiable engineering specialties. These specialties, and descriptions of each, are shown in the appendix. In addition, many other specialties are recognized by professional engineering societies and each of the major branches of engineering has numerous subdivisions.

The Education of Engineers

As noted by the Bureau of Labor Statistics, a bachelor's degree in engineering is required for almost all entry level engineering jobs. Most engineering degrees are granted in electrical and electronics engineering, mechanical engineering, and civil engineering. This is true in Alaska and in all states. The broad education of engineers allows employers to meet staffing needs in which engineers may be in short supply. It also allows engineers to shift to fields with better employment prospects.

Engineering degree programs involve a concentration of study in an engineering specialty, along with courses in mathematics and the physical and life sciences, as well as courses in general engineering.

The Accreditation Board for Engineering and Technology (ABET) accredits college and university programs in engineering and engineering technology. ABET accreditation is based on a program's faculty, curriculum, and facilities; the achievement of a program's students; program improvement; and institutional commitment to specific principles of quality and ethics. All of the undergraduate engineering programs at the University of Alaska Anchorage and the University of Alaska Fairbanks are ABET accredited.

Not all students who enter into engineering degree programs complete them. While the University of Alaska engineering programs of study are designed to be completed in four years, many students take considerably longer to complete their engineering degree. The progress toward completing a degree is highlighted in this study. Both in Alaska and nationwide, only one-half of those who enter engineering complete their degree requirements.

Employing Engineers in Alaska

Employers in Alaska take different approaches in their hiring of an engineering staff. Those firms involved in design hire students immediately upon graduation, often taking the opportunity to work with the students through an internship with their company. Other companies and agencies that employ engineers require them to have advanced management skills that can only be obtained from experience by working in the field. Some of these firms hire permanent employees by first engaging contract employees as a testing period while others employ a broad, widely advertised recruiting process, and then select from among the applicants.

The firms that hire newly graduated engineers add to the engineer's education by providing training within their firms. Those whose hiring preferences and needs are for a highly trained engineer also augment their employee's education by paying for the cost of obtaining an advanced degree, most often in project management. The University of Alaska Anchorage master's degree program in Project Management was often mentioned in the employer interviews.

---


Ira Fink and Associates, Inc.
Licensure

Alaska, along with the other 49 states and the District of Columbia, require engineers to be licensed when they offer their services directly to the public. Those who are licensed are identified as professional engineers. Not all students who graduate become professional engineers; not all employers require their engineering employees to be licensed professional engineers. In data prepared by the State of Alaska for this study, it was determined that one of six individuals who graduated in engineering from the University of Alaska in the last ten years and is currently employed (other than self-employment) in Alaska is a professional engineer licensed in Alaska.

Facilities

The academic education of engineers occurs both in the classroom and in the teaching or class laboratory. As this study describes, the class laboratory facilities at both UAA and UAF are limited in terms of the space needed for the hands-on education that engineers require. In some cases, the laboratories themselves are dated.

The recent surge in engineering enrollments at the University of Alaska has led to a critical need for expanded teaching and research laboratory space as programs on both campuses continue to grow, as this report indicates.

---

Engineering Expansion Initiative

Introduction

University of Alaska,
Engineering Expansion Initiative
UAF, Duckering Building, Room 109, CEM Machine Shop. The CEM Machine Shop is a unique feature in the College of Engineering and Mines. Students have access to a modern and fully-equipped machine shop, including CNC machines. Mechanical engineering students take a class in the machine shop during their sophomore year, and then have access to the shop for academic and research purposes. As larger computer-controlled modern machines have been added, the lab has become quite crowded with equipment, as shown above.
APPENDIX A – ENGINEERING EXPANSION INITIATIVE

A. INTRODUCTION

In November 2007, the University of Alaska Board of Regents adopted the Engineering Expansion Initiative as part of their approval of the fiscal year 2009 University of Alaska Operating and Capital Budget Request to the State of Alaska. The intent of the initiative was to provide direction to the Regents' interest in helping meet the engineering workforce needs of the State of Alaska by producing more graduates from the University's engineering schools at the University of Alaska Anchorage and the University of Alaska Fairbanks.

The entire initiative and background is included below in this Appendix A.

B. UNIVERSITY OF ALASKA, ENGINEERING EXPANSION INITIATIVE

Primary Goal:

- By 2012, UAA and UAF will produce 200 undergraduate trained engineers annually, more than doubling the annual number of current undergraduate trained engineers.

Secondary Goals:

- By 2012, produce 20 baccalaureate Construction Management graduates and train 40-60 certificate and two-year Construction Technology program graduates annually. The two-year associate degree and certificate Construction Technology program started in fall 2006 with 69 students and 25 students in the first baccalaureate Construction Management class this fall (2007).
- By 2012, including the 200 undergraduate trained engineers, produce a total of 340 graduates in engineering related programs from certificate and associate to PhD level programs. This includes surveying and mapping, masters programs and post-baccalaureate certificates in areas such as Arctic Engineering.
- Increase the number of Project Management certificate and master degree recipients.
- Increase the number of students graduating from Alaska high schools who desire a career in engineering. These students will have the necessary math and science skills to be successful in engineering. A special emphasis will be placed on attracting UA Scholars and first-generation college students. The university will do this by:
  - Increasing outreach efforts to middle school and high school students including:
    - Career awareness opportunities
    - Sponsored math, science, and engineering type competitions
- Summer math and science intensives through UA campuses
- Institutionalizing the Alaska Native Science and Engineering Program (ANSEP) model.
- Increasing outreach efforts to middle and high school math, vocational, and science teachers for curriculum support and student preparation awareness.
- Provide merit and need-based college scholarships for students entering engineering programs who have demonstrated adequate high school math and science preparation.

- Expand Engineering Research capacity in areas important to Alaska including Transportation, Energy, and Climate Adaptation. Over the next four years, increase engineering related research by 50 percent from $18 million to $27 million.

- Expand professional development opportunities for existing professionals as continuing education will be required for maintenance of the PE license. Additionally, the National Council of Examiners for Engineering and Surveying (NCEES) Model Law adopted in 2006 proposes that licensing Boards require a MS or PhD in engineering, or at a minimum 30 credits of acceptable coursework beyond the BS degree, beginning in 2015.

- Develop 1+3 programs at Juneau, Mat-Su, Kenai and other UA community campuses as first-year feeder programs into the UAA and UAF engineering programs.

- Increase the number of scholarships available to engineering students reaching senior status in time to graduate within 5 years. Promote on-time graduation and full-time enrollment to completion. Providing for an initial goal of an annual $10,000 scholarship (room, board, books, tuition and fees) for 100 senior engineering students would cost $1.0 million annually.

- Develop centers of excellence in niche disciplines such as Energy, Arctic Engineering, and Transportation through establishing ten named professor positions (five-year private funding commitments of $250,000/ year/professor).

Current Status:

University of Alaska’s undergraduate engineering programs are listed below. Relative to public university engineering program offerings in small western states the breadth of Alaska’s engineering programs is reasonable, but not above average. The programs at UAA and UAF are complementary and collaborative with UAA offering general engineering with select emphases while UAF offers specialized discipline programs. Civil Engineering is the most popular discipline and requires the most graduates; therefore it is appropriate that it is provided at both locations.

- Engineering – Computer emphasis UAA
- Engineering – Electrical emphasis UAA
- Engineering – Mechanical emphasis UAA
- Geomatics UAA
- Civil Engineering UAA, UAF
- Mechanical Engineering UAF
• Electrical Engineering
• Computer Engineering
• Petroleum Engineering
• Geological Engineering
• Mining Engineering

Through the programs currently offered at UAA and UAF, 80 students earn undergraduate engineering degrees each year. Prior to the addition of the UAA general baccalaureate engineering (BSE) program, UAA graduated about 30 students; this number will increase to 90 by 2012. At UAF, 50 students receive baccalaureate degrees annually, with 110 expected in 2012.

The number of new students entering UA's undergraduate engineering programs reached more than 230 this fall, 130 at UAF and 100 at UAA. This compares to 80 first-time freshmen entering three years ago and 150 last year. Of these students, 46 are UA Scholars, nearly three times the number attending last year.

Other University of Alaska engineering related programs include:
• Programs for undergraduate engineering majors:
  – Engineering 2+2 Collaborative (UAA, UAF)
  – Alaska Native Science and Engineering Program (ANSEP)
• Engineering support careers including:
  – GIS, Geomatics, Surveying and Mapping, CAD Training
  – Construction Technology, Process Technology, Instrumentation
  – Construction Management, Project Management
• Engineering graduate level degrees and certificates:
  – Arctic, Electrical, Mechanical, Petroleum, Mining, and others.

Recent Investments in UA's Engineering Programs:
The engineering instruction programs at UAA and UAF cost $10.4 million in FY07 (UAA $4.2 million, UAF $6.2 million). This total is up from $6.5 million three years ago (UAA $2.4 million and UAF $4.1 million). With the exception of minimal state funded salary and benefit increases and the investments noted below, internal campus reallocations and tuition revenue have been the primary sources of the engineering expansion at both UAA and UAF. Additionally, UAF's Institute of Northern Engineering research faculty conduct nearly $18 million in research annually of which only $2 million is funded from state general funds.
UAA investments:

- FY06, UAA’s BSE program started with a combination of UAA funding reallocation and temporary UA funding totaling $200,000. There was an additional $200,000 of temporary funds provided for professional development and the Construction Technology programs.
- FY07, state funding was appropriated to base for UAA’s ANSEP program, BSE program faculty, engineering professional development, and related general education support courses totaling $780,000.
- FY08, the Board imposed a system-wide reallocation for health and engineering programs, with UAA engineering receiving an additional $200,000 for BSE faculty. There was also one-time workforce development funds provided for the start-up of the Construction Management program.

UAF investments:

- FY07, state funding of $150,000 was appropriated to fund career awareness activities, student recruitment efforts, and engineering instruction faculty to increase the number of new students.
- Also in FY07, $250,000 in-state funding was provided for engineering research related to the public/private partnership in cold climate housing and energy.

Current State Funding Requests:

The UA Board of Regents’ FY09 proposed budget includes a $2.2 million state funding request for Engineering and Construction Management program expansions augmented by $810,000 from resulting tuition revenue and grants for total program funding of $3 million. There is also state funding of $500,000 requested for Energy research and $500,000 for Transportation research related to the University Transportation Center.

- UAA: $1.15 million of the state funding is requested for UAA including a total of 8 faculty for BSE program, Civil Engineering, Geomatics, Construction Management and related advising and general education requirements.
- UAF: $850,000 of state funding is requested for student recruitment, advising for student success, core instruction in math and physics, lab equipment, graduate assistants for added lab focus, support of a graduate certificate in Construction Management and a modest amount for additional engineering instruction faculty. The Transportation and Energy research funding requests are centered within the UAF Institute of Northern Engineering.
- UAS: $100,000 is requested for a 1+3 program in Juneau and $65,000 for mining training support.

Future-Year Funding Needs:

Facilities and Equipment:

- Expansion of facilities for classrooms, laboratories, additional teaching equipment, faculty offices, and research space is critical to meet these initiative goals.
• UAA proposed an expansion to its engineering facility in the FY09 capital budget request. Two years prior, due to the impact of instruction program growth and dramatic engineering related research growth at UAF, a new engineering building was proposed as part of UAF’s 6-year capital plan.

• The Board of Regents’ FY09 proposed capital budget request includes planning funds for both facilities: $2.5 million for UAF’s engineering building (expected project cost $35 million) and $2.0 million for UAA’s expansion (estimated project cost $12 million).

• Partnering with industry for facilities has been successful at other universities including Oregon State University (see http://enr.oregonstate.edu/prosperity/building/, http://enr.oregonstate.edu/prosperity/building/naming.php, http://enr.oregonstate.edu/prosperity/building/power.html).

Engineering and General Education Faculty to Meet Student Demand:

• The Board of Regents’ FY09 operating budget request provides the faculty and graduate teaching assistants to meet FY09 student demand. Assuming the Governor and legislature provide sufficient funding based on current declared students progressing to junior and senior status and the planned incoming class in FY10, at least seven additional engineering programs and general education support faculty will be required for the two programs.

• Engineering faculty salaries are increasing as demand for engineers in private industry is increasing. Funding may be required to maintain competitive in recruiting and retaining the engineering faculty necessary to fully realize the goals of this initiative.

Advising, Tutoring, and Mentoring for Student Success:

• Meeting the stated engineering initiative goals requires sufficient advisors and mentors to enhance student success. Outreach efforts in middle and high schools, and retention of students while in engineering requires active involvement of advisors and mentors to guide students. Below are a few examples:
  - Summer intensives workshops for middle and high school student focused on math, engineering and vocational technology: A two-week session accommodating 300 students will cost $200,000.
  - Perspective-Reaching 300 9th graders: Fewer than 65% of the reported 11,500 Alaska ninth-graders graduate from high school which is near the bottom in the nation. There are about 7,300 Alaska high school graduates annually of whom fewer than 46% go to college; this is again near the bottom in the nation. Of the graduates who go to college over 60% attend in-state at UA; that is about 2,100 first-time freshmen, which is below national average, but significantly improved from the 45% attending in-state 10 years ago. Of those that do attend UA, two-thirds require remedial education, many in more than one subject and for more than one-semester (i.e. 2 or 3 semesters of math, English, and science). Reaching 300 ninth-graders is 2.5% of the Alaska ninth-graders. Setting a target of 20 annual intensive workshops could reach 50% of Alaska ninth-graders ($4 million).
- Sponsoring high school math and engineering competitions such as Lego Robotics and national math and computer programming contest. A state director who organizes industry volunteers and support events in various communities would cost $300,000 annually.
- Increase collaboration with school districts to encourage dual credit.

Measures of Success:

Below are a few indicators that will be followed to predict and measure success of this initiative.

- Increase enrollment and retention rates of students with declared engineering majors
- Increase graduation rates in the engineering disciplines
- Create joint college and School of Engineering alliances that include regular gatherings of the representatives to collaborate towards attaining aligned goals
- Conduct regular joint meetings among colleges and School of Engineering advisory councils, and dean/faculty/staff groups
- Establish joint strategies to be implemented and supported by UA engineering programs
- Increase number of internship and scholarship opportunities
- Maintain the excellent in-state job placement rates for UA engineering graduates
Update on the Engineering Plan 2010

Ira Fink, Ph.D., FAIA
UPDATE ON THE ENGINEERING PLAN 2010
Ira Fink, Ph.D., FAIA

Background
The two engineering facility projects scheduled for presentation at the Board of Regents Facilities and Land Management Committee meeting on September 20 achieve three important objectives for engineering at the University of Alaska:

• First, they support and fulfill objectives of the Board of Regents’ 2007 Engineering Expansion Initiative.
• Second, they meet the recommendations outlined in the University of Alaska Engineering Plan 2010 presented to the Board of Regents at their February 2011 meeting.
• Third, when the projects are completed, they position the University of Alaska Anchorage and the University of Alaska Fairbanks to respond to the changes and challenges of an engineering education into the 21st century.

This brief report will serve as an update on the Regents’ Engineering Expansion Initiative and the Engineering Plan 2010.

The Regents’ Engineering Expansion Initiative
The Board of Regents in November 2007 set forth a broad agenda for helping meet the engineering workforce needs of the State of Alaska by producing more graduates from the University’s engineering schools at the University of Alaska Anchorage and the University of Alaska Fairbanks. In response to the need for additional engineering and engineering-related graduates in the State of Alaska, the Regents established a goal that by the year 2012, UAA and UAF would graduate 200 undergraduate engineers annually, more than doubling the annual number of the engineering undergraduate trained engineers at that time.

In addition, the Regents set forth the goal of achieving 140 graduates per year in engineering-related programs from Certificate and Associate to Master’s and Ph.D. level programs. This included areas such as surveying and mapping, Master’s programs, and post-baccalaureate certificates in areas such as arctic engineering.

The Regents’ Engineering Expansion Initiative also established the Regents’ objectives to:

• Assist in increasing the number of students graduating from Alaska high schools who desire a career in engineering.
• Encourage the expansion of engineering research capacity in areas important to Alaska, including transportation, energy, and climate adaptation.
• Expand professional development opportunities for existing professionals through continuing education as a requirement for maintenance of their professional engineering license.

• Identify the need to develop feeder programs at Juneau, Mat-Su, Kenai, and other UA community campuses.

• Increase the number of scholarships available to engineering students reaching senior status in time to graduate within five years.

• And, encourage the development of centers of excellence in niche disciplines such as energy, arctic engineering, and transportation through establishing named professor positions.

**Engineering Plan 2010**

In February 2010, the Regents received an omnibus indicators report, the *Engineering Plan 2010*, about the progress of the program and recommendations regarding the Engineering Expansion Initiative as a follow-up to the Board action in June 2010 authorizing the University administration to proceed with project development.

The *Engineering Plan 2010* described the significant increases that occurred in engineering enrollment at the two campuses since 2007 and the progress that was being made in reaching the graduation goals set out by the Regents. In spring 2010, there were 154 baccalaureate engineering degrees granted at the two campuses, compared to 72 in spring 2007. Although this was a doubling of graduates, the *Engineering Plan 2010* indicated that, based on the completion rates of engineering degrees, it would be until the year 2014 that the Regents' objective of achieving 200 undergraduate engineering degrees per year would be met.

The *Engineering Plan 2010* also described the need for more trained engineering in Alaska, based on workforce projections prepared by the State of Alaska Department of Labor and Workforce Development. The plan described changes that are occurring in Alaska high school graduations, graduation rates, and the increased interest in Alaska high school students in enrolling in engineering programs at the two campuses. It highlighted the current employment status of past engineering graduates from UAA and UAF and noted that of those who had graduated within the past ten years, two-thirds remained in Alaska and one-third had left the State.

**Engineering Plan 2010 Recommendations**

The *Engineering Plan 2010* recommended maintaining the Regents' objective of graduating a minimum of 200 undergraduate trained engineers annually. It also recommended objectives on increasing the graduation rate percentage of students who enter the baccalaureate engineering programs, reducing the dropout rate, and making internal changes to minimize the time to graduation for these students.
And, of importance to the campuses, the Engineering Plan 2010 recommended that both UAA and UAF begin detailed facility programming and conceptual design for new engineering buildings on their campuses to accommodate the rapid growth in the engineering programs and outlined a projected square footage for engineering facilities without describing the facilities in detail.

The Regents accepted the Engineering Plan 2010 and authorized the President and the campuses to begin programming and conceptual design on new facilities at both campuses to meet the instructional needs of engineering education and to help alleviate the space shortages created by the recent surges in engineering enrollment.

Programming, Planning, and Conceptual Design

Following the Board of Regents direction, the campuses immediately solicited proposals from design professionals, interviewed firms, and selected separate teams to begin working on the engineering buildings at both UAA and UAF. These detailed space programming activities began in May 2011 and were carried out through summer 2011 at both campuses. This involved teams of architects and engineers, facilities staff from both campuses, faculty and staff in the College of Engineering and Mines at UAF and the School of Engineering at UAA, and representatives from the University of Alaska Statewide offices.

Both campuses worked diligently to identify their most urgent needs for space, identified methods for changing how instruction, teaching, and learning would take place, sought methods to achieve multiple uses of new spaces, and, in a highly interactive series of campus workshops, completed facility programs that will serve to meet the Regents' objectives and will result in projects that will achieve the most for the money invested in these new projects.

In developing their facility programs, both campuses faced site challenges for their projects, incorporated maximum reuse of their existing engineering facilities to minimize their new space needs, and remained within the objectives of the Engineering Plan 2010 in their space allocation decisions.

Both campuses have now completed facility programs that meet their distinctive objectives in how engineering education takes place on their campuses, based on the degree programs each offers and their mutual goals of creating projects that facilitate interactive, collaborative, and multidisciplinary teaching and research.

Proposed Projects

The proposed engineering facility projects at both campuses are a combination of technology-enhanced instructional classroom space, extensive development of hands-on class laboratories in their engineering disciplines, expansion of computer laboratories for individual and group instruction, and provision of space for student projects and engineering on display. Both proposed projects build upon the ability to accommodate to changes that are occurring in engineering education, including distance education, undergraduate research, and the ability to have space for students.
that does not exist at either campus at present. Both proposed projects are based on laboratory
intensive problem solving programs.

Moreover, both buildings provide space for machine shops and shop services, create space for
building support, and identify areas for material loading, docks, and supply delivery and storage.
Both campuses incorporate in their projects campus-wide Registrar-scheduled classrooms, include
space for current faculty, and have provision for additional faculty offices. Although each project
was separately programmed, both design teams independently chose the same size structural and
space planning module, thereby allowing flexibility of space changes over time.

Most significantly, the project teams at both campuses have worked diligently and have created in
two dimensions a vision for engineering facilities that will encourage and excite students as they
enter engineering programs at the University of Alaska.

Project Schedule
As currently proposed, both projects will follow similar generalized future schedules as follows:

- Fall 2011    Regents’ approval
- Spring 2012   Schematic design complete
- Fall 2012     Design development complete
- Winter 2013   Construction documents complete
- Spring 2013   Construction starts
- Fall 2015     New building construction complete
- Fall 2016     Renovations complete
Program Overview

UNIVERSITY of ALASKA ANCHORAGE

School of Engineering
Engineering & Industry Building

Project No. 08-0024

September 20, 2011
Project Vision

Create an environment for enhancing Engineering teaching, learning, and research that fosters collaboration and inspires greater achievement and success. Create a center of activity that is an economic stimulus and powerhouse for Alaska that attracts and engages students, faculty, and the engineering and industry community.
Program
<table>
<thead>
<tr>
<th>Category</th>
<th>Subtotal</th>
<th>New Bld</th>
<th>Existing</th>
<th>Percentage of Phase 1</th>
<th>Need</th>
<th>Phase One</th>
<th>Percent of TOTAL Site Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Instructional Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Instructional Labs</td>
<td>41,745</td>
<td>24,322</td>
<td>17,787</td>
<td>6,534</td>
<td>36.4%</td>
<td>17,424</td>
<td></td>
</tr>
<tr>
<td>B Lab Support Space</td>
<td>16,154</td>
<td>9,801</td>
<td>3,630</td>
<td>6,171</td>
<td>14.7%</td>
<td>6,716</td>
<td></td>
</tr>
<tr>
<td>C Classroom Space</td>
<td>36,486</td>
<td>14,978</td>
<td>9,992</td>
<td>4,984</td>
<td>22.4%</td>
<td>16,360</td>
<td></td>
</tr>
<tr>
<td>D Academic Support</td>
<td>2,294</td>
<td>422</td>
<td>120</td>
<td>302</td>
<td>0.6%</td>
<td>1,872</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>96,679</td>
<td>49,520</td>
<td>31,529</td>
<td>17,991</td>
<td>74.1%</td>
<td>42,372</td>
<td></td>
</tr>
<tr>
<td>II. Collaborative Teaching/ Industry Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Labs</td>
<td>3,630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
<td>3,630</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>3,630</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
<td>3,630</td>
<td></td>
</tr>
<tr>
<td>III. Office Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Admin &amp; Faculty Space</td>
<td>15,465</td>
<td>9,945</td>
<td>6,315</td>
<td>3,630</td>
<td>14.9%</td>
<td>5,520</td>
<td></td>
</tr>
<tr>
<td>B Office Support</td>
<td>3,750</td>
<td>2,150</td>
<td>1,550</td>
<td>600</td>
<td>3.2%</td>
<td>1,800</td>
<td></td>
</tr>
<tr>
<td>C Graduate &amp; TA Space</td>
<td>5,440</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
<td>5,440</td>
<td></td>
</tr>
<tr>
<td>D Student Organization Space</td>
<td>2,000</td>
<td>320</td>
<td>320</td>
<td>0</td>
<td>0.5%</td>
<td>1,680</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>26,655</td>
<td>12,415</td>
<td>8,185</td>
<td>4,230</td>
<td>18.6%</td>
<td>8.4%</td>
<td>14,440</td>
</tr>
<tr>
<td>IV. Common Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Public Space</td>
<td>11,925</td>
<td>3,525</td>
<td>3,525</td>
<td>0</td>
<td>5.3%</td>
<td>9,000</td>
<td></td>
</tr>
<tr>
<td>B Student Space</td>
<td>7,680</td>
<td>990</td>
<td>710</td>
<td>280</td>
<td>1.5%</td>
<td>6,690</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>19,605</td>
<td>4,515</td>
<td>4,235</td>
<td>280</td>
<td>6.8%</td>
<td>3.1%</td>
<td>15,690</td>
</tr>
<tr>
<td>VI. Building Support Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A General Building Support</td>
<td>420</td>
<td>420</td>
<td>370</td>
<td>0</td>
<td>0.6%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>420</td>
<td>420</td>
<td>370</td>
<td>0</td>
<td>0.6%</td>
<td>0.3%</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>146,989</td>
<td>66,870</td>
<td>44,319</td>
<td>22,501</td>
<td>45.5%</td>
<td>76,132</td>
<td></td>
</tr>
</tbody>
</table>

**Phase One Target Net**: 64,256
-2,614
Less Registrar classrooms: 2,514
Delta: -100

**New Building**: 44,319

**Existing SoE Building**: 22,501

**NEW BUILDING**
- Efficiency: 52% to 60%
- GSF New Building: 85,229 to 73,865

**PHASE 1 & 2 ONLY**
- Efficiency: 52% to 58%
- Total GSF: 231,636 to 215,090

---

**Current Draft Program Summary**

---

**UAA Engineering & Industry Building**

---

**SoE BOR Meeting**

Sept 20, 2011
<table>
<thead>
<tr>
<th>Category</th>
<th>Space Description</th>
<th>Square Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Engineering</td>
<td>Electromagnetic Eng Lab</td>
<td>1,089 nsf</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Electrical Utility Power &amp; Transmission</td>
<td>1,089</td>
</tr>
<tr>
<td>(ME/ EE)</td>
<td>Controls/ Instrumentation Engineering</td>
<td>1,089</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>Corrosion/ Materials</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Kinematics &amp; Machine Design</td>
<td>1,089</td>
</tr>
<tr>
<td>(ME/ CE)</td>
<td>Heat &amp; Mass Transfer</td>
<td>1,089</td>
</tr>
<tr>
<td></td>
<td>HVAC Engineering</td>
<td>1,089</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Fluids Engineering</td>
<td>2,178</td>
</tr>
<tr>
<td></td>
<td>Soil Mechanics Engineering</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Mechanics of Materials Lab</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Transportation Engineering</td>
<td>1,815</td>
</tr>
<tr>
<td></td>
<td>Environmental Engineering</td>
<td>1,815</td>
</tr>
<tr>
<td>Geomatics</td>
<td>Land Surveying</td>
<td>2,178</td>
</tr>
<tr>
<td></td>
<td>Hydrographic</td>
<td>1,089</td>
</tr>
<tr>
<td></td>
<td>Photogrammetry / Cartography</td>
<td>1,452</td>
</tr>
<tr>
<td>Computer Systems</td>
<td>Computer Systems Lab</td>
<td>1,089</td>
</tr>
<tr>
<td>Shops Gen Use</td>
<td>Injection Molding &amp; Rapid Prototyping</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Milling &amp; Lathing Mech. Engineering</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Wood Projects Shop</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Machine Shop</td>
<td>2,178</td>
</tr>
<tr>
<td>General Use</td>
<td>Mud Room</td>
<td>182</td>
</tr>
<tr>
<td>Student Work Space</td>
<td>Secure Lab Storage</td>
<td>2,178</td>
</tr>
<tr>
<td>General Maint Support</td>
<td>Equipment Maintenance</td>
<td>545</td>
</tr>
<tr>
<td></td>
<td></td>
<td>34,122 nsf</td>
</tr>
</tbody>
</table>

Note: Blue indicates Placement in Existing SoE Building
### Preliminary Classroom Spaces (Phase 1)

#### Tiered/ Sloped Floor Classrooms
- Lecture Hall (60)  
  - 1 @ 1,690  
  - 1,690

#### Flat Floor Classrooms
- Seminar/ PBL (24 seats)  
  - 6 @ 720 ea  
  - 4,320
- Distance Learning/ Gen (1 @ 32, 1 @ 16)  
  - 1,204

#### Computational Classrooms
- Large (50)  
  - 1 @ 1,750  
  - 1,750
- Med (36 seats)  
  - 5 @ 1,260  
  - 6,300

#### Student Classrooms
- Thesis Design  
  - 0

#### Misc. Support
- 467

---

Classrooms distributed between existing and new buildings

---

Engineering & Industry Building
Engineering Lab Issues

- Confederation of Disciplines
- Ground Floor Popularity
- Conflicting Requirements
  - Vibration
  - Air Quality/Exhaust
  - Power Quality/EMI
- Equipment Driven Design
- Service Requirements
  - HVAC
  - Electrical
  - Compressed Air
  - Water

Engineering & Industry Building
SoE User Participation is Key

- Equipment in Labs Influences Design
- **Schematic Design** – What’s where and Who’s next to Who
  - 2 to 3 Workshops with users during this phase (Nov thru Feb)
- **Design Development** – Intensive, Iterative One on One Lab
  User involvement “Diving into Detail”
  - 3 to 4 Workshops with users during this phase (Mar thru June)
Preliminary Existing Engineering Building Repurposing

Existing Building Accounts for 22.5K asf (half of new building asf)

- Mix of Labs, Offices, Classrooms
- 1st Floor – Labs/Shops with exterior access and overhead crane; environmental lab; support shops and equipment service area
- 2nd Floor—PM Program offices, classrooms, distance classrooms
- 3rd floor ESM offices and classrooms, Geomatics offices and labs

This is an integral part of Phase 1 and will be sequenced in such a way to minimize program disruption.
Phase 1 Recap

- Consolidates program space currently spread across campus
- Provides critical (deficient) space for current program to maintain accreditation
- Allows re-use of existing building after repurposing
- Uses a site and design that is expandable
- Considers future campus connections
Preliminary Phase 2

- Approximately—76K ASF (about 126K GSF)

- Phase 1 fulfills the current critical need to maintain accreditation

- Phase 2:
  - Supports expected growth of undergrad, graduate programs and research
  - Instructional Space (labs, support space, classrooms*)
  - Industry, Collaborative Teaching and Professional Development Space
  - Office Space (Staff, Faculty, Grad Students, Student Orgs)
  - Common Space (Public, Student)

\* Includes large section centrally scheduled classrooms and labs that are omitted from or shared with Phase 1 labs
Overall Project Schedule

- **2011**
  - Nov 2011: Design

- **2012**
  - 4 Mo: Design
  - Feb 2012: Design
  - May 2012: Bidding/ Negotiation, Permitting, Construction

- **2013**
  - 4 Mo: Bidding/ Negotiation, Permitting, Construction
  - Move

- **2014**
  - Bidding/ Negotiation, Permitting, Construction

- **2015**
  - Bidding/ Negotiation, Permitting

- **2016**
  - Jun 2016: Construction

- New School of Engineering
- SoE Repurposing
- Structured Parking

**Engineering & Industry Building**
PROJECT COST PROJECTION SUMMARY

For All Project Components

Including Annual Operating Cost
### BUILDINGS

<table>
<thead>
<tr>
<th>Phase 1 Building</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Area in GSF</strong></td>
<td>75,187</td>
</tr>
<tr>
<td><strong>Construction Cost ($581/SF)</strong></td>
<td>$43,699,099</td>
</tr>
<tr>
<td><strong>15% Contingency</strong></td>
<td>$6,554,865</td>
</tr>
<tr>
<td><strong>Escalation (30 Mths @ 3.5% = 9%)</strong></td>
<td>$4,513,320</td>
</tr>
<tr>
<td><strong>Cost/SF (excluding contingency)</strong></td>
<td>$668</td>
</tr>
<tr>
<td><strong>Total Construction Cost</strong></td>
<td>$54,767,284</td>
</tr>
<tr>
<td><strong>Total Project Cost</strong></td>
<td>$78,238,977</td>
</tr>
<tr>
<td><strong>Total Project Cost/SF</strong></td>
<td>$1,041</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Existing Building</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Area (40,000 GSF)</strong></td>
<td>40,000</td>
</tr>
<tr>
<td><strong>Construction Cost ($230/SF)</strong></td>
<td>$9,200,000</td>
</tr>
<tr>
<td><strong>15% Contingency</strong></td>
<td>$1,380,000</td>
</tr>
<tr>
<td><strong>Escalation (30 Mths @ 3.5% = 9%)</strong></td>
<td>$950,190</td>
</tr>
<tr>
<td><strong>Cost/SF (excluding contingency)</strong></td>
<td>$265</td>
</tr>
<tr>
<td><strong>Total Construction Cost</strong></td>
<td>$11,530,190</td>
</tr>
<tr>
<td><strong>Total Project Cost</strong></td>
<td>$16,471,700</td>
</tr>
<tr>
<td><strong>Total Project Cost/SF</strong></td>
<td>$412</td>
</tr>
</tbody>
</table>

**Construction Cost Estimate Total:** $86,242,402

**Project Budget Estimate Total:** $123,203,431

### PARKING

<table>
<thead>
<tr>
<th>Parking Garage</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Parking Stalls</strong></td>
<td>500</td>
</tr>
<tr>
<td><strong>Cost / Stall</strong></td>
<td>$29,892</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$14,946,102</td>
</tr>
<tr>
<td><strong>5% Contingency</strong></td>
<td>$747,305</td>
</tr>
<tr>
<td><strong>Escalation (24 Mths @ 4% = 8.2%)</strong></td>
<td>$1,219,602</td>
</tr>
<tr>
<td><strong>Total Construction Cost</strong></td>
<td>$16,913,009</td>
</tr>
<tr>
<td><strong>Total Project Cost</strong></td>
<td>$24,161,441</td>
</tr>
<tr>
<td><strong>Total Project Cost/stall</strong></td>
<td>$48,323</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temporary Parking</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Parking Stalls</strong></td>
<td>420</td>
</tr>
<tr>
<td><strong>Cost / Stall</strong></td>
<td>$6,065</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$2,547,296</td>
</tr>
<tr>
<td><strong>15% Contingency</strong></td>
<td>$382,094</td>
</tr>
<tr>
<td><strong>Escalation (12 Mths @ 3.5%)</strong></td>
<td>$102,529</td>
</tr>
<tr>
<td><strong>Total Construction Cost</strong></td>
<td>$3,031,919</td>
</tr>
<tr>
<td><strong>Total Project Cost</strong></td>
<td>$4,331,313</td>
</tr>
<tr>
<td><strong>Total Project Cost/stall</strong></td>
<td>$10,313</td>
</tr>
</tbody>
</table>

**Operating & Maintenance Annual Cost Estimate:** $1,189,000
UAA Campus Master Plan Amendment
UAA School of Engineering and Industry Building Master Plan Amendment

1. Purpose

Since the UAA campus master plan was drafted in 2003, adopted in 2004, and amended in 2009 a number of significant changes regarding the UA Engineering program have been made. In 2007, the UA Board of Regents adopted the Engineering Expansion Initiative with the primary goal the University of Alaska will produce 200 undergraduate trained engineers annually. In 2010, UA hired Ira Fink and Associates, Inc. to provide a summary progress report on the accomplishments made to meet the objectives of the 2007 Engineering Expansion Initiative; an indicator report identifying details of the engineering enrollment, engineering education and engineering employment in the State of Alaska; a summary of projected engineering enrollments and graduates and the resultant need for facilities to meet the BoR goals in engineering education; and a statement of the importance that engineers have in the economy of the State of Alaska and the role that the University of Alaska has in assisting in meeting the demand for engineering employment in the State. The purpose of this master plan amendment is to address the School of Engineering and Industry Building and its connection to the main campus. This amendment refers to the 2004 Plan as updated in 2009 with the Amendments for the Health Science District and the Sports and Housing District. The notions of densifying the campus core and connecting the Health District with campus north of Providence are themes that are carried forward in the 2009 Master Plan Update and this amendment.

2. Site Consideration:

Two sites were considered as possible sites for the new Engineering and Industrial Building. One was a site north of Engineering Building but south of Mallard and referred to the UAA Drive Site and another was a site in the South Parking lot just west of ANSEP referred to as the Providence Drive site. See Figure 1, below. Both sites are identified as future building sites in the 2004 Campus Master Plan (Amended in 2009). The Providence site occupies a portion of the south parking lot totaling 1.7 acres, bounded by Providence Drive to the south, Spirit Drive to the East, the campus bookstore to the North, and a grassy parking lot median to the west.

The UAA Drive site is located to the north of the existing Engineering Building, bounded by UAA Drive to the East, Mallard Drive to the north, Chester Creek watershed to the west, and the existing school of Engineering to the South, occupying 4.16 acres.
The project team did an extensive analysis of both sites. In order to evaluate each site's appropriateness for this project, the entire precinct around the proposed sites was studied to identify the idiosyncratic nature of the area. The project team worked closely to establish a methodology for choosing the appropriate site. A site selection matrix was developed and used for considering quantitative and qualitative characteristics of the sites. Soil samples were also taken for the sites. Both the Providence Drive Site and the UAA Drive site were considered concurrently. Characteristics that were studied included solar exposure, prevailing winds, utilities, views of the building, setbacks, topography, pedestrian and vehicular circulation, soils conditions, and fit, expandability, adjacencies, UAA and SOE Highest and best use, compliance with master plan among others. Sample Matrix is Figure 2 below. The complete matrix is Appendix 1. Once evaluated the Providence Site was the preferred site. Of 730 possible points Providence Drive Site scored 616; the UAA Drive site scored 383.
### Site Selection Process

<table>
<thead>
<tr>
<th>Criteria Examined</th>
<th>Oct 12, 2011</th>
<th>Providence Drive</th>
<th>UAA Drive</th>
<th>Score</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems &amp; Networks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoning &amp; Restrictions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Attributes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visibility &amp; Prominence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic Synergies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campus Connectivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Attributes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsurface Conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Prep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providence Road</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

**Figure 2. Sample Site Selection Matrix**

### 3. Description

Based upon site evaluations and analysis, the UAA School of Engineering and Industry Building master plan was developed along Providence Drive, north of the new Health Sciences Building (Figure 3). The area south of Providence Drive is envisioned as the Health Sciences district, connected to main campus by pedestrian pathways and a central circulation spine. North of Providence Drive, a new academic building to the west and the School of Engineering and Industry Building to the east extend the new pedestrian network from the main campus and form a quadrangle spanning across Providence Drive. Locating the Engineering and Industry Building at this site provides opportunities to promote engineering and foster new and existing relationships with industry and with medical, business, and education programs at UAA. This plan meets the spirit, objectives, and intentions of the campus master plan.
4. Development Intent

Two phased implementation of the Engineering and Industry Building is anticipated. The first phase is conceptually planned as a rectilinear building oriented north to south at the west side of the Providence Drive site, with an engineering yard and service access to the east. Locating Phase I to the west side of the site allows flexibility in the Phase II expansion of the facility to the east. The intent to develop this portion of the campus is to accommodate phased implementation of the program; include the ANSEP Building to the School of Engineering composition; provide the conduit to connect the campus spine the Health Sciences district; accommodate building service requirements easily; emphasize the aspects of “Engineering on Display”; and enhance the School of Engineering’s prominence and visibility-be the gateway to the School of Engineering; provide an attractive, vibrant campus building; and create the perception of the university as a quality institution to attract and retain students in Alaska.

5. Policy Compliance

Does this amendment meet the requirements of 05.12.030 B.

1. Projected Enrollment and other factors affecting the need for the Facility and Infrastructure: This amendment allows the addition of deficient program space square feet to the UAA Campus to meet its current program requirements as defined
in the BOR 2007 Engineering Initiative and validated in the Ira Fink UA 2010 Engineering Plan. The site allow for expansion for future phases.

2. General Areas for land acquisition and disposal: No acquisitions or disposals are envisioned.

3. The general location of new or upgraded infrastructure, including roads, parking, pedestrian circulation, transit circulation and utilities.
   - Parking must conform to Municipality of Anchorage parking requirements
   - Parking demand will require 495 new parking spaces
   - To sustain the parking requirement, structured parking is required
   - Multiple sites being considered (Figure 3)

4. Demolition of buildings, structures and facilities:
   - No building to be demolished
   - The temporary parking lot will be incorporated into the phase I parking

5. General location, size and purpose of new buildings, structures and facilities:
   - Planned growth for this district is shown in the amended 2009 UAA Campus Master Plan on Pages 13 and 92
   - 2008-18
     - Honors college and classroom building
   - 2018-2020
     - College of Education Learning Lab
     - Administration, Alumni Relations and Visitor Center Building
     - Health Sciences Phase III
     - Engineering Phase II
   - After 2028
     - Health Sciences Ph IV
     - Medical and Pharmacy Schools

6. Guidelines for landscaping:
   - Landscaping will comply with the MOA ordinance and the Landscaping and Amenities guidelines of the amended UAA Campus Master Plan 2009 p 117, 118.

7. General locations and intent for open spaces, plazas, etc.
   - The quad will be the central theme of this district. In future phases the quad and pedestrian overpasses will unify the main campus and this district. The quad will be developed partially with each phase.

8. Guidelines for signage, both freestanding and on buildings and structures:
   - Signage will be accomplished in accordance with MOA approved UAA Unified Exterior Sign Plan October 2007. Signage on new facilities must comply with the plan.
9. Architectural guidelines for building, structures and facilities:
   - Architectural Guidelines are as provided in the UAA amended Campus Master Plan 2009 pages 119-120. This district will be built out consistent with them.

10. Environmental and cultural issues, ADA access and Energy conservation:
    - Will comply with the existing UAA Campus Master Plan p102 through 106
    - Facilities will comply with the law on ADA access.
    - Facilities will incorporate energy efficient building envelopes, heating and cooling systems, lighting, and building automation systems.

11. The relationship of the campus to its surroundings and coordination with local government land use and ordinances:
    - Will comply with existing Master Plan guidance on page 123, Building Cluster Guidelines.
    - Phase I features include: 3 story plus penthouse, glass, metal panels, granite, flat roof, landscaping. Orientation such as to not shadow neighbors or give views into industrial space.

    - Site projects discussed in 5 above. Campus wide project on p 85 of Campus Master Plan.

6. Approvals
   President Recommends:

   Motion:

   The Facilities and Land Management Committee recommends that:

   The Board of Regents in accordance with Regent's Policy 05.12.030.C approves UAA Engineering and Industry Building Campus Master Plan Amendment. This amendment will be incorporated into the revision of the 2004 UAA Campus Master Plan in due to begin in 2012.
Appendix A: Engineering and Industry Building Site Analysis and Comparison Matrix
SITE ANALYSIS

2009 MASTERPLAN AMENDMENT

VIEWS
SITE ANALYSIS

TOPOGRAPHY

SOILS
SITE ANALYSIS

UTILITIES

VEHICULAR CIRCULATION
SITE ANALYSIS

CAMPUS & PUBLIC TRANSIT

PEDESTRIAN CIRCULATION
<table>
<thead>
<tr>
<th>Master Plan &amp; Site Development</th>
<th>Providence Drive Site</th>
<th>UAA Drive Site</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score</td>
<td>Weight (150)</td>
<td>Total</td>
</tr>
<tr>
<td>A. UAA Highest &amp; Best Use</td>
<td>4</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>B. Site Highest &amp; Best Use</td>
<td>5</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>C. Compliance to Master Plan</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>D. Site Fit</td>
<td>5</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>E. Phase Year Growth</td>
<td>5</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>F. Long Term Growth</td>
<td>5</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>G. Guiding Principles-Campus Core development</td>
<td>5</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>H. Guiding Principles-Develop buildings on paired</td>
<td>5</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Zoning &amp; Restrictions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Height FAR restrictions</td>
<td>5</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>J. Site coverage &amp; Setback requirements</td>
<td>4</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>K. Wetlands Development</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Utilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. Availability of Major Utilities</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>M. Adequacy of Utilities</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>N. Utility Relocation</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O. Automobile access</td>
<td>5</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>P. Access to public transit</td>
<td>5</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Q. Parking</td>
<td>4</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Section</td>
<td>Providence Drive Site</td>
<td>Score</td>
<td>Weak</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>R.</td>
<td>Parking Relocation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>S.</td>
<td>Track &amp; Service access</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>T.</td>
<td>Road Network</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

2. Dynamic Attributes

Visibility & Prominence

| A. External Visibility | 5 | 5 | 5 | 25 |
| B. Campus Prominence | 5 | 5 | 3 | 20 |
| C. Monuments | 4 | 4 | 4 | 16 |
| D. Iconography | 5 | 5 | 3 | 20 |

Academic Synergies

| E. Proximity to Existing Sites | 2 | 2 | 4 | 8 |
| F. Proximity to Health Sciences | 5 | 5 | 4 | 20 |
| G. Exposure to non-engineering students | 4 | 4 | 3 | 12 |

Social Synergies & Campus Connectivity

<p>| H. Proximity to SPS (today) | 3 | 3 | 4 | 12 |
| I. Proximity to Student Central Bookstores | 4 | 4 | 4 | 16 |
| J. Proximity to Library | 3 | 3 | 3 | 9 |
| K. Performance of other campus buildings (short term) | 5 | 5 | 5 | 20 |
| L. Long Term potential to connect to other campus buildings | 5 | 5 | 5 | 20 |</p>
<table>
<thead>
<tr>
<th>Site Characteristics</th>
<th>Providence Drive Site</th>
<th>UAA Drive Site</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score</td>
<td>Total</td>
<td>Score</td>
</tr>
<tr>
<td><strong>Dynamic Attributes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Wind dynamics</td>
<td>3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>B. Noise &amp; Vibration</td>
<td>3</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>C. Solar Orientation</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>D. Obscured Light</td>
<td>4</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>18</td>
<td>Subtotal</td>
</tr>
<tr>
<td><strong>Subsurface Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Soils</td>
<td>1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>F. Soil Permeability</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G. Foundations</td>
<td>3</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>H. Water</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>23</td>
<td>Subtotal</td>
</tr>
<tr>
<td><strong>Site Preparation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Demolition</td>
<td>3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>J. Relocation of current occupant</td>
<td>3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>K. Construction Logistics</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total Score</td>
<td>65</td>
<td>Total Score</td>
</tr>
</tbody>
</table>
Health Science District Master Plan Amendment

1. Purpose

Since the UAA Campus Master Plan was drafted in 2003, and adapted in 2004, a number of significant decisions have been made, the Health Science parcel of land was acquired, four building projects have been undertaken, and a number of personnel and policy changes have occurred. The purpose of this master plan amendment is to address the Health Science district and how it ties back to main campus.

2. Description of Health Science District

This recently acquired property of approximately 10 acres will enable the University to announce its presence on both sides of Providence Drive. A sub-area master plan was prepared for this area in 2008. It describes the Health Sciences district south of Providence Drive connected by footbridges to a new Honors College and Classroom building to the west and a new Engineering complex to the east forming a quad that spans Providence Drive. The Health Sciences complex will benefit from proximity to PAMC, the Alaska Psychiatric Institute and McLaughlin Youth Center. The Southwest Campus is valuable as a potential expansion of the heart of the campus, and should be planned as a whole before any new buildings are constructed there.

Attached is a rendering of the envisioned Health Science district and how it ties back to the main campus via a quad element.
Sketch of Phase I, Phase II and a parking structure and first bridge over Providence Dr.

Rendering of the future built out district.

5. Approvals

President Recommends:

Motion:

Approve the HS District Amendment to the 2004 UAA Campus Master Plan. This amendment will be incorporated in the revision of the UAA Campus Master Plan currently underway.
UNIVERSITY OF ALASKA FAIRBANKS
ENGINEERING FACILITY

EXECUTIVE SUMMARY
PROGRAMMING AND SITE SELECTION REPORT

FINAL
12 SEPTEMBER 2011

ECI/HYER
NBBJ
AMC
PDC
HMS
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Executive Summary</td>
</tr>
<tr>
<td>2.</td>
<td>Program Summary</td>
</tr>
<tr>
<td>3.</td>
<td>Site Selection</td>
</tr>
<tr>
<td>4.</td>
<td>UAF Campus Masterplan Amendment</td>
</tr>
<tr>
<td>5.</td>
<td>Cost Estimate Summary</td>
</tr>
<tr>
<td>6.</td>
<td>Project Schedule</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

The University of Alaska Fairbanks, responding to the 100% increase in student enrollment and graduation of baccalaureate trained engineers called for in the University of Alaska Statewide Engineering Expansion Initiative, is proposing a new UAF Engineering Facility at the Fairbanks campus. The proposed new UAF Engineering Facility:

- Responds to the initiative to graduate more engineering students
- Enhances the student experience for engineering students and other students campus-wide with a visible and interactive learning environment
- Integrates UAF’s successful engineering research and graduate programs
- Addresses critical classroom needs.

The proposed facility of 116,900 gross square feet (gsf) is ideally situated adjacent to the existing Duckering Building currently housing the College of Engineering and Mines (CEM) and provides the opportunity to complete Cornerstone Plaza with an attractive and functional focal point at the southeast corner of the UAF main campus. The proposed new facility will have five floors blending with surrounding buildings while standing out as a new and exciting campus destination. The proposed new facility maintains full connectivity to the existing Duckering building and programs, and offers future connectivity to the adjacent Bunnell Building. The proposed new facility plan will renovate approximately 23,000 gsf of Duckering Building to provide a functional connection with the proposed new building and to allow efficient use to better serve the needs of the engineering program.

Project Vision: “Innovation by Design” is the vision as described by the College of Engineering and Mines.

Programmatic Goals of the Proposed New Building

- Facilitate interactive, collaborative, multi-disciplinary learning and research
- Enhance Teaching and Research through the extensive use of technology
- Focus on enhancing future-making experiences. Motivate students and faculty to move at the speed of their ideas
- Maximize interconnectedness between CEM Departments and with the main campus

Design Goals

- Make the learning process and products of engineering education and research more visible to students and faculty
- Unify the College of Engineering and Mines (CEM)
- Maximize transparency to the public and other students
- Enhance presence on the UAF campus, across Alaska and amongst the greater engineering community
- Promote sustainable design
- Create a permanent building on campus
- Create a design that enriches entrepreneurship

Program Distribution by Space Type:

- 27% Office and Conference
- 65% Classroom, Computer, Shops, and Research Laboratories
- 7% Existing and New Classrooms
- 1% Building Services
SECTION 1

EXECUTIVE SUMMARY

The new building size is based on the total programmable area identified in the UA Engineering Plan 2010, plus program additions since the plan was issued, and less the CEM space in the existing Duckering Building. The following comparison is based on assignable square feet (asf).

Comparisons of the UA Engineering Plan 2010 asf Need (UAEP2010) and UAF CEM asf 2011 Program Need
- Academic (CEM): UAEP2010 = 72,808 asf  ECI Hyer/NBBJ 2011 = 73,212 asf
- Research (ISE): UAEP2010 = 54,000 asf  ECI Hyer/NBBJ 2011 = 50,927 asf
- Existing Classrooms UAEP2010 = 6,600 asf  ECI Hyer/NBBJ 2011 = 6,900 asf
- Subtotal Comparison UAEP2010 = 133,808 asf  ECI Hyer/NBBJ 2011 = 131,039 asf

Program Additions Subsequent to UAEP 2010:
- New Classrooms 4,000 asf
- Proposed New Building Shell Space
  - Computer Science 6,304 asf
  - Advanced Materials Group 5,772 asf
  - Subtotal Program Additions 16,076 asf

Proposed Project Program Assignable Square Feet Total
- Subtotal Comparison ECI/Hyer 2011 131,039 asf
- Subtotal Program Additions 16,076 asf
- Proposed Project Program Area Total 147,115 asf

Proposed Project Program Assignable Square Feet (asf) by Building:
- 69,005 asf Proposed New Building (60/20 = Total Proposed New Finished Space/ Proposed New Shell)
- 78,110 asf Existing Duckering Building
- 147,115 asf Total Need (See Section 2 Program and Cost Estimate Summaries)

Proposed Project Gross Square Feet (gsf) for Building Size and Cost Estimating:
- 116,900 gsf Proposed New Building (69,005 asf/.59 Efficiency Factor)
- .59 Efficiency Factor within industry standard range of .55 to .60

Total Proposed Project Cost:
- $98.6M General Fund - Proposed New Building and Duckering Functional Connection
- $9.98M UAF Bonding - to provide shell space in the proposed new building structure

Project Schedule
- September 2011 Project Approval to proceed through Schematic Design
- April 2012 Schematic Design Approval
- February 2013 Design Completed
- April 2013 Construction Starts
- August 2015 Proposed New Building and Duckering Functional Connection Complete
SECTION 2

PROGRAM SUMMARY

2.1 Program Summary Statement

This section provides a list of the space needs of the College of Engineering and Mines (CEM), the Institute for Northern Engineering (INE) and general assignment classrooms. The list articulates all needs without regard to financial strategies to achieve them. The process of developing this information heavily involved leadership, faculty and staff of CEM and the University Administration working closely with the office of the UA Chief Facilities Officer and their consultant.

2.2 Program Pedagogy

The ECI Hyer/NBBI team met with both the CEM Project Leadership Team as well as with Department Chairs over several work sessions to understand the problems they face in delivering their pedagogy and the opportunities they see that will transform their fields of study. Through those meetings, a list of spaces emerged and was vetted at an initial level by the CEM Project Leadership team.

The spaces identified in the Space List have been developed with a specific focus on the current need and future direction of CEM. In particular, greater emphasis will be placed on connecting theory to practice by placing certain teaching spaces in direct proximity to shops, a high bay space and CAD labs. Space has been set aside for the display of ongoing student work and for meeting and working with business and Industry representatives. Finally, consolidation has occurred across all of CEM so that an increasing number of spaces can be shared by many groups, growing the real world situations where engineers from different fields will be working together.
2.3 Program Discussion Gross, Net, and Assignable Terms and the Efficiency Factor

Programming space to serve the needs of a User Group or client is done in terms of assignable square feet (asf). Building construction is done in terms of gross square feet (gsf). An efficiency factor exists between the two. The efficiency factor is used to extrapolate from the determined programming assignable square feet to predict the required building gross square feet. Several definitions aid in understanding this concept:

"Gross Square Feet" (GSF) is defined as the overall enclosed construction area of the building. It is generally measured to the outside face of the enclosure and includes structure, circulation, penetrations, penthouses, basements, etc.

"Net Square Feet" (NSF) is defined as all usable floor space in the building. It is the GSF less wall thicknesses, mechanical duct shafts and similar unusable spaces.

"Assignable Square Feet" (ASF) is defined as comprising functional areas such as offices, classrooms and laboratories, excluding required building support spaces like exterior enclosure, circulation, mechanical and structural areas.

The "Efficiency Factor" is defined as the ratio between the assignable square feet of program space divided by the gross square feet of the building. Conversely, dividing Assignable Square Feet by the Efficiency Factor yields the Gross Square Feet.

The efficiency factor for a given building can vary over a fairly large range, but is typically from 50% to 70% for campus academic buildings. The efficiency is affected by the overall size of the project (with larger projects typically being more efficient) to the number, size and openness of the types of spaces in the program. The amount of circulation and openness decreases efficiency, as does the need to enclose all mechanical space due to a cold climate. Connecting to existing buildings tends to add some inefficiency when compared to a freestanding building. Some general ranges of efficiency include:

| Mixed Lab & Office | 50% to 60% |
| Wet Laboratory     | 53% to 59% |
| Teaching Laboratory| 56% to 62% |
| Private Offices    | 60% to 70% |
| Open Office        | 67% to 72% |

By way of example, the Duckering Building has an efficiency factor of 56% (82,330 ASF/147,575 GSF).

The UAF West Ridge Research Building (WRRB) efficiency is at 60% (36,727 ASF/60,917 GSF).

For the purposes of predicting the gross square feet of the new addition, an efficiency of 59% was assumed, based on the likely program types, need for connections to existing buildings and significant mechanical equipment to be enclosed.

A test fit of the program was then accomplished to confirm that the distribution, number of floors and floor plate dimensions met the program requirements on the site.
2.4 CEM Program Summary - Sorted By Category

This section summarizes a detailed breakdown of the College of Engineering and Mines programming of space needs into “type of space” categories. The total space need shown here is equal to the CEM Program Summary – Sorted By Department space needs also shown in this section.

<table>
<thead>
<tr>
<th>Category</th>
<th>Assignable Sq.Ft.</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office and Conference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office &amp; Office Services</td>
<td>35,188</td>
<td>23.9%</td>
</tr>
<tr>
<td>Conference &amp; Conference Services</td>
<td>3,513</td>
<td>2.4%</td>
</tr>
<tr>
<td>Classroom, computer, Shops, and Research Laboratories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom Labs &amp; Classroom Lab Services</td>
<td>33,210</td>
<td>22.6%</td>
</tr>
<tr>
<td>Computer Lab &amp; Computer Lab Services</td>
<td>11,801</td>
<td>8.0%</td>
</tr>
<tr>
<td>Lobby</td>
<td>500</td>
<td>0.3%</td>
</tr>
<tr>
<td>Research Labs, Research Lab Services &amp; Storage</td>
<td>45,174</td>
<td>30.7%</td>
</tr>
<tr>
<td>Seminar</td>
<td>726</td>
<td>0.5%</td>
</tr>
<tr>
<td>Shop &amp; Shop Services</td>
<td>4,603</td>
<td>3.1%</td>
</tr>
<tr>
<td>Existing and New Classrooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing and New Classrooms</td>
<td>10,900</td>
<td>7.4%</td>
</tr>
<tr>
<td>Building Services &amp; Receiving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Services &amp; Receiving</td>
<td>1,500</td>
<td>1.0%</td>
</tr>
<tr>
<td>Totals</td>
<td>147,115</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
2.5 CEM Program Summary - Sorted By Department

This section provides a detailed breakdown of the College of Engineering and Mines programming of space needs by each CEM Department. The total space need shown here is equal to the CEM Program Summary – Sorted By Category shown previously.

<table>
<thead>
<tr>
<th>Department</th>
<th>Complete Program Total ASF</th>
<th>% Of Total ASF</th>
<th>Existing Duckering ASF</th>
<th>Proposed New Space ASF</th>
<th>Proposed New Shell ASF</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Of Engineering &amp; Mines</td>
<td>29,006</td>
<td>19.7%</td>
<td>15,860</td>
<td>10,968</td>
<td>2,178</td>
</tr>
<tr>
<td>Advanced Materials Group</td>
<td>5,772</td>
<td>3.9%</td>
<td>0</td>
<td>0</td>
<td>5,772</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>1,089</td>
<td>0.7%</td>
<td>0</td>
<td>1,089</td>
<td>0</td>
</tr>
<tr>
<td>Civil &amp; Environmental Engineering</td>
<td>16,618</td>
<td>11.3%</td>
<td>0</td>
<td>16,618</td>
<td>0</td>
</tr>
<tr>
<td>Computer Science</td>
<td>6,304</td>
<td>4.3%</td>
<td>0</td>
<td>6,304</td>
<td>0</td>
</tr>
<tr>
<td>Electrical &amp; Computer Engineering</td>
<td>12,272</td>
<td>8.3%</td>
<td>10,092</td>
<td>2,180</td>
<td>0</td>
</tr>
<tr>
<td>Institute For Northern Engineering</td>
<td>18,224</td>
<td>12.4%</td>
<td>18,224</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>13,400</td>
<td>9.1%</td>
<td>1,784</td>
<td>11,616</td>
<td>0</td>
</tr>
<tr>
<td>Mining And Geological Engineering</td>
<td>9,892</td>
<td>6.7%</td>
<td>9,892</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mineral Industry Research Laboratory</td>
<td>3,105</td>
<td>2.1%</td>
<td>0</td>
<td>3,106</td>
<td>0</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>6,187</td>
<td>4.2%</td>
<td>3,528</td>
<td>2,659</td>
<td>0</td>
</tr>
<tr>
<td>Petroleum Development Lab</td>
<td>4,515</td>
<td>3.1%</td>
<td>0</td>
<td>4,515</td>
<td>0</td>
</tr>
<tr>
<td>Water &amp; Environmental Research</td>
<td>9,830</td>
<td>6.7%</td>
<td>9,830</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Registrar Classrooms</td>
<td>10,900</td>
<td>7.4%</td>
<td>8,900</td>
<td>2,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>147,115</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>78,110</strong></td>
<td><strong>54,751</strong></td>
<td><strong>14,254</strong></td>
</tr>
</tbody>
</table>

2.6 CEM Program Building Summary and Future Considerations

This project builds a new 116,900 gross square foot building with approximately 92,900gsf of finished space and 24,000gsf of shell space along with a Duckering Functional Connection of about 23,000gsf within Duckering that provides the functional level renovation of existing space.

To eventually colate the CEM program additions of computer science and advance materials lab the buildout of the shell space will be required. It is an important priority of UAF to include the shell space to maximize the future capacity of this facility; a facility that is taking up one of the last core campus building sites available. Finishing the shell space is estimated at an additional $10M and will be prioritized among future state capital projects. Additionally, UAF will be seeking development and grant opportunities to complete sections within the shell. The buildout of the shell is likely 3 to 5 years after construction is complete.

Additional backfill renovation within the Duckering Building to better serve the programs will also occur. This additional renovation is estimated at $17M and will be prioritized among all of UAF’s renewal, repurposing and deferred maintenance priorities and would be expected to occur 3 to 10 years after the construction project.
3.1 Site Vision

COLLEGE OF ENGINEERING AND MINES

The proposed expansion of the College of Engineering and Mines (CEM) is conceived as an addition to The Duckering Building (current location of the College) and provides state-of-the-art teaching and learning spaces for the College in support of the Campus Master Plan vision for greater program and campus integration. The Integration of teaching and research is a primary goal of the University.

The Proposed New CEM building with the functional connection to the Duckering Building will establish a campus precedent for connectivity between buildings. By exercising innovative campus planning and building design, the new engineering facility will enhance the campus experience and pedestrian circulation while specifically unifying building functions and exterior architecture. This proposed new building will create “neighborhood” spaces on lower campus for collaboration and interaction that Integrate research, teaching, and student life through the interconnection of mixed-use buildings presenting a new unified face for the College of Engineering and Mines to Cornerstone Plaza, the University and the engineering world beyond.
3.2 Site Selection Process
This section is a summary of the Site Selection Process. See Section 5 and Appendix 2 of the Final Report for a full examination of the site vision and selection process.

The design team considered three locations near Duckering Building for the expansion of the College of Engineering and Mines.

The Forestry East Site;
The location of the current Forestry Building east of Duckering Building.

The Duckering South Site;
The current parking lot south of Duckering Building.

The Bunnell West Site;
The parking lot off the west end of Bunnell Building.

A test fit of the program and a conceptual building massing study was done for each site. To determine the recommended location for the proposed new engineering building, each site option was measured against a list of planning and design criteria, such as, the ultimate carrying capacity of the site, ability to meet the University's goals for integration of teaching and research, and adherence to the Campus Master Plan. The studies were reviewed by the Project Leadership Team and collectively graded against the list of criteria.

The Duckering South Site was selected and recommended as the site that best meets the University's and CEM's overall project goals.
3.3 Recommended Site
The recommended Duckering South site lies on the lower campus in a parking lot between Duckering and Bunnell Buildings. Duckering Building houses the existing CEM programs and Bunnell Building is the home of the School of Management. This site will provide sweeping views to and from the building and holds an honorific position for the College of Engineering and Mines on Cornerstone Plaza. The proposed new building, by the interconnection of mixed-use buildings, will establish a strong integration of research, teaching, and student life and will present a new unified face for the College of Engineering and Mines to the University.
UAF CAMPUS MASTER PLAN AMENDMENT

This project complies with Board Policy and amends the 2010 UAF Campus Masterplan to include the Duckering South building site as supported by the University of Alaska Fairbanks.

The recommended Duckering South Site was identified in the 2002 UAF Master Plan as a “Future Building Site.” However, this site was inadvertently excluded in the 2010 Master Plan. Upon review of the considered sites and the completed program for the addition to the College of Engineering and Mines, The University of Alaska Fairbanks Chancellor has approved a motion by the UAF Master Plan Committee to amend the 2010 UAF Campus Master Plan to include the recommended site. Reference the following four pages.
MEMORANDUM

Date: August 30, 2011
To: Brian Rogers, Chancellor
From: Rich Boone, Chair

Re: MPC Recommendation 2011-11 – Amend 2010 Campus Master Plan to Include Duckering South site as a building site

The MPC moves to amend the 2010 Campus Master Plan to include the Duckering South site as a building site, as per the earlier 2002 Campus Master Plan.

Motion made by Gary Newman (seconded by Deb Horner)

Motion passed unanimously 8-0.

Thank you.

dem
SITE SELECTION
ENGINEERING FACILITY College of Engineering and Mines
University of Alaska Fairbanks

UAF ENGINEERING FACILITY
09.12.11

4-3
PROJECT COST PROJECTION SUMMARY

For All Project Components

Including Annual Operating Cost
## Section 5

**UNIVERSITY OF ALASKA FAIRBANKS**  
**COLLEGE OF ENGINEERING AND MINES**

### BUILDINGS

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAF New Building Finished Space</td>
<td>$85,620,000</td>
</tr>
<tr>
<td>Construction Area in Gross Square Feet</td>
<td>92,900</td>
</tr>
<tr>
<td>Construction Cost w/ Escalation (22 Mths 9.4%)</td>
<td>$66,625,000</td>
</tr>
<tr>
<td>Construction Cost $/SF</td>
<td>$706</td>
</tr>
<tr>
<td>Construction Contingency 10%</td>
<td>$8,562,500</td>
</tr>
<tr>
<td>Construction Administration (CA) 20%</td>
<td>$13,432,500</td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$85,620,000</td>
</tr>
<tr>
<td>Total Project Cost Per Square Foot</td>
<td>$922</td>
</tr>
</tbody>
</table>

### BUILDINGS

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duckering Functional Connection</td>
<td>$13,000,000</td>
</tr>
<tr>
<td>Building Area in Gross Square Feet</td>
<td>23,000</td>
</tr>
<tr>
<td>Construction Cost w/ Escalation (22 Mths 9.4%)</td>
<td>9,629,637</td>
</tr>
<tr>
<td>Construction Cost $/SF</td>
<td>$419</td>
</tr>
<tr>
<td>Construction Contingency 10%</td>
<td>$1,444,445</td>
</tr>
<tr>
<td>Construction Administration (CA) 20%</td>
<td>$1,925,918</td>
</tr>
<tr>
<td>CA includes design, management and administration</td>
<td></td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$13,000,000</td>
</tr>
<tr>
<td>Total Project Cost Per Square Foot</td>
<td>$565</td>
</tr>
</tbody>
</table>

### BUILDINGS

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAF New Building Shell Space</td>
<td>$9,980,000</td>
</tr>
<tr>
<td>Building Area in Gross Square Feet</td>
<td>24,000</td>
</tr>
<tr>
<td>Construction Cost w/ Escalation (22 Mths 9.4%)</td>
<td>$7,920,000</td>
</tr>
<tr>
<td>Construction Cost $/SF</td>
<td>$330</td>
</tr>
<tr>
<td>Construction Contingency 10%</td>
<td>$792,000</td>
</tr>
<tr>
<td>Construction Administration (CA) 20%</td>
<td>$1,288,000</td>
</tr>
<tr>
<td>CA includes design, management and administration</td>
<td></td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$9,980,000</td>
</tr>
<tr>
<td>Total Project Cost Per Square Foot</td>
<td>$416</td>
</tr>
</tbody>
</table>

### BUILDINGS

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total New Finished, New Shell, &amp; Connection Project Cost</td>
<td>$108,600,000 ($98.62M GF, $9.9M UAF Bond)</td>
</tr>
<tr>
<td>Building Area gsf New 116,900 &amp; Connection 23,000 = 139,900gsf</td>
<td></td>
</tr>
<tr>
<td>Construction Cost w/ Escalation (22 Mths 9.4%)</td>
<td>$83,174,640</td>
</tr>
<tr>
<td>Construction Cost $/SF</td>
<td>$595</td>
</tr>
<tr>
<td>Construction Contingency 10.6%</td>
<td>$8,798,945</td>
</tr>
<tr>
<td>Construction Administration (CA) 20%</td>
<td>$16,626,415</td>
</tr>
<tr>
<td>CA includes design, management and administration</td>
<td></td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>$108,600,000</td>
</tr>
<tr>
<td>Total Project Cost Per Square Foot</td>
<td>$776</td>
</tr>
</tbody>
</table>

### Construction Cost Estimate Total: $83,174,640

### Project Budget Estimate Total: $108,600,000 ($98.62M GF, $9.9M UAF Bond)

### Shell Space Completion Estimate: $10,000,000

### Future Backfill Estimate: $17,000,000

### O&M Annual Cost Estimate: $2,228,000

---

**UAF ENGINEERING FACILITY**  
09.12.11  
5-1
perspective
the state of engineering
vision:
innovation by design
Programmatic Goals

The building will facilitate hands-on interactive, multi-disciplinary learning and research

Teaching and Research will be enhanced through the extensive use of technology

The building will enhance future-making experiences; allowing the students and faculty to move at the speed of their ideas

Maximize Interconnectedness

Maximize Flexibility
Design Goals

- Make Engineering visible
- Maximize Transparency
- Enhance Presence
- Promote sustainable design
- Create a permanent building

Create a design that promotes collaboration, and enriches entrepreneurship and interaction with business
our proposal
campus making campus impact
questions