

Submission date: February 7, 2020

Program/s in this review: Construction Management (CM) AAS & BS

Specialized accrediting agency (if applicable): American Council for Construction Education (ACCE)

Campuses where the program is delivered: University of Alaska Anchorage

Members of the program review committee:

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1. Centrality of Program Mission and Supporting Role (700 words or less)

Development of the CM program started with the Alaska construction industry's need for a stable, reliable workforce. Often construction managers were hired from the lower 48, brought to Alaska, trained in company protocol only to leave after their first Alaska winter. It was clear that reliable employees were those familiar and comfortable with Alaska's polar environment. In the early 2000s, a consortium of construction companies donated over \$150,000 to help subsidize development of the program's curriculum. The result of having a CM program in Alaska is reflected in data from UAA's Office of Institutional Research showing that within one year of graduation, 90% of the AAS graduates and 94% of the BS graduates are employed in Alaska. AAS graduates earn on average \$45,173 within one year of graduation and BS graduates earn \$62,268. After five years, 90% of AAS graduates remain in Alaska making on average \$76,469 and 75% of BS graduates remain, making approximately \$99,510 annually. The CM program clearly contributes significantly to the Alaska workforce, providing a steady supply of seasoned Alaskan workers who are committed to remaining and flourishing in Alaska.

The construction industry continues to actively support the evolution of the CM program. There are currently fourteen industry members sitting on the CM Advisory Board. They provide valuable input into the consideration of how to best tailor the program to meet industry needs while maintaining rigorous accreditation standards. The construction industry is at the forefront of applying innovative technologies to improve efficiency and quality in the built environment. Industry members partner with faculty to provide information on current company practices. This supports faculty ability to adapt course material to support the development of this vital workforce.

The construction industry is also a strong supporter of the Associated Schools of Construction annual student competition in Sparks, Nevada. The competition simulates the process used in bidding for a construction project. Simulations are based on projects that have been built and provide a realistic framework for students to develop their professional capabilities. UAA students have taken first place on two occasions and placed in the top three in past years. For Alaska students it is a heavy financial burden to travel 2,500 miles to attend the completion but the Alaska construction industry recognizes the benefits that students get from this exercise and the benefits that industry gets from having students come to their companies equipped with this rich learning experience. As of fall 2019, construction industry donations have topped \$20,000, enabling at least one team to travel to Nevada for this four-day event.

The Alaska Department of Labor outlook for construction managers lists it as having a high number of openings and an average monthly wage of \$9,632. Data from UA Statewide and UAA Offices of Workforce Programs shows that there is a shortage of 73 construction managers annually. The Institute of Social and Economic Research at the University of Alaska forecasts a 10% increase in construction spending in 2019, further exacerbating the shortage of construction managers in Alaska and highlighting the importance of the CM program in supporting Alaska's construction industry.

The CM program is also an important supplier of interns who are regularly used by construction companies during the busy summer months. Summer of 2019 saw nineteen students actively engaged with fifteen different construction firms throughout the state. A partial list of companies providing internships for CM students includes Silver Lake Construction, H. Watt & Scott, Inc., Quality Asphalt & Paving / Colaska, Anchorage School District, Frontier Properties, Reynolds General Contracting, Alyeska Pipeline Service Company, Dawson Construction, Watterson Construction Co., ASRC SKW Eskimos, Inc., Mass Excavation, Inc., White Mountain Construction, LLC, Granite Construction, Knik Construction, Eklutna Construction & Maintenance, Northwind Site Services, AK Dept. of Transportation and Public Facilities, Bethel Contracting Inc., Highland Construction & Services, LLC, GMC Contracting, Inc., Chinook Fire Protection, Inc., Cornerstone General Contractors, Inc., United States Air Force, Cruz Construction, Inc., Turnagain Marine, TDX Quality, LLC, Doyon Government Group Construction, Ahtna Construction & Primary Products Corporation, International Steel, West Coast Concrete Restoration, LLC, Davis Constructors & Engineers. This list illustrates the extensive role that the CM program plays in supporting the construction industry in Alaska.

2. Program Demand (including service to other programs), Efficiency, and Productivity (7 year trend; 1400 words or less)

Following is an analysis of each CM program data point provided by UA Institutional Research (IR).

It is important to note that the Construction Management (CM) program is closely intertwined with the Architectural and Engineering Technology (AET) program. The CM program grew out of the AET program. Many AET courses are required for CM degrees. 46% of the core courses required for the Bachelor of Science degree in CM are AET courses. More than 50% of the core courses required for the Associate of Applied Science degree in CM are AET courses. This is not reflected in most of the IR reports which impacts this program analysis.

Seven year degree and/or certificate awards trend

This IR data point shows a decline in degree and certificate awards and should be considered in light of general demographic trends in the state. Statistics from the World Population Review website reveal an overall decline in the state's population and a 3.2% decline in Anchorage population since 2015. It should also be noted that the state entered a recession in the summer of 2014. Tighter economic circumstances may discourage prospective students from spending money on school.

The *2017-2018 Fact Book* published by UAA Institutional Research shows the student headcount at UAA has declined by 12% from 2013 to 2017 (p.14). The decline in BS degrees mirrors this trend. It indicates that degree awards in CM remain steady and that the program is not in decline relative to prevailing conditions in the state and the university.

Credits per Degree (Average Credits Earned)

123 credits are built into the BS degree and 64 into the AAS. The discrepancy in the target credits for the degrees can be attributed to several factors:

- CM students are often not on the Honors track and tend to take more preparatory classes in writing and math.
- CM students often struggle with the physics, chemistry, and accounting classes and repeat them.
- The CM program has many non-traditional students pursuing their degree at a later age, often having work and family obligations that impinge on academic study.
- Students often come to the CM program from other departments such as Engineering with accumulated credits in other disciplines.
- Students who transfer into the CM program from other institutions often come with excess credits from their institution of origin.

Seven year majors or program enrollment trend

The enrollment trend for the BS degree shows a 30% drop between 2013 and 2019. This should be considered relative to the number of degrees awarded within the same time frame. 17 BS degrees were awarded in 2013 and 15 in 2019, which is a 12% decline: a decline consistent with the decline in the overall UAA student population. The indication is that although more students explored the CM program in 2013, the number of dedicated degree seekers who actually completed the program has remained relatively constant over time. This is perhaps an indication of the success UAA has had in increasing retention and graduate rates by hiring Student Success Advisors starting in 2017.

Course pass rates

The pass rates for CM students are very similar to those found in the Business Administration program. Pass rates for 100-299 level courses in the CM program are somewhat higher than Business Administration but somewhat lower at the 300-499 course level. The similarity is not surprising given that CM baccalaureate students can take two extra classes in Business Administration and earn a minor in Business Administration

Internal demand

A majority of students enrolled in the program have declared CM as their major (~ 90%). This reflects the non-traditional nature of the CM student population: they are typically older: often possess field experience in construction: often are supporting families by working while enrolled in the university. These are students who have established a clear educational objective and are dedicated to the pursuit of a CM degree.

Seven year Student Credit Hour (SCH) production trend

In 2015, during the prioritization process, the decision was made to merge many CM classes into Architectural and Engineering Technology (AET) classes containing similar subject matter. This was done to improve enrollment numbers for the AET program which was experiencing a downturn. Comparing the seven-year average CM SCH production (1313 SCH) with the 2019 combined SCH production for CM and AET, it can be seen that overall SCH production has remained relatively constant.

Student Credit Hours per Full Time Equivalent Faculty

The Student Credit Hours associated with each Full Time Equivalent Faculty member is trending upward. This indicates that more student time is being invested in each faculty member's class, meaning that class sizes are increasing and program efficiency is improving.

Enrollment per Full Time Equivalent Faculty

The trend clearly shows that the number of students in each CM class is increasing. This reinforces the trend indicated by the Student Credit Hours per Full Time Equivalent Faculty data above. The trend indicates a program that is utilizing its faculty resources in increasingly efficient and effective ways.

Full Time Equivalent Students per Full Time Equivalent Faculty

One Full Time Equivalent Student is one student who takes a full load of classes for one academic year. The upward trend in Full Time Equivalent Students per Full Time Equivalent Faculty is an indication of the program's increasingly successful efforts to retain students in the program. It indicates that students are committed to successful completion of the program.

Class Size (Average Class Size)

In an effort to make the CM program financially sustainable, faculty have consistently increased class sizes. As class sizes grow, tuition revenue grows while overhead costs associated with faculty compensation remains unchanged. The trend is clearly upward and the goal is to maintain a break-even point where tuition revenue is greater than, or equal to, the cost of conducting the class.

Cost per Student Credit Hour

Until 2015 the CM and AET programs were separate but shared much course content in many classes. Starting in 2015 the decision was made to cross-list similar classes under the single AET designation. This had the effect of inflating AET Student Credit Hours (SCH) and reducing CM SCH. As the cost of maintaining CM faculty remained constant, the number of student credit hours supporting the CM program was reduced. As this change took hold starting in 2016, the perceived cost of maintaining the CM program has gone up. This IR data however fails to account for the fact that SCH from CM students are being attributed to the AET program.

Tuition Revenue per Student Credit Hour

Tuition revenue shown in the IR data does not accurately reflect actual revenue due to the fact that 46% of BSCM core courses and over 50% of the AASCM core courses are currently listed as AET courses. With 16 AET majors declared in 2019 versus 91 CM majors, it is assumed that revenue generated by the CM program would substantially surpass the cost of maintaining it.

External Demand

The data indicates that many graduates with an AAS CM go on to earn a more advanced degree. CM Advisory Board members generally agree that the AAS CM degree does not adequately prepare students to work in the industry and that the BS is greatly preferred. This is incentive for students to continue work towards a baccalaureate degree. Given the high demand for construction managers and their high salary, there is little incentive for graduates with a BS degree to pursue graduate degrees.

3. Program Quality, Improvement and Student Success (1500 words or less)

The American Council for Construction Education (ACCE) is CM's national external accreditation body. ACCE states, "[ACCE is] a leading global advocate of quality construction education that promotes, supports, and accredits quality construction education programs. The primary goal of ACCE is promotion and continued improvement of postsecondary construction education..." Accreditation by ACCE ensures that the UAA Construction Management program maintains the highest quality educational standards.

The CM program maintains a continuous process of critical self-evaluation for program improvement. It was determined that an inherent problem with the program was its remote location at the University Center Mall, about a mile from main campus. It was felt that a stronger connection with main campus was needed. Towards that end, program literature was distributed around main campus. This proved only marginally

successful, not yielding significant results. The program has since relocated to main campus which has greatly improved program quality. Classes are now held in state-of-the-art engineering facilities with well-maintained computers and workshops. CM students are now in close proximity to engineering students creating opportunities to cultivate relationships and develop a better understanding of their future colleagues on construction projects.

Access to the College of Engineering shop facilities has opened new possibilities for implementation of the high-impact practice of undergraduate research. Students are now able to build models and develop prototypes. In the *Sustainability in the Built Environment* class students are required to develop a research project based on a topic of their choosing. One student was interested in developing a manually-operated rammed earth block maker. He was able to first construct a scaled-down 3D printed version of the device as a proof-of-concept and then he fabricated a full-scale version out of metal and actually made rammed earth blocks. His intention is to deploy this device in his native country of Ivory Coast to help provide affordable, sustainable housing.

Students in this class are also required to write weekly reports that detail progress made and submit a final term paper that documents the project's findings. Students are also required to write several papers that explore issues of sustainability, a topic that continues to gain importance. This intensive writing regime is another high impact educational practices. The CM program recognizes the value of such practices and continuously strives to incorporate them into curriculum.

Internships, which are also high-impact practices, are an integral part of the CM program. All students are required to complete an internship at some point during the program. Students are encouraged to complete internships early to help bridge the gap between classroom knowledge and field experience. The internship has also been used in innovative ways to help students achieve their career objectives. Students who are determined to establish their own construction companies have been allowed to use the internship as a way to develop a business plan, obtain a business license, and launch their enterprise.

The program has scrutinized its course sequencing which has led to substantial revisions. Faculty determined that the two fundamentally important Construction Project Management (CPM) classes should be delivered early in the program and timed to follow each other. CPM I has historically been offered in first semester of the program and CPM II offered at the end of the second year of study. This has been rectified by placing CPM II in the second semester following CPM I.

The CM structures courses have also been realigned to improve on the process of building knowledge incrementally, using the knowledge gained from one class as a foundation for subsequent courses. Relying on the expertise of recently hired faculty who are registered engineers, it was determined that the structures sequence was essentially backwards. The sequence was recently changed: it now requires a physics course to establish a fundamental understanding of physics principles, followed by the statics class, establishing an understanding of static equilibrium, followed by the structural technology class that engages in the actual design of structural members.

In 2018, the CM program developed a strategic plan envisioning improvements that could be attained within five years. The primary objective of the plan was to develop all CM courses for online distance delivery by the year 2022. The program is committed to developing four courses per semester and is on track to achieve its 2022 goals. This objective is especially important to the CM program because of the non-traditional nature of CM's student population: they are generally older, have families, and have jobs. The flexibility of online courses allows CM students to integrate educational objectives with busy lives. Faculty have availed

themselves of the resources available through Academic Innovations & eLearning to improve online delivery techniques and employ online tools. In 2012 and 2013, several faculty members attended the Distance Teaching & Learning Conference in Madison, Wisconsin sponsored by the University of Wisconsin. This experience laid a solid foundation for the development of online courses. Presentations included “Strategies to Ensure Quality in Online and Blended Courses”, “Creating Powerful Learning Experiences”, “Making the Most of Online Courses”, “Improving Courses Across an Online Program”, and many more.

The CM program has a rigorous system of tracking Student Learning Outcomes (SLOs). Current indicators show that all data points related to the SLOs are performing at an acceptable level (above a 70% average pass rate) and a majority performing in the 80% - 90% range. The assessment procedure allows faculty to not only see percentage pass rates but also to evaluate the tests and assignments used for evaluation. Those courses that have fallen into the 70% - 80% range, although considered adequate, have been reviewed for possible improvement. One example is the result for SLO 20 – “Understand the basic principles of mechanical, electrical and piping systems”. There was a decline from 86% in 2017 to 78% in 2018. The course had undergone a change from faculty evaluation of pipe sizes entered into an AutoCAD drawing to students entering the pipe sizes into Blackboard for automatic correction. It was surmised that the decline in student performance was a result of data entry fatigue. The following year the number of entries was reduced without compromising the integrity of the exercise. It was found that scores rose from a 78% average to an 82% average.

In 2017 the Community and Technical College hired a Student Success Advisor for CM’s division to boost graduation and retention rates. This has been a great benefit. Even though the IR data for “Seven year majors or program enrollment” shows a 30% decline in BS majors, the number of BS degrees awarded has remained relatively constant considering the 12% decline in the overall UAA student population over the past several years. A Program Assistant was also hired giving the program the administrative support needed to support student success.

Every year CM students participate in the Associated Schools of Construction competition in Sparks, Nevada. Students must complete a bid package for a real construction project in a limited amount of time. The exercise simulates the kind of real world experience that construction managers face on the job. Hundreds of students from around 50 universities across the western US compete. In 2016 UAA took first place in the heavy civil category, earning a \$25,000 donation from The Beavers Construction Company. In 2015 students took second place in heavy civil and third in the commercial category.

4. Program Duplication / Distinctiveness (300 words or less)

Both the University of Alaska Fairbanks (UAF) and University of Alaska Southeast (UAS) have Associate of Applied Science (AAS) degrees. UAS has an AAS degree in Construction Technology and an Occupational Endorsement Certificate in Residential Light Construction. UAF has an AAS in Construction Management. Neither the UAF nor the UAS programs are externally accredited.

At UAA both the BSCM and the AASCM are accredited by the American Council for Construction Education (ACCE), ensuring that rigorous academic standards are maintained. UAA has the only Construction Management Bachelor of Science degree in Alaska.

As the UAA CM program continues to follow its strategic plan, developing all its CM courses for online delivery, the opportunity arises for students at UAS and UAF who have earned their AAS degree, to enroll in UAA’s online courses. This could be a great benefit to all, allowing UAF and UAS students to earn an accredited BSCM degree while increasing enrollment at UAA.

5. Summary Analysis (500 words or less)

The Construction Management (CM) program is externally accredited by the American Council for Construction Education (ACCE). ACCE establishes rigorous standards of excellence that ensure the quality of the UAA CM program and, by extension, the Alaska construction workforce. The UAA CM program is the only CM program with external accreditation in Alaska.

The CM program is a crucial source for much-needed construction managers in Alaska. The September 5, 2018 UA Statewide and UAA Offices of Workforce Programs report to the Board of Regents revealed a deficit of seventy-three construction managers annually in the state. Local construction firms draw heavily from the CM program for their workforce needs. Summer of 2019 saw 18 different construction firms provide 22 CM students with internships; often these internships roll into full time employment. This is a fundamental aspect of the CM mission, "...to prepare future industry employees with the education, skills, and training for entry-level professional positions in construction management" which strongly supports the CTC mission, "...to build Alaska's workforce and foster student success through quality education and technical training."

The Alaskan demand for UAA CM graduates is clear from UAA Institutional Research data: within one year of graduation 90% of AAS graduates and 94% of BS graduates are employed in Alaska. The Alaska construction industry cannot rely on people from the lower 48 who struggle to adjust to Alaska's unique environmental conditions. The construction industry needs acclimated Alaskans to operate efficiently.

The CM strategic plan has set a goal of offering all courses online by 2022. This will enable the UAA CM program to collaborate with unaccredited construction programs at UAF and UAS to provide their AAS students with the opportunity to earn an ACCE-accredited BS degree from UAA. As more CM courses are developed for online delivery, it is anticipated that more students from other remote locations will join the program.

Another CM program goal is to enhance high-impact practices in its curriculum. Internships have always been integral to both the AAS and BS degrees since inception. Writing-intensive practices are currently incorporated into the *Sustainability in the Built Environment* course as is undergraduate research. As mentioned earlier, one highly successful student project entailed the development of a manually-operated rammed earth block maker. By the end of the course, a scaled down printed 3D model of the machine was produced as a proof-of-concept prototype. The student then proceeded to further develop the project in their CM internship, which resulted in a fully operational rammed earth block maker. The student has started a production company and aspires to introduce the device into the African continent, making affordable rammed earth block homes. They also envision using the device in Alaska. This kind of student success illustrates the type of contribution that CM students can make to the built environment if given the chance to pursue what they find inspiring.