The University of Kansas

Civil, Environmental & Architectural Engineering

December 2, 2016

Higher Education Coordinating Commission
The State of Oregon
255 Capitol Street NE, Third Floor
Salem, OR 97310

Dear Commission Members:

This letter's purpose is to express strong support for the approval of a new Bachelor of Science in Architectural Engineering (BSAE) degree program at Oregon State University. The graduates of this program will help meet a large, long-standing need for such in the Pacific Northwest. This endorsement is given by an alumnus of three of the oldest existing architectural engineering (abbreviated AE, ARCE, or ARE, typically) programs (Kansas, Texas, and Colorado); I am also in my 25th year as an architectural engineering faculty member at the University of Kansas (KU) where I'm known as a curriculum, recruitment, and placement expert. A brief version of my academic vita is attached.

One of the best reasons for starting an accredited architectural engineering degree program is for economic development of its institution's state and region. Consulting engineering firms, especially those that design buildings' systems, are in dire need of hiring qualified individuals; after employing their first AE graduates, firms often report that the "AEs hit the ground running." The firms then want to hire many more. OSU's AE graduates will quickly be in high demand for employment as highly-paid professionals, and likely with job offers from every firm with which they interview; on-campus engineering career fairs, with participation of AE students and the many firms that want to hire them, are always very pleasing to observe. Over time, OSU's AE graduates will start their own firms or become part of ownership-groups for existing companies, and then themselves will be eager recruiters of AEs and others. One of Kansas City's such firms, Henderson Engineers (HEI), has grown from 30 to over 600 during my tenure and is currently led by one of our KU MSAE alums. These AE-related firms are always eager to help our faculty and students with our modest needs, financial and otherwise.

The draft OSU program proposal lists the intention to establish three options within their new BSAE program: structural, mechanical, and lighting/electrical systems design. These are very appropriate and represent three of the four traditional areas of emphasis recognized by our accreditation teams. The fourth, construction management, is already addressed by OSU's existing degree program in construction engineering. The proposed AE program will create new synergies with that and other programs at OSU, and by increasing enrollment in their courses enhance everyone's financial performance. Only a very small number of new faculty positions are typically needed to start a new BSAE program because we utilize many preexisting courses, and this appears to be especially true at

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OSU. The longstanding expertise in wood/timber at OSU will introduce a much needed aspect to our international AE community.

The first architecture graduate in the U.S. was N. Clifford Ricker in 1867 at the University of Illinois; he quickly became professor and chair of architecture there. In 1890, Ricker founded the first architectural engineering degree program, also at Illinois, after he recognized that about a third of his students were more-oriented to the technical aspects of buildings instead of their aesthetics. Architecture and architectural engineering degree programs are, and always have been siblings; OSU's new AE program will not compete with UO's architectural programs.

The large majority of OSU's BSAE graduates will choose to enter the consulting engineering profession where they will work closely with architects to complete buildings' designs and construction. Architectural engineers understand architects' philosophies and objectives, as well as those of contractors, and tend to work very well with both groups toward achieving their goals.

Architectural engineers normally become registered Professional Engineers (P.E.s) within five years of graduation from EAC/ABET-accredited degree programs, as OSU's program intends to become. However, like at KU, a few of OSU's BSAE graduates each year will likely choose to continue their studies in UO's NAAB-accredited Master of Architecture program to also eventually become Registered Architects (R.A.s); the two faculties are encouraged to work closely together to make this an attractive option that will enhance both programs' recruitment efforts greatly.

Housing OSU's new AE program within their CCE School is very appropriate and is the national trend. Even here at KU, our program, founded in 1912, merged with civil and environmental engineering in 2001 to achieve efficiencies. However, for optimal results, OSU's faculty need to establish a somewhat-freestanding identity for their new AE program because the discipline's philosophy is different; the proposal mentions a small, separate office and webpage, as well as an AE-specific classroom – usually known as the "AE Senior Design Studio" elsewhere – and these have proven to be the modest but effective means for creating an AE home and common experiences. It is also recommended that, like elsewhere, the name of OSU's school be changed to include "architectural" as soon as is practicable; if launched effectively the new AE program's enrollment should quickly become large, high quality, and diverse, and will eventually become a significant percentage of the School's undergraduates. A significant portion of their BSAE graduates will also become CCE Master of Science students, especially those students who select structural design as their career path.

Again, and in closing, I express my support for approval of this new program as well as for its as-rapid-as-possible and full implementation. If a reviewer has questions about architectural engineering or related matters, he or she is encouraged to contact me.

Sincerely,

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Abridged Vita (full version available upon request)

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Education and Licensing

University of Colorado at Boulder. *Doctor of Philosophy*, Civil, Environmental, and Architectural Engineering Department's Building Systems Program, May 1992. Dissertation topic: building HVAC and indoor air quality performance modeling

The University of Texas at Austin. *Master of Science in Engineering*, December 1986. Major: Energy & Fluids, Minor: Engineering Mathematics. MS topic: energy source options

The University of Kansas. *Bachelor of Science in Architectural Engineering*, May 1985. A 5-yr. ABET-accredited engineering degree, HVAC/Solar option. *Bachelor of Environmental Design*, May 1985, Environmental Systems option

Professional Engineer, by the mechanical exam, Kansas No. 13568, 1995

Research and Professional Experience

The University of Kansas, Lawrence, Kansas. *Associate Professor of Civil, Environmental, and Architectural Engineering*, with continuous tenure, 8-98 to present. *Assistant Professor of Architectural Engineering*, 8-92 to 7-98.

National Renewable Energy Laboratory (NREL, formerly SERI), Golden, Colorado. 1-90 to 7-92. *Graduate Co-op* in the Thermal Sciences and Engineering Branch of the Industrial Technologies Division.

ASHRAE Activities

The PI is a Fellow of ASHRAE, was the 2007-2008 Chair of the Society's Handbook Committee, a member of the Kansas City Chapter, a voting member and former chair of Technical Committee 4.3, and a corresponding member of TCs 4.1 and 5.3 (former voting member of the latter).

He is actively involved in HVAC&R education and research, and was selected as the 1996 ASHRAE New Investigator Award recipient. Dr. Rock was the PI of ASHRAE RP-787, A Sensitivity Study of Floor and Ceiling Plenum Energy Model Parameters, and ASHRAE RP-806, Design Criteria for Building Ventilation Inlets. He also was PI for Development of Room Air Distribution Design Guide (ASHRAE 1065-RP). For TC 4.3 and the ASHRAE Board of Directors, he wrote ASHRAE's challenging "ETS design guide" which had a twelve member ASHRAE review committee and was approved and then published as Ventilation for Environmental Tobacco Smoke.

Dr. Rock was the advisor for four ASHRAE Grant-in-Aid recipients, and one of his graduate assistants was selected as an ASHRAE Alwin B. Newton research award recipient. He joined ASHRAE in 1984 as a student and has participated in ASHRAE Winter and Annual Meetings since 1992. Before starting graduate study he worked in HVAC&R system installation in Austin, TX.

Sample Publications

"Heat Gains from Passenger Vehicles Parked in Residential Attached Garages," invited for the *ASCE Journal of Architectural Engineering*, Reston, VA, in review.

"To Mini-Split or Not to Mini-Split; The Question of Two Story Houses' Stratification," accepted by the *ASHRAE Journal*, expected in press about March 2017.

"A Rapid Tool for Comparing Solar Orientations Early in the Design Process," submitted to the *Architectural Science Review Journal*, in review.

"Thermal and Economic Evaluation of Slab-on-Grade Insulation in Wood-Framed Buildings". *ASCE Journal of Architectural Engineering*, vol. 15.1, pp. 14-25, March 2009.

"Passive Solar Thermal" and "Active Solar Thermal"; two new "Green Tips" in the *ASHRAE Green Guide, 2nd Ed*. Butterworth-Heinemann, ISBN 1-933742-07-0, 2006.

"A User-Friendly Model and Coefficients for Slab-on-Grade Load and Energy Calculations." *ASHRAE Transactions*, vol. 111(2), pp. 122-136, 2005.

Designer's Guide to Ceiling-Based Air Diffusion, with Dandan Zhu. ASHRAE, ISBN 1-931862-11-7, soft cover, 154 pages, 2002.

"Placement of Ventilation Air Intakes for Improved IAQ (RP-806)," with Kelly A. Moylan. *ASHRAE Transactions*, vol. 105(1), pp. 71-79, 1999.

"Performance of Fixed, Air-Side Economizer, and Neural-Network Demand Control Ventilation in CAV Systems," with C. T. Wu. *ASHRAE Transactions*, vol. 104(2), pp. 234-245, 1998.

"Impact of Daylight Saving Time on Residential Energy Consumption and Cost." *Energy and Buildings*, vol. 25, issue 1, pp. 63-68, 1997.

"A Sensitivity Study of Floor and Ceiling Plenum Energy Model Parameters (RP-787)," with Don Wolfe. *ASHRAE Transactions*, vol. 103(1), pp. 16-30, 1997.

"Post-Occupancy Indoor Environmental Quality Evaluation of an Institutional Building," with Craig A. Hillman. The *ASCE Journal of Architectural Engineering*, vol. 2, no. 3, pp. 88-94, Sept. 1996.

Synergistic Activities

EAC/ABET, author of KU's *BS ARCE 2012 Self-Study Report*, and the *2014 Interim Report* that described our change from a five to four year curriculum. Both reports were very successful.

U.S. DOE's Energy Analysis and Diagnostic Center (EADC)/Industrial Assessment Center (IAC). Acting Director, 25 audits/reports, #397 to #421 (many authors), June to November 1993.

Energy and Buildings, member of the Editorial Board. An international technical journal, 2015 Impact Factor = 2.973, Elsevier. 2010 to current.

Senior Design/Construction Projects (funded primarily by ASHRAE):

"Fan and System Effects Experimental Apparatus"
"Full-Scale Variable Air and Water Flow Wet Cooling Tower for Class Experiments"
"Direct Digital and Pneumatic Control of Ventilation and Energy Systems"
"Analysis, Design, and Construction of an Active Solar Thermal Energy System"

New Faces in Engineering (early career recognition program; former students):

Amanda (Curry) Bogner, 2005. ASHRAE finalist.
Cynthia Cogil, 2004. First National New Faces in Engineering winner.

Areas of Expertise Related to Energy Efficient Designs, Technologies, and Improvements

Load and Energy Calculations: Practical thermal comfort, psychrometrics, and energy management
HVAC&R Systems Design: Ventilation/IAQ, air distribution, fans, central equipment, insulation
Heat and Mass Transfer: Heat exchangers, heat recovery, coil/chiller/cooling tower performance
Plumbing, Piping, and Fire Protection Systems: Pump performance, optimal sizing, conservation
Solar-Thermal and PV Energy Systems: Site evaluation, system analysis and design, economics

Courses Taught at KU

HVAC&R analysis and design, fire protection, hydronic systems (plumbing/piping/pumps), solar energy systems, automatic controls, advanced energy analysis, capstone senior design, engineering economics, and introduction to architectural engineering