Oregon

State Board of Examiners for
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PROFESSIONAL PRACTICES AGENDA

Meeting of Friday, December 13, 2013
1:00 p.m.

Public Comment –

Unfinished Business –

A. Meaning of ORS 215.080
B. Software Engineering
   Concerns Submitted by Richard Balkins *
C. Clarification on Engineers Performing Survey Work

New Business –

A. Digital Signatures – Carl Tappert
B. Questions Regarding a Postcard – Robert Demers, Jr.
C. Interpretation of ORS 672 – Redi Pour Wall Systems
D. Acoustical Analysis – Mark Bastasch
E. Filing of Boundary Line Adjustment Map
F. Dust Control Plan – Adam Barber
G. Electronic Documents – A Draft Interpretative Guideline (WA) *

* Additional Agenda Item

Richard W.C. Balkins
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To the Professional Practice Committee of OSBEELS and the board:

Hello, I am Richard W.C. Balkins and owner of Wavestar Interactive. This letter is to express my concerns about the licensing of software engineers and its implications on software development businesses such as my own. To begin, I will start by a little synopsis of my background and to extent what I do and then proceed on about my concerns.

BACKGROUND

My education and experience in this field in question traces back to 1986/1987. I have been in one form or another have been an independent practitioner in the complete software development cycle and in effect I conduct all roles from software developer, "software architect", "software engineer", programmer, graphic artists, etc. In my current incarnate of business under the name "Wavestar Interactive", I am currently in development of product line software for online pay per install games and non-gaming applications which includes usage of new augmented reality and virtual reality technologies such as castAR for use on desktop and mobile devices platform.

In the past, I've worked on many different software and software systems for multiple software applications domains and I plan to continue to do so in the future as well as my overall role as the "software architect" & "software engineer" and in the foreseeable future all the other roles that I currently do. However, my business does not typically engage in life & safety critical systems at this time.

REGARDING CONCERNS ABOUT SOFTWARE ENGINEERING LICENSURE

I became aware of the discussion about introducing software engineering as a discipline under OSBEELS requiring licensure. It is my understanding the underlying issues concerning software engineering and enacting licensing requirements on the practice of software engineering has to do with with life and safety critical systems in which software is a component of those systems. This also leads to concerns of a skewed perspective of what is software engineering. It is my concern that the board is looking at "software engineering" as pertaining only to life and safety critical systems. The problem is that is not what software engineering is about. Software engineering is not just one software application domain. Software engineering along with software architecture is the Planning and Specification of software and software systems BEFORE you construct the software. (ie. Computer programming, graphics development, etc.)

A prominent authority on the topic of software engineering, Roger Pressman, in his book "Software Engineering A Practitioner's Approach", cites Fritz Bauer whom is largely regarded as defining software engineering:

"Software engineering is the establishment and use of sound engineering principles in order to obtain economically software that is reliable and works efficiently on real machines."

He raises the questions not well described in Bauer's simple definition and that is: What are the "sound engineering principles" that can be applied to software development? How do we "economically" build software so that it is "reliable"? What is required to create computer programs that work "efficiently" on not one but many different "real machines"?

As I see it, one must keep in mind Bauer's context of time and place. He was from a time period where there were a lot of theorists developing "software" on theoretical systems on a "pseudo-code" that works fine in theory but often broke when dealing with real hardware with their limits. A time period when a lot of physics & math phd students and researchers were the dominant users of computing machines testing computation theories and so forth. A lot is left to be answered and a profession has to develop to establish a body of knowledge. An organization known as the IEEE had established an evolved or more comprehensive definition only after mere decades apart and a rapidly growing profession and field that exploded with the advent of microcomputers for the masses not the classes.

IEEE definition for software engineering as quoted in Pressman's book:

Software Engineering: (1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software. (2) The study of approached in (1).

Pressman states: "... yet, a "systematic, disciplined, and quantifiable" approach applied by one software team may be burdensome to another. We need discipline, but we also need adaptability and agility."

I agree on these notions and one approach that is suitable for one type of application or even a scale of team may not be efficient or effective for a different application type or size of time. Pressman states of seven software application domains. That is seven broad categories: System software, application software, Engineering/Scientific software, Embedded software, Product-line software, Web applications, and Artificial Intelligence software. Each of these domains represents unique challenges to software engineers and millions of software engineers worldwide work on software projects in one or more of these software application domains.

Grady Booch suggested in his book Handbook of Software Architecture the following architectural genres for software-based systems:

Artificial intelligence, Commercial and Non-profit, Communications, Content Authoring, Devices, Entertainment and sports, Financial, Games, Government, Industrial, Legal, Medical, Military, Operating Systems, Platforms, Scientific, Tools, Transportation, and Utilities

Each of these genres represents unique challenges and requirements for software architectural design would be different from any of the others. It is even possible where there is multi-genres that have to be carefully applied.

In this regard, it is very clear that software engineering is a core aspect of all software development and definitely not just life and safety critical systems.

Concerns:

How will software engineering licensing impact software engineers in the seven software domains?

How would those of us without ABET accredited degrees or even largely experience and even independent practice be recognized by a board largely unqualified by area of competence?

For example, I have started my education and independent practice since long before any ABET accredited software engineering degree existed and I would not want to be forced into expensive degrees and internships and then have to take a bunch of tests such as the Fundamental of Engineering exam that is geared around civil, structural, mechanical and electrical and plumbing engineering not software just to start EIT. Then after 4 years in a traditional engineering office then be allowed to take the Principles of Engineering Exam(s) just to continue operating my business.

Then there is this whole "practice of engineering" and territorial creep of OSBEELS.

(1) "Practice of engineering" or "practice of professional engineering" means doing any of the following:

(a) Performing any professional service or creative work requiring engineering education, training and experience.

(b) Applying special knowledge of the mathematical, physical and engineering sciences to such professional services or creative work as consultation, investigation, testimony, evaluation, planning, design and services during construction, manufacture or fabrication for the purpose of ensuring compliance with specifications and design, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works or projects.

As I read the definition and especially the subsection (b), I would have some serious concerns about how the words are interpreted. How wide or narrow would the interpretations be? As wide as it can be, it can literally be applied to any and all software development which would be in effect interpretable to be 'engineering' and requiring a license. This raises concerns of added cost to development of software. Since with licensing comes professional liability insurance requirements and high insurance rates as they are for structural engineers, mechanical engineers and other traditional engineers. It would in turn cause the rates of software engineers to increase drastically which would eat into contribution margin of revenues for software. Although the board may be required to uphold health, safety and welfare interests and often that's just focused on physical health, physical safety and physical welfare. The board and state does have a duty and interest to look at financial and business implications of their actions and decisions they make. For example, if I have to be licensed or have to hire a licensed engineer to stamp my software. If I have to do the latter, it would put me out of business and forcing me out of this field that I have spent over two decades in education and experience. The larger software businesses would just send their software engineering and development overseas or elsewhere and effectively layoff Oregon citizens that practices software engineering in Oregon.

The issue is very clear, the boards will continue to push agendas to expand scope creep based on how far they can interpret the meaning of the law. A policy is not enough to defined and contain creep. A policy is whimsical and can be changed at any moment without prior notice. Most software engineers are probably not even aware of OSBEELS's very existence or knows about what is happening.

In addition, other concerns that I have would be about once software engineering is a licensed profession: There will be a growing environment of territorialism aka protectionism. The abuse of using the name of health, safety and welfare as the platform for their excuse for political agendas to push out competitors for personal gains. It would cause the profession to lose focus of professional matters and circle around complaining about the unlicensed undercutting them or how they can keep pushing the unlicensed out and continue to use the licensing system as a vehicle to reduce competition by legislating the competition out of business. This is what the system was originally created for by Architects and to some extent Engineers. That was their real reasoning for pushing these licensing law through closed-door legislative action... when citizens were not being allowed to be present during legislative sessions or even a voice on the matters.

I have concerns about destructive side effects that are not necessarily being concerned or factored in. From the cases I have heard about from the Investigator (speaking generally without naming parties), I have reasons to conclude that some of the problem cases in software engineering has been an issue of improper coordination and almost always life and safety critical systems involves engineers from more conventional engineering disciplines licensed by OSBEELS.

With these concerns, I like OSBEELS and the Professional Practice Committee to take time and deep thoughts and deliberations over the subject matter. No need to rush any implementation and considerations at addressing concerns such as the ones I raised. Get more feedback from software engineers outside the close domains where software engineers and more traditional engineering disciplines are co-involved in. Get feedback from software engineers in other software application domains than life and safety critical systems. Consider the impact that OSBEELS would impose.

I would like feedback and possible opportunity to discuss this with the board and committee via teleconference if possible. I can’t readily run over to Salem, Oregon. If you want public input, you need to get out and get input via mechanisms that would work with people across state not expect them to be physically present.

I am not stating a position against licensing but I am concern about implementation. I would recommend some system of recognition for prior experience not just experience under supervision of a licensed engineer. For most software engineers, we don’t have involvement with other engineering disciplines because the software we engineer are not part of life & safety critical systems or systems that a part of buildings and structures.

I am familiar about the other disciplines of engineering such as structural, civil, mechanical, electrical and plumbing engineering. I am also a building designer in another business of mine. However, I typically am not involved with those engineers in regards to software and software systems. I do have a stakeholder interest in the matters. I do have concerns as it applies to me but I am also concern about the implementation of software engineering licensing to others besides myself.

I apologize for the length so bear with me.

STATE OF WASHINGTON
BOARD OF REGISTRATION FOR
PROFESSIONAL ENGINEERS AND LAND SURVEYORS
P.O BOX 9025
OLYMPIA, WASHINGTION 98507

February 1, 2013

ELECTRONIC DOCUMENTS

A Draft Board Interpretative Guideline

Last year the Board voted to suspend the Board Policy on *Computer Aided Designs (CAD)* as it was felt that this policy was dated. Feedback from the engineering/surveying community had indicated that the Board did not have a policy that adequately dealt with the rapidly increasing use of digital media in the engineering and surveying professions.

To help establish improved understanding of this technology the Board has developed the following *Interpretive Guideline* for licensees and public officials to refer to for development of their own processes and practices.

Comments are welcome. Please send your opinions or suggested changes to the Board at: engineers@dol.wa.gov

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It is accepted practice for engineering, land surveying and on-site wastewater design documents to be prepared, stored and transmitted in electronic format. These electronic documents must still meet the applicable requirements of chapter 18.43 RCW, chapter 18.210 RCW, chapter 196-23 WAC and chapter 196-33 WAC. This policy seeks to clarify what is allowed and what is not allowed in the sealing and reproduction of electronic documents. This is provided as guidance for electronic documents. However, the above statutory and administrative rule provisions take precedence whenever this guideline appears to be in conflict.

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Definitions

For the purposes of this Board Policy, the following definitions will apply:

Electronic: (RCW 19.34.020 (12)) Means electrical, digital, magnetic, optical, electromagnetic, or any other form of technology that entails capabilities similar to these technologies.

Electronic Record: (RCW 19.34.020 (13)) means a record generated, communicated, received, or stored by electronic means for use in an information system or for transmission from one information system to another. A Digital Signature can be used to sign these records.

Electronic Document: An electronic document is any document that is generated or stored on a computer showing an image of a plan, drawing, plat, map, report, specification, letter, contract or photograph.

Electronic Documents can be combined or transformed to become all or part of an Electronic Record. A Digital Signature can be used to sign these documents.

Electronic Signature: A signature in electronic form attached to, or logically associated with, an Electronic Record or Electronic Document. An Electronic Signature DOES NOT incorporate encryption or security measures. An Electronic Signature, by itself, DOES NOT meet the requirements of WAC 196-23-070 (2). An Electronic Signature can be a sound, image, icon or graphic that has been adopted by the signer. Common examples of Electronic Signatures include:

A. Digitized images of a "wet" signature,
B. Graphical representations of a handwritten signature (constructed using graphics software or special fonts), and
C. Other icons or representations adopted by the person with the intent to sign the document.

Digital Signature: Means a secure signature in electronic form that can be attached to an Electronic Record. The Digital Signature must have the following properties:

A. It must be unique to the licensee;
B. It must be capable of independent verification;
C. It must be under the exclusive control of the licensee;
D. It must transform the Electronic Record such that a recipient can determine that the record was signed by the licensee,
E. It must transform the Electronic Record such that a recipient can determine if the initial record was altered since the transformation was made.

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Images of Stamps and Seals

Engineering, land surveying and on-site wastewater design stamps and seals may be digitized, scanned, or electronically reproduced. The electronic seals/stamps can be placed on or in plans, plats or documents in either electronic or hard copy form. The electronic seals/stamps must conform to the design specified in WAC 196-23-010 or WAC 196-33-500. While the size is not specified, it is critical that the image be fully legible.

Electronic Seals/Stamps Usage

Seal/Stamp Usage must be as described in WAC 196-23-020 or WAC 196-33-500. Usage guidelines include:

A. An electronic seal/stamp may be embedded in an electronic document as part of a template, drawing border, or cover sheet.
B. The licensee may authorize another individual (such as a drafter, designer, technician, etc.) to place his seal/stamp on or in an electronic document.
C. The licensee is responsible for assuring that the seal/stamp is only applied to documents prepared by or under his or her direct supervision per RCW 18.43.070.
D. If the seal/stamp is combined with an Electronic Signature into a single graphic entity, then it may only be applied;
    a. by the licensee,
    b. to final documents per WAC 196-23-020, and
    c. in conjunction with the licensee also applying his Digital Signature to the document.

Signature

A signature must be, as described in WAC 196-23-070 or WAC 196-33-500, either:

A. An original "wet" signature, written by hand, and applied by the identified registrant;
B. A Digital Signature; or
C. An Electronic Signature as applied under the next section titled "Electronic Signature Usage".

Electronic Signature Usage

Applying Electronic Signatures to sealed/stamped documents is allowed as follows:

A. An Electronic Signature, such as a scanned image of a "wet" signature, may be applied to a final Electronic Record as long as a Digital Signature is also applied to that record.
B. An Electronic Signature can be embedded into a Digital Signature.
C. Applying an Electronic Signature, without an accompanying Digital Signature, does <u>not</u> meet the requirements of WAC 196-23-070 (2) or WAC 196-33-500 and will put the licensee in violation of Washington State Rules and Law.

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Digital Signature

A Digital Signature has the following properties:

A. It has a hardware or software cryptographic protection (such as a public/private key pair) that is unique to the licensee.
B. It can be independently verified by a third-party certification authority.
C. The Electronic Record to which it is attached is encrypted such that the recipient can verify that the document was uniquely signed by the licensee.
D. The Electronic Record to which it is attached is encrypted such that the recipient can verify if the document has been altered since the licensee signed it.

Digital Signature Usage

Applying a Digital Signature to a sealed/stamped document or record must be as described in WAC 196-23-070 (2) or WAC 196-33-500. Usage guidelines include:

A. Only a Digital Signature is acceptable as meeting the requirements of chapter 196-23 WAC or chapter 196-33 WAC for final documents that are distributed as an Electronic Document or Electronic Record.
B. The Digital Signature applied to the document, must be applied by the licensee.
C. The licensee must maintain exclusive control of the passwords, private key, and/or security device that allows access to their Digital Signature.

Preliminary Documents (as defined in WAC 196-23-020 (2))

Preliminary electronic documents must be clearly identified as "PRELIMINARY" and shall be stamped/sealed with either an electronic or physical stamped seal. Preliminary documents do not need to be signed by the licensee.

Unsigned preliminary electronic documents may be stored or transmitted in any electronic format, with no restrictions.

It is recommended that the licensee not transmit electronic documents that contain their seal/stamp in an image format that can be easily copied or extracted. (An example of this would be a MS Word document where the seal/stamp is an embedded graphic image that can be easily copied by the recipient.) The licensee will maintain better control over their seal/stamp by only transmitting it in preliminary documents that are flattened PDF's or image files.

Signed preliminary electronic documents must conform to the same requirements as Final Documents, as described below.

Final Documents (as defined in WAC 196-23-020 (1))

Final Electronic Documents or Electronic Records must be signed and sealed as described in WAC 196-23 and as described above under "Stamping and Seals" and "Signature". Final sealed and signed electronic documents/records may be stored, transmitted, or reproduced in electronic format as follows:

A. A printed copy of the final document that has been sealed, signed with a hand written "wet" signature, and dated by the licensee that meets the requirements of WAC 196-23-070 or WAC 196-33-500. The printed document is then scanned into an electronic format that either cannot be

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easily modified, or can be protected by the licensee to prevent any modification or editing of the document.

a. Examples of formats that cannot be easily modified are: TIFF, JPEG, BMP or other "picture" formats where the entire document, including the seal and signature, are a single graphic entity.
b. Examples of formats that can be protected are: PDF, DWF or other formats where the licensee enables protection and where modification of the document is under his *exclusive* control.
c. If a PDF, DWF or other similar document format has been "flattened", such that all layers of text, graphics and content are merged into a single graphic entity, then protection is not required.

B. An electronic copy of the final document or record is sealed with an electronic copy of the licensee's seal, dated and signed by the licensee with a Digital Signature that meets the requirements of WAC 196-23-070 or WAC 196-33-500

a. In its native format this type of electronic document can be stored, transmitted, or reproduced only with the Digital Signature intact.
b. Copies of this type of electronic document can be stored, transmitted, or reproduced as long as the native format is converted into a TIFF, JPEG, BMP, flattened PDF, or other formats where the entire document, including the seal and signature, are a single graphic entity.

C. The electronic final documents or records can be combined into a plan, plat or document set as a single file. For plan/plat sets each page should have an electronic copy of the responsible licensee's seal, the date, and an Electronic Signature. This plan set can then be signed by the overall responsible licensee with a single Digital Signature.

a. As long as the documents are combined into a single file prior to application of the Digital Signature, a Digital Signature only needs to be applied one time to the set. Separate application of the Digital Signature to every page in the set is not required. Separate application of a Digital Signature to the set by every responsible licensee is also not required. Only the licensee taking responsible charge of the entire set needs to apply his digital signature.
b. In its native format this type of electronic document can be stored, transmitted, or reproduced only with the Digital Signature intact.
c. Copies of this type of electronic document can be stored, transmitted, or reproduced as long as the native format is converted into a TIFF, JPEG, BMP, flattened PDF, or other formats where the entire document, including the seal and signature, are a single graphic entity.

The format of the final documents will depend on the requirements of the recipient. The licensee will need to meet the requirements of the law, while still trying to match the requirements of the recipient.

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