



Oregon

**State Board of Examiners for
Engineering & Land Surveying**

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Oregon Specific Acoustical Engineering Examination Syllabus

General Description of Examination

The Oregon Specific Acoustical Engineer exam is an open-book exam that involves two, four-hour examination sessions: a four-hour morning session and a four-hour afternoon session.

The exam covers a variety of sound sources and receivers and a variety of intervening physical situations. The exam is not a multiple-choice or true-false type problem exam. Instead, it is made up of problems that have several parts which must be answered. The problems are usually complex and require the use of varied acoustical analyses to solve all the parts making up a problem. The problems have been written for the examinee who will have been working in the acoustical engineering field under the guidance of an acoustical engineer and who believes he or she is capable enough to do the work of the PE, alone.

The morning examination session problems cover Outdoor and Industrial Noise: Oregon DEQ, FHWA, HUD and OSHA noise compliance. The afternoon examination session problems cover Indoor Sound: small and large rooms, communication and privacy. A more detailed description of what is covered in the examination sessions is presented below.

Technical Areas Covered by Exams

Morning Session: Outdoor and Industrial Sound, DEQ and OSHA Compliance

The morning examination problems will test the ability to solve problems which may involve but is not limited to the following topics:

- C, A and un-weighted sound spectrums
- Engine enclosure design
- Fan isolation with springs and inertia blocks
- Muffler design with side branch resonators and resonant chambers
- Finite length line source calculations
- Machine sound power calculations
- Multiple sources and workers in OSHA calculations
- Insertion Loss calculations to meet DEQ and OSHA requirements
- Multiple time exposures in DEQ and OSHA calculations
- Enclosed source, mass law, absorption calculations
- Reverberant room issues in OSHA calculations
- Point source, barrier, receiver level calculations
- Statistical traffic (L_{xx}) levels derived from individual pass-by events
- Blower sound power level calculations
- Hand calculation of L_{dn} levels

- Calculation of required traffic barrier from traffic count, speed, and distance data
- DEQ compliance in rural setting

Afternoon Session: Indoor Sound: Small/Large Rooms, Communication/Privacy

The afternoon examination problems will test the ability to solve problems which may involve but is not limited to the following topics:

- Plenum attenuation
- Wall assembly, STC prediction
- Composite partition TL
- Vocal source in reverberant room, S/N
- Receiver level adjustment using Hass reflections
- Distributed sources in reverberant space, specific source/receiver S/N
- Loudspeaker power, outdoor level at distance
- Floor vibration, surface sound level, vibration exposure criteria
- Noisy environment, walk away test, SIL
- Investment, low cost high maintenance, high cost low maintenance, lifetime
- Air diffusers in semi reverberant room, adjust for PNC
- Speaker directivity, program level and placement in reverberant room
- Blower vibration isolation from structure on rooftop
- Partitioned reverberant room
- Coupled reverberant rooms with source in one room and desired level in other room
- Pure tones considered relative to DEQ compliance
- Blower, blades, rpm, cfm, power, STC, office noise levels
- STC, IIC, IOTC ratings
- Mass, strength, density and damping
- RT60, Sabines, room constant, direct to reverberant ratio
- % Alcons. RASTI

Reference Materials

The examinee is encouraged to bring and use professional reference books and materials to the exam and to become very familiar with them before using them in the exam. Publications such as:

The latest version of the ASHRAE Handbook on HVAC Applications
 Handbook of Noise Control, Harris
 Acoustical Design and Noise Control, Rettinger
 Noise and Vibration control, Beranek
 Sound System Engineering, Davis & Patronis
 Handbook for Sound Engineers (Cyclopedia), Ballou
 UBC or IBC or equivalent building standards
 The Noise Guidebook, HUD
 Catalog of STC and IIC Ratings for Wall and Floor/Ceiling Assemblies, DuPree
 Oregon DEQ's OAR 340 Division 035, Noise Control Regulations and Tables
 Occupational Noise Exposure 1910.5, Appendix A and B
 FHWA Highway Traffic Noise Prediction Model FHWA-RD-77-108