

Laboratories: low-noise & low-vibration design

Large-scale laboratory facilities integrate multiple uses, both technical and human, including scientific research labs, animal facilities, offices, meeting spaces and the large machinery and delivery systems required to support them. These present a diverse and sometimes conflicting array of noise and vibration requirements, and the goal is to provide a productive design for instruments, animals and people. Given the high stakes, these laboratories are some of the most challenging projects. Below are some of our projects addressing the needs of humans, research animals, and advanced technology instruments in these facilities.

Physical Sciences Facility (Pacific Northwest National Labs): Full vibration and acoustical design for a 5-building nuclear materials research complex. Lab spaces include imaging suites (TEM, SEM) as well as biological and chemistry labs. The project also includes an underground “Deep Lab” (with cleanroom) and a visitors’ center. Site ground vibration testing drove the decision to specify active vibration isolation for one of the TEMs to minimize impact of road traffic. Inside one building, major air-handling equipment was located above the sensitive spaces. We constructed a 3D finite element model of the structure (with soil effect) to help optimize the dynamic design of the structure.



Collaborative Life Sciences Building (Oregon Health Sciences University): Vibration design for a high-end imaging center inside a 480,000GSF, \$295M facility supporting multiple research laboratory groups. The site is extremely challenging from an environmental vibration perspective: a very poor soil condition exacerbates the vibration impact from interstate highways and light rail alignments that bound the site on three sides. We designed a unique isolated deep foundation for the imaging suite that takes advantage of an unusual quirk of the different soil layers at the site. The novel foundation design provides enough margin to allow third-party tool vibration isolation to be successful.



Integrated Science and Engineering Laboratory (University of Delaware): Vibration design for a 194,000GSF facility. The project included an eight-room imaging suite and a 10,000SF nanofabrication cleanroom in addition to characterization and teaching labs. We were brought onto the project after another consultancy was unable to successfully accommodate the future vibration impact from a major Campus Utilities Plant (left) being constructed on the parcel immediately adjacent. We were able to streamline vibration design of both the ISEB as well as the CUP; the architect estimated that we saved the project more than \$1M in unnecessary isolation costs.

