Pacific Northwest National Labs
PNNL Hanford Site, WA

Low-noise & low-vibration design

Owner
PNNL / Battelle

Architect, Engineer
Flad & Associates (Madison)
AEI (Seattle)

Design Work Scope
Architectural Acoustical Design
HVAC Noise Design
Laboratory Vibration Design
M/E/P Isolation Design

Test & Measurement Scope
Site Vibration Validation
M/E/P Installation Observation
Final Vibration & Noise Testing

Facility Size
335,000 gsf (total)
175,000 nsf (laboratory)
445 Staff

Structures
4 Primary Buildings
1 Central Plant
1 Underground Lab

Completion
2011

Battelle, as operator of PNNL for DOE, has been tasked with providing replacement facilities for multifunctional research capabilities currently at Area 300 of the Hanford Site. The Physical Sciences Facility (PSF) consists of several buildings for chemistry and materials research.

Three of the buildings house mixed laboratory and office space for research missions in nucleotide detection, characterization, and materials performance. Lab spaces in these buildings support state-of-the-art imaging facilities (TEM, SEM) as well as biological and chemistry labs. The project also encompasses an underground "Deep Lab" (with cleanroom) and a visitors' center.

From a **noise control design** perspective, the imaging suites presented significant challenges. The SEM and TEM tools in these suites impose considerable demands on very-low-frequency noise. Industry standards such as the "NC" (Noise Criteria) curves fail to address the very-low-frequency portion of the spectrum; we took a customized approach to defining and designing to tool criteria.

Similarly, **vibration control design** for the imaging suites was challenging. The results of our **site validation testing** drove the decision to specify an active vibration isolation option for one of the TEMs, to minimize impact of auto traffic adjacent to the site. Inside the building, the team made the conceptual decision to locate major air-handling equipment above the sensitive spaces. We constructed a 3D finite element model of the structure (with soil effect) to probe the dynamic behavior of the structure. Through our model, we found a cost effective solution for minimizing the transmission of dynamic forces from the upper floors down to the sensitive ground floor. By using heavier columns in certain areas, the design confines motion to the floor diaphragm in the upper level.

In addition to noise control design, we provided significant **architectural acoustical design** services, as well. These addressed the creation of high-quality office and meeting spaces as well as "semi-secure" spaces for the presentation and discussion of sensitive data. In the lab areas, small rooms with intensive fume hood service presented unique exhaust- and valve-noise challenges.

VACC, Inc. DBA
Vibro-Acoustic Consultants