

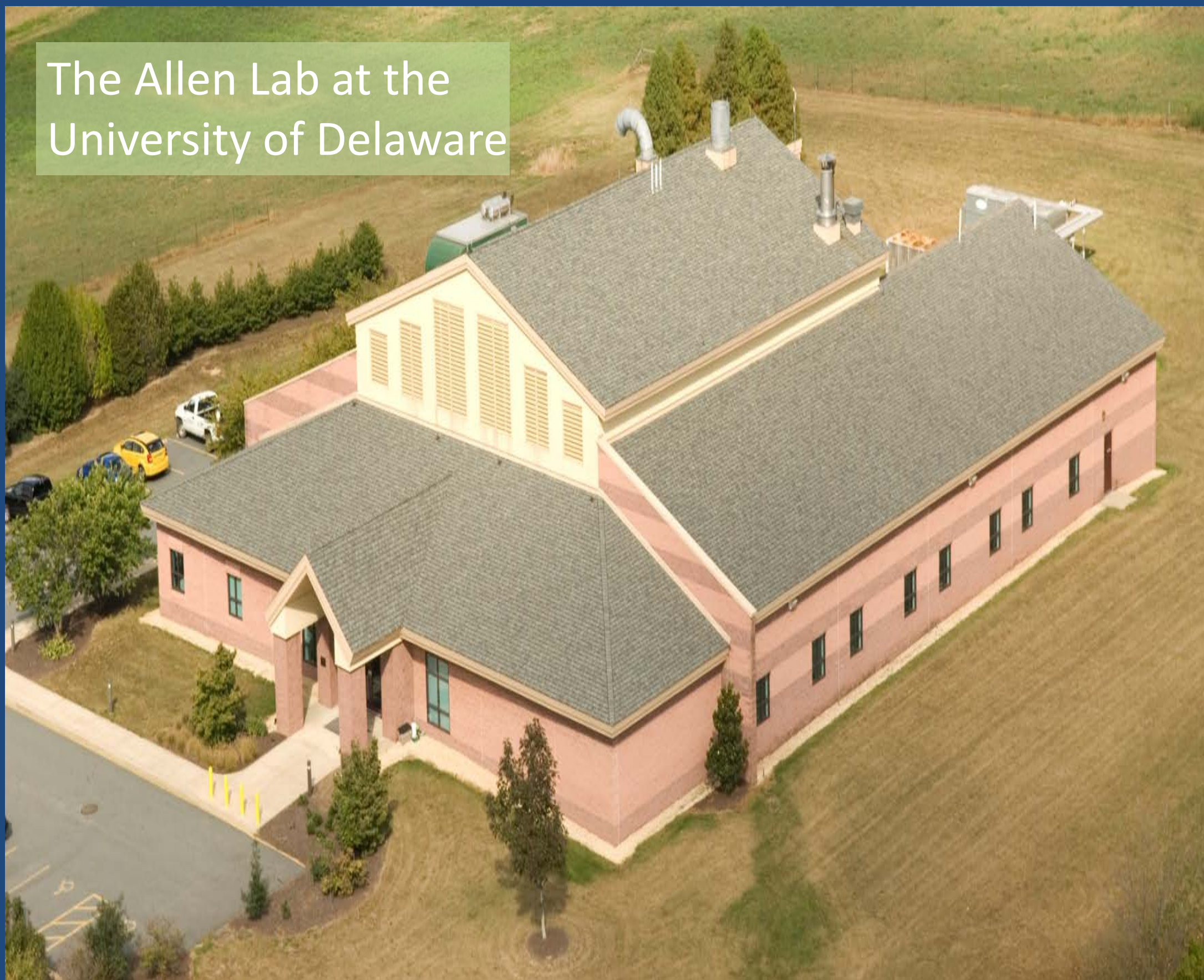
HVAC Containment Re-Verification in a BSL3 Facility to Meet Select Agent Program Requirements

K. L. Murray, R. L. Alphin, and B. S. Ladman
University of Delaware, Newark DE



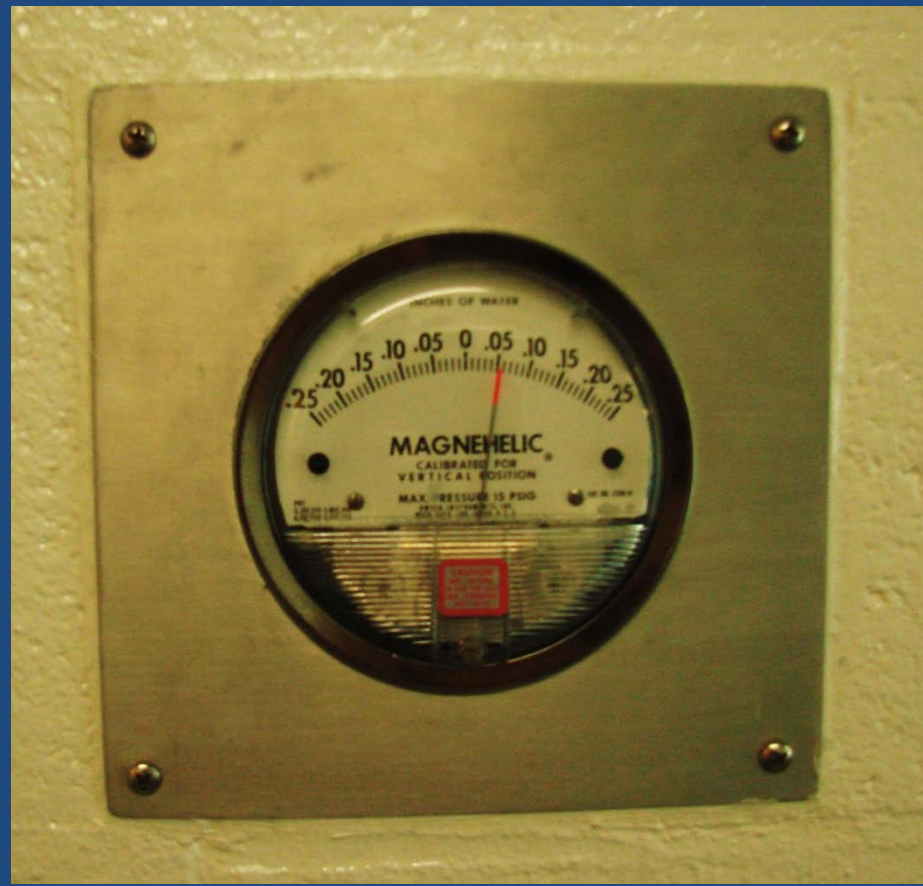
Abstract
The University of Delaware performs research on avian disease viruses which are included in the Select Agent (SA) program. This work is performed in a BSL3 facility that has been in operation for approximately 15 years. Work was performed on the facility HVAC system in December 2011. This work met the definition of “major changes to the system”. To comply with the SA program guidance issued on 8/5/11 in regards to compliance with the 5th Edition of the *Biosafety in Microbiological and Biomedical Laboratories* manual on HVAC verification, a procedure to verify containment was needed. Environmental Health & Safety (EHS), Facilities Maintenance & Operations, and laboratory staff worked together to develop the procedures and data collection tools. Testing was performed to verify the building was functioning properly prior to reinstating BSL3 operations. When problems were identified, Facilities worked to correct the issues and the group collaborated again to perform additional testing. The process took over 105 man-hours from start to finish. At the conclusion, testing verified the building containment was operating properly and met the SA program requirements.

- Background**
- The University of Delaware has a BSL3 facility for avian research which is included in the SA program. The building was opened in 1997.
 - In August 2011, the Federal Select Agent Program sent out an SA Gram in regards to the policy on BMBL 5th Edition Laboratory Facilities (Secondary Barriers) Standards.
 - The 5th Edition BMBL states the requirements for BSL3 and ABSL3 facility design and operational procedures, to include documentation of verification of HVAC design functionality under failure conditions. Verification must be performed annually & when major changes are made to the system.
 - In December 2011 work was performed on the HVAC system. In an attempt to lower energy costs, new variable frequency drives were installed on the supply air handler. This constituted a major change to the system according to the BMBL.

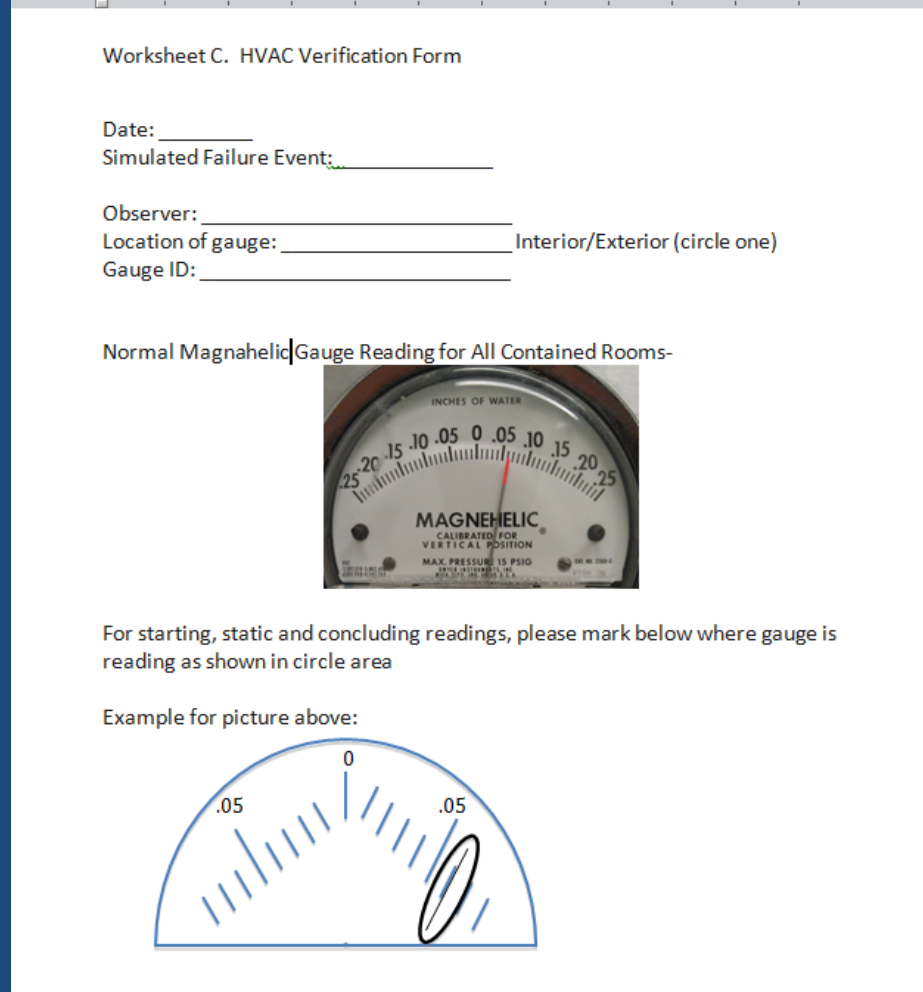


- Testing**
- Following repairs & prior to official testing, HVAC staff performed preliminary testing. Found that all BSL3 labs were going positive due to increased time for system to switch over during failure. Determined the supply interlock with the exhaust was not working properly.
 - After repairs, additional preliminary testing indicated system seemed to be operating properly.
 - In-wall magnehelic units were all calibrated by contractor prior to system testing.
 - Observers were stationed at each magnehelic to verify unit reading during testing. Approximately 20 people required. Recorded results on developed worksheets. Observers had either smoke generators or dry ice to determine airflow direction & if containment was broken. Facilities HVAC personnel monitored automated control of HVAC system to observe building performance. Other HVAC personnel in the mechanical room forced failure conditions of equipment. Only SA approved personnel were allowed access to SA rooms unless accompanied by an SA approved employee.
 - The RO served as test manager. Observers were trained before initiating tests.
 - All of the suites passed the smoke tests with no smoke entering clean corridor with exception of one suite. Problem was identified when building switched back from emergency power to city power. Adjustments were made to problem suite & automatic transfer switch in electrical system was cleaned & re-lubricated. Suite was retested & found to maintain containment. Electrical power correctly switched from emergency generator back to city power.
 - Worksheets from all observers were collected. Building Manager, RO & Facilities personnel signed off on the report verifying testing was successfully completed.
 - Institution plans to do verification testing during semi-annual shutdown to meet requirements of SA program & to ensure building containment is working as expected.

- Tool Development**
- A committee was formed to determine how to perform and document the HVAC verification testing.
 - Members included the facility manager, researchers, EHS, the Responsible Official, Facilities Maintenance and Operations, and the testing and balancing company.
 - Other institutions with similar systems were contacted to see how they performed this testing and how it was documented.
 - Documentation must be provided of verification of HVAC design functionality under failure conditions.
- The failure conditions for verification include:**
- **Mechanical failure of exhaust fan or fan component(s):**
Ability to transition to alternate fan without reversal of air flow from potentially contaminated laboratory space into “clean” areas surrounding laboratory must be verified.
 - **Simultaneous power failure supporting supply & exhaust fan components:**
Ability to transition from “normal” power to backup system without reversal of air flow from laboratory should be verified.
 - **Return from power failure to “normal” operating conditions:**
Verify ability exists to transition from backup power to normal power without reversal of air flow from the laboratory.
- Worksheet was developed to collect information & verify testing.
 - Plan was developed for monitoring BSL3 rooms as each failure condition was tested.
 - All procedures were developed into a verification protocol, which included worksheets for data collection & signatures for final report.



- Summary**
- By working together a plan was developed to meet the building containment verification requirements of the SA program.
 - Tools were developed, testing was performed, and documentation completed to ensure the BSL3 & ABSL3 labs maintained proper containment in failure situations.
 - Recertification required planning by approximately 10 people for 25 man-hours, and the testing required 20 people and approximately 80 man-hours, but we were able to confidently state the building would meet the SA requirements.



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