



Tradeline Publications: USDA to Open New Lab and Large Animal Facilities in Iowa

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Orinda, California

The United States Department of Agriculture (USDA) operates a 480-acre campus in Ames, Iowa, that houses approximately 800 employees from two USDA agencies: the Agriculture Research Service (ARS) and the Animal and Plant Health Inspection Service (APHIS). Together, they comprise the National Centers for Animal Health.

The APHIS organization consists of the National Veterinary Services Laboratories with its mission for diagnostic testing, training, reference assistance, and production of reagents, and the Center for Veterinary Biologics that ensures the products available for diagnosis, prevention, and treatment of animal diseases are pure, safe, potent, and effective. The ARS researchers at the Ames facility conduct basic and applied research on selected diseases of economic importance to the U.S. livestock and poultry industries.

The Ames campus is in the midst of a \$460-million modernization effort that will feature among other things a new consolidated laboratory facility and a biocontainment level 3-Ag large animal facility, and all of the associated central plant and infrastructure needed to support the facilities. The modernization effort is aimed at replacing older facilities built in the 1950s and the 1970s and creating a new state-of-the-art complex for diagnostics, research, and biologics evaluation for agricultural animal health.

New Facilities

Construction on the consolidated laboratory building began in September of 2005 and is expected to be complete in January of 2009. The BSL-3Ag large animal facility is in the initial commissioning stages with occupancy projected for February of 2007.

“Currently the ARS and APHIS agencies are in separate buildings on the Ames campus,” says Don Jones, chief of the Ames Modernization Branch, whose team is managing the design and construction activities of the effort. “The new laboratory facility will allow the scientific programs of the two agencies to function under one roof, which is why we refer to it as the consolidated lab.”

Jones adds that the move will allow USDA to consoli-

date administrative and support activities, and stimulate greater scientific exchange between research and diagnostic groups by encouraging interaction in areas such as shared training rooms, a central cafeteria, and large circulation space within the new lab.

Approximately 700 scientific and administrative staff will be housed within the new four-storey, 535,000-sf consolidated lab. The facility will include three floors of laboratories constructed to the BSL-2 and -3 biosafety levels, a vivarium, scientific staff offices, and administration and support areas.

Many of the same scientific programs will use the new 153,650-sf large animal facility, which will feature 22 separate animal rooms to accommodate various animal species and multiple agents simultaneously. The animal facility is constructed to BSL-3Ag biosafety level standards, a standard unique to the agriculture industry, where the room itself serves as the primary containment measure.

Worldwide Benchmarking

“Since this project involves so many diverse players, such as engineers, scientists, IT people, bio-containment specialists, and constructors, we have looked for tools to bring the team together so that we all stay focused on our common goal of building a world class facility,” says Jones.

One tool he points to is benchmarking tours taken early in the design phase. Approximately 30 people from the project team visited five privately-owned and government laboratories in the mid-west, Atlanta, and North Carolina, and five government-run large animal facilities within Canada, Australia, and England.

“Within the worldwide animal health industry, there is a very cooperative spirit since we are working toward the same goals,” says Jones. “At the facilities we visited, the staffs readily shared their thoughts on specific organizational practices, as well as design and construction processes.”

Members of the benchmarking team were each assigned specific areas to focus on during the trip and to summarize in report form afterwards. The goal was to

gather metrics related to construction costs, energy requirements, design and construction trends related to lab layout, casework options, animal spaces, and operating procedures related to animal handling and carcass disposal.

Containment Barriers

To ensure proper containment Jones advocates charting the exact flow of materials, equipment, supplies, people, animals, feed, and waste (including carcasses) expected to take place within the facility.

“Once you understand what has to move back and forth across the containment boundary you can use the flows to develop an effective floor plan,” says Jones. “This analysis will also help determine the type of construction materials required for containment, as well as the location of entryways, shower block arrangements, dip tanks, autoclaves, and airlocks.”

Jones adds that charting the flows also helps to identify and analyze potential containment risks and determine whether protocols, facility design, or a combination of the two is needed to mitigate the risk.

One example Jones points to is the USDA’s decision to continue delivering feed into the animal rooms manually rather than install an automatic feed delivery system in the BSL-3Ag large animal facility, which can often house as many as six bison in one room. The decision to stay with manual delivery was made after reviewing costs, the risks associated with maintaining containment, and the risk of cross contamination between rooms.

Extensive Mock-ups

“Since there is really nothing cookie-cutter about the large animal facility, we used a wide variety of mock-ups ranging from computer-generated tours of the facility plan to large scale models,” says Jones. “We found mock-ups to be a very helpful decision-making tool and an effective way to communicate with the program staff and to verify functionality of the spaces.”

The BSL-3Ag standard mandates that large animal rooms must withstand a pressure decay test to ensure that the room is air tight since the room itself serves as the containment device. To achieve this, the walls are typically cast-in-place concrete in order to pass pressure decay tests and provide the durability to withstand the abuse by animals as strong as bison and cattle.

“We used full-scale plywood mock-ups of the animal rooms to ensure the penning and gating configurations allowed for the safe and efficient handling of the animals. The mock-ups also helped ensure equipment and devices were properly located since working with cast-in-place concrete walls presents a unique challenge when it comes to placing MEP embeds and duct penetrations,” says

Jones. “With this construction method, you need to know exactly where those devices are located and how conduits are routed in the wall before it is poured.”

A large-scale concrete mock-up was also used to test various concrete design mixes, and fit and finish elements, including the durability of epoxy coatings, the height and location of hose reels and sinks, the placements of penning and gating, and the room’s ability to withstand washdown and decontamination processes.

Another mock-up tool used by the USDA modernization team was a vendor fair organized to help the team select air pressure resistant doors, which are required in BSL-3Ag facilities. Various vendors were invited to bring doors onsite, which helped a large cross section of the USDA program staff test a wide variety of doors in a cost-efficient and timely way.

Proper Commissioning

“Although the formal definition says that commissioning is conducting tests and completing documentation to verify that the building systems perform according to design intent, the real purpose is to find any problems before the building owner does,” says Jones. “You should expect to find problems during commissioning. The challenge, however, is solving those problems as a team rather than pointing fingers at individual parties.”

Jones also points out that there are varying approaches to commission a building, but for high-containment facilities, commissioning should be taken to its highest level and involve a third-party commissioning agent.

“Although using a third-party agent does add costs to the overall project expense, it is worth the costs if commissioning is able to pinpoint and correct deficiencies that would have led to unexpected problems after occupancy. Correcting deficiencies in a containment facility after occupancy is expensive and has a significant impact on the scientific programs,” says Jones.

He adds that during commissioning the building systems should be tested in as many operational and failure modes as can be imagined. The overriding goal is to ensure that all backup systems are fully operational so that containment is never jeopardized.

Lessons Learned

“Benchmarking and mock-ups helped us to define quality control and project management goals, but also proved to be very effective communication tools,” says Jones. “Both were excellent ways to communicate our design intent to facility users and our performance and quality expectations to the contractors.”

He adds that once you determine your design expectations, they should be thoroughly documented within

the construction documents to help transition from design to construction to commissioning and occupancy.

“Commissioning should be a team effort that is ingrained early during the design phase and throughout construction,” says Jones. “Ideally the contractor and the commissioning agent should be brought in during design so that the entire team has a common understanding of the intended commissioning process.”

Once commissioning is complete, Jones warns that the final step of facility turnover is often overlooked.

“Transferring the facility to its owners is much more than just handing over the keys,” says Jones. “Instead it should be viewed as a knowledge-transfer with formal training offered on building systems and equipment, warranty response systems in place, and post-occupancy support systems offered such as accurate as-built information, quality Operation and Maintenance manuals, and access to construction personnel for a period of time after turnover. The process begins during the design stage with the operating staff participating in development of design concepts and reviewing designs for operational and maintenance needs.”

Jones also suggests considering follow-up training on critical systems after the staff has had a chance to live with the facility for a few months.

Biography

Don Jones is chief of the Ames Modernization Branch at USDA’s Agriculture Research Service (ARS). He has been with ARS for 12 years serving as engineering team leader and engineering project manager for several projects. Before joining the USDA, Jones spent 15 years in various civilian positions with the Department of the Army involved in design, construction, operation, and management of Army-installation facilities.

This report is based on a presentation given by Donald Jones at Tradeline’s *International Conference on Biocontainment Facilities* in March 2006.

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Project Information

Project Teams

BSL-3Ag Large Animal Facility

- Agricultural Engineering Consultant: Curry-Wille & Associates, Ames, Iowa
- Architectural Design: Merrick & Company, Aurora, Colorado
- Biocontainment Consultant: Biocontainment Design Services
- Central Plant/Site Infrastructure: RMF Engineering, Baltimore, Maryland
- Commissioning Agent: Cornerstone Commissioning, Boston, Massachusetts
- General Contractor: McCarthy Building Companies Inc., St. Louis, Missouri
- MEP Engineer: Merrick and Company, Aurora, Colorado

Consolidated Laboratory Facility

- Architectural Design: HOK, St. Louis, Missouri
- Civil and Structural Engineer: Fox Engineering, Ames, Iowa
- Commissioning Agent: Cornerstone Commissioning, Boston, Massachusetts
- General Contractor: Whiting-Turner, Baltimore, Maryland
- Laboratory Planner: GPR Planners Collaborative Inc., Purchase, New York
- MEP Engineering: Vanderweil Engineers Inc., Boston, Massachusetts

Figure 1

The USDA’s new 535,000-sf laboratory, targeted for completion in 2009, will include BSL-2 and 3 labs, a vivarium, offices, and training space. (Photo courtesy of U.S. Department of Agriculture.)



Figure 2

The new BSL-3Ag large animal facility is in the initial commissioning stages with occupancy projected for February of 2007. The high-containment facility will include 22 animal rooms for various species such as cattle, elk, deer, bison, sheep, and poultry. (Photo courtesy of U.S. Department of Agriculture.)



Figure 3

For its new BSL-3Ag large animal facility, the USDA used a variety of mock-ups including computer generated “tours,” scale models, vendor fairs, and functional/spatial mock-ups to determine the layout of pens and gating within the animal rooms and to test specific fixture elements such as gate hinges and pins. (Photo courtesy of U.S. Department of Agriculture.)

