

Design Considerations when Retrofitting a BSL3-Ag Facility

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Overview

- ▶ What are the basics of a BSL3-Ag
 - Large Animals cannot be contained in primary containment cages, the primary containment is “the building”.
- ▶ Site Selection
 - What issues complicate new vs retrofit for BSL3-Ag?
- ▶ Case Study
 - What specific challenges did we face on this retrofit project?
 - How did Alliance Biosciences handle these difficult challenges?
- ▶ Lessons Learned



What are the basics of a BSL3-Ag?

- Almost everyone here today has some understanding of the requirements of a ABSL3 or ABSL2 animal facility
- The goal of this presentation is to hopefully educate you on some of the requirements or differences for implementing a BSL3-Ag
- Only recently was the BMBL modified that set guidelines for a large animal facility



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What are the basics of a BSL3-Ag?

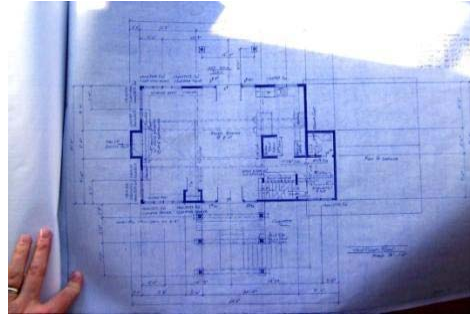
It is much more than putting up a fence around the larger animals



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What are the basics of a BSL3-Ag?

- Who should be involved in the design of a BSL3-Ag facility?
- Who is involved?
 - End-User
 - Scientific personnel
 - Biorisk Management Team
 - Architect
 - Engineering Team
 - Construction Management Team
 - Commissioning Agents
 - Local Jurisdiction
 - Regulatory Authorities
 - Etc.



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What are the basics of a BSL3-Ag?

BSL3-Ag

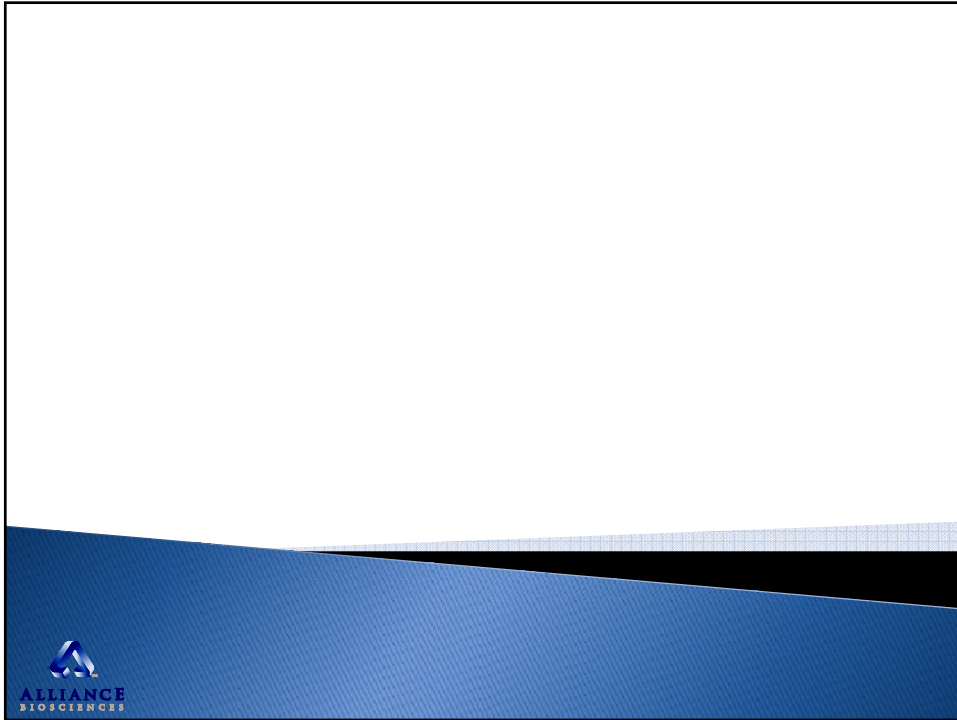
- Higher number of air changes
- HEPA filtered supply air
- PPE much more restrictive and mandatory
- Redundancy of exhaust is a requirement
- Integrity pressure testing is required
- The primary containment is **"The Building"**

ABSL3

- Somewhat lower airflow
- Primary containment is in isolated cages
- Potential lower construction costs
- Smaller animals
- Biosafety cabinets/animal housing units are the primary containment



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Site Selection – What Issues Complicate New vs Retrofit for BSL3-Ag

- Movement of Animals
 - How are you going to get your animals into the facility? Get them out?
- Disposal of Waste
 - Incineration
 - Digester
 - Chemical Neutralization
- Truck Access
 - Animal & Feed Delivery



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Site Selection – What Issues Complicate New vs Retrofit for BSL3-Ag

- Height of the Building – multi-story
- Existing drains in floor
- Existing walls - were they sealed properly?
- Roof not designed to support equipment
- Original building not designed for this type of application – not enough sq footage



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Site Selection – What Issues Complicate New vs Retrofit for BSL3-Ag

- Power to building does not meet needs
- Location is not acceptable to surrounding neighbors (publicity)
- Security is not sufficient or impossible
- Location too close to trains, airport and/or other disruptive items
- Original building not structurally sound



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Site Selection – What Issues Complicate New vs Retrofit for BSL3-Ag

- Emergency response services
- What happens in the event of an incident?
- Local Code restrictions
- Infrastructure and Utilities need to be easily accessible



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Case Study

- ▶ What – A BSL3-Ag facility with associated ABSL2, BSL2, ABSL3 and BSL3 space from an abandoned /existing ABSL2 facility built around 1978
- ▶ Approximately 30,000 square feet on a single level with a 6 foot basement/crawl space
- ▶ Liquidated damages if building is not operational in 9 months from start of contract
- ▶ Existing building was retrofitted saving \$, weeks on the schedule and a new addition was added only for the digester and waste treatment areas





Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- No formal risk assessment had been done
 - Facility is intended to handle pathogens;
 - NIPAH Virus, Anthrax, Bird Flu (H5N1)
 - Zoonotic agents (one agent per trial)
- *We gathered the appropriate standards, documents and guidelines that would be utilized to formulate the basis of design and compliance. This demonstrates the need to integrate the design team + biosafety team + risk assessment to keep the project moving in the right direction. Risk assessment on the fly!*



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- Multiple Standards and Guidelines needed to be applied – NZ/AUST Standard does not contain BSL3-Ag criteria – Used BMBL Guideline
 - *The country of Malaysia aligns much of it's standards with Singapore and utilizes the Australian Standard for most of their BSL Labs and facilities. Since the Australian Standard does not contain information on BSL3-Ag we needed to combine information from BMBL, NIH and other US Standards to make sure that we could comply with the contracted direction.*



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- At contract award there was an existing concept design already complete
 - *The original concept had airlocks and pass-throughs that would not have allowed a 500lb Cattle to move through it, with a technician and make a right hand turn inside the airlock. There was insufficient space allocated for Necropsy, no room for waste treatment and the operation and people flow were not based on accurate or current data.*
 - *Alliance generated a new concept design and flow pattern that was used for the final design*



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- Budget Constraints
 - *We formulated an internal budget to guide the design team with decisions on critical equipment selection*
- Demolition had already begun
 - *We halted all demolition until design and biosafety concerns could be addressed. They were doing demolition without any PPE or controls. Also the site was a total mess*



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- Existing Floor Drains did not work
 - *Existing drains were capped and filled with grout and concrete. A new double-wall containment system replaced the original piping and was connected to the EDS (waste) system*
- Existing Sewer System did not work
 - *A new septic field was designed for effluent from normal waste and all hazardous waste is sent to the EDS , Digester or Autoclaved*



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?



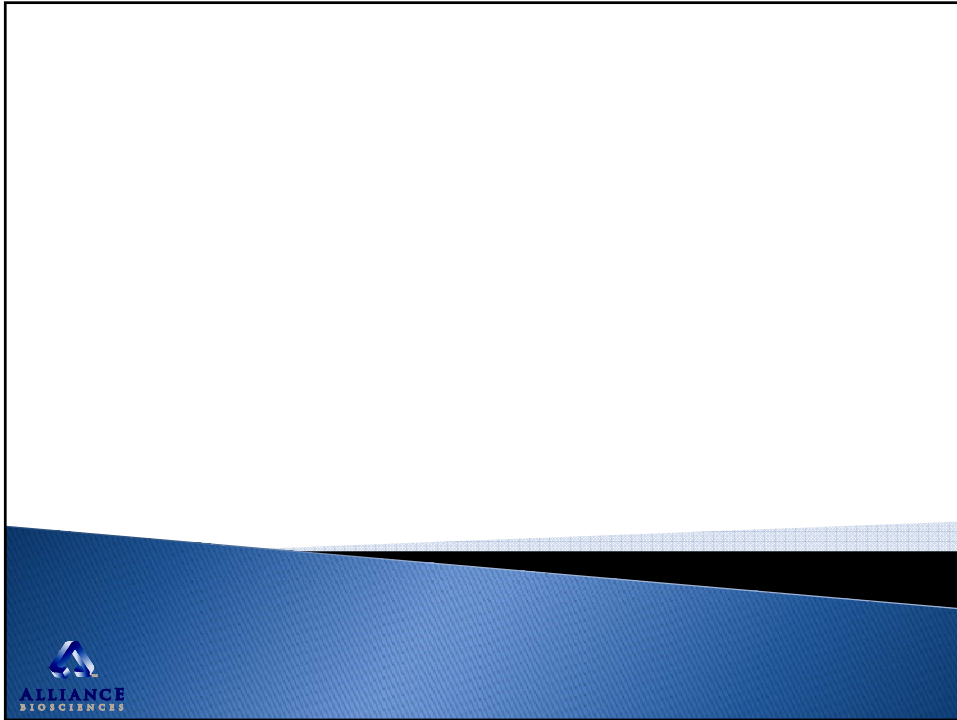
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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- Floors had a structural capacity of only 60# per square foot live load, in lieu of 100#
 - *We re-positioned large equipment to the new addition and designed structural supports for the autoclave and any area where additional weight was expected.*
 - *New concrete takes about 6 months to a year to cure completely*



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- Timeline was extremely aggressive
 - *We created a schedule that encompassed every aspect of the project and got buy-in from the client. We held to that schedule*
- A de-fumigation methodology had not been thought through
 - *Alliance developed a mobile H2O2 system for de-fumigation and testing of ductwork and rooms*



Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

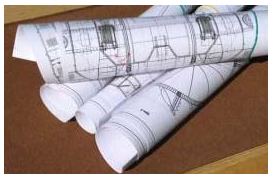
- Client was unfamiliar with PM controls or procedures
 - *Helped institute an understanding of how the documents, specifications, needs list, schedules and emails create a trail that can be tracked electronically, assisting the project*
- Flow of information was not quick enough
 - *We set up an FTP site to transfer documents and drawings*



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Case Study - What specific challenges did we face on this BSL3-Ag Retrofit and how did we handle them?

- Utilities Client was 12 hours time difference and 2 days travel away
 - *We utilized Skype, Video Conferencing and Go To Meeting to facilitate communication and knowledge transfer*



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Lessons Learned – What would you do differently?

- We were not given the opportunity on this project – but ALWAYS prepare a risk assessment FIRST
- The renovated facility was previously used as an ABSL2 lab. Demolition should have included biosafety controls – it did not!
- Budget the time to educate your clients on Biosafety considerations of the design



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Lessons Learned – What would you do differently?

- Begin the engineering phase with the entire team performing a site visit/survey
- Demanded better Project Management controls from the client
- Gathered vendors for a preconstruction meeting for all large process equipment
- Contacted the Utility Co's about services on the first week



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Lessons Learned – What would you do differently?

- ▶ Review Items with the Commissioning team as early as possible...and keep reviewing from beginning until the end.
- ▶ Redundancy is recommended – Not required
- ▶ Have a clear understanding of the critical areas that can make or break your project?



Conclusions

- Build a Team with experienced professionals
- Get Commissioning started at the very beginning of the project
- You can do anything with enough money or time....but if you want to do something special – hire professionals that have done it before and build off of their experience
- Plan, Plan, Plan and Plan some more!



Thank You

**A very special thanks to those that supported
my efforts to bring this presentation to you
today!**

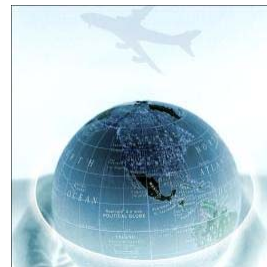
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Questions?



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