

# Programming and Pre-Design

## *Student Guide*





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**Introductions**

- Instructors
- Students
  - Your name?
  - Where are you from?



Slide 2

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# Action Plan

By the end of this lesson, I would like to:

KNOW		FEEL		BE ABLE TO DO	
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*Your learning doesn't stop with this lesson. Use this space to think about what else you need to do or learn to put the information from this lesson into practice.*

What more do I need to know or do?	How will I acquire the knowledge or skills?	How will I know that I've succeeded?	How will I use this new learning in my job?

Use space on back, if needed



**Key Messages**

- Programming is recording information about the needs, wants and aspirations of all parties involved in a construction or renovation project, balancing these with budget, codes and regulations.
- Pre-Design is organizing criteria for design into diagrams, drawings and charts that will help to give shape to the project.
- Programming requires input from a well rounded group of stakeholders including building users, safety officers, security personnel, administrators, O&M personnel, owners, regulatory authorities and members of the community.
- A well developed program should include clearly stated goals for the project, a list of the types and numbers of occupants, charts showing how the people and departments are organized, a functional space program or space list, a list of applicable codes and regulations and a project budget.
- Establishing detailed pre-design criteria results in more functional designs, saves time in the design process and allows for more accurate cost estimating.



Page 4

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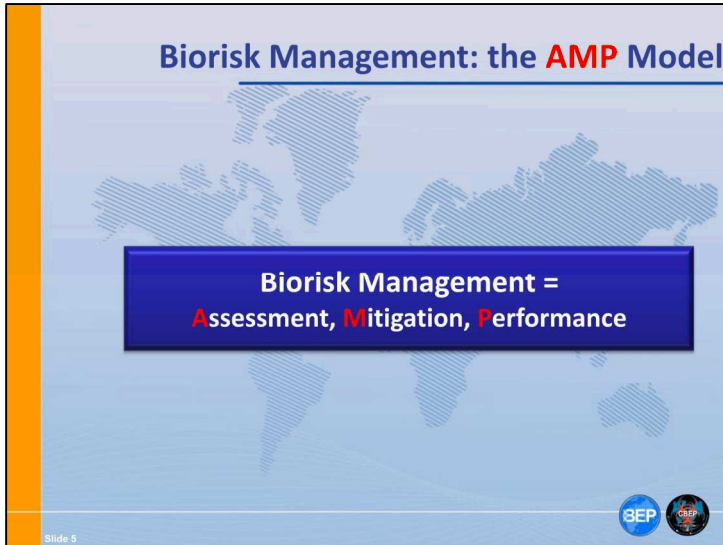
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**Key Components of Biorisk Management**

☣ **Biorisk Assessment**

- Process of identifying the hazards and evaluating the risks associated with biological agents and toxins, taking into account the adequacy of any existing controls, and deciding whether or not the risks are acceptable



Slide 6

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**Key Components of Biorisk Management**

🔗 **Biorisk Mitigation**

- Actions and control measures that are put into place to reduce or eliminate the risks associated with biological agents and toxins



Slide 7

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**Key Components of Biorisk Management**

**Performance**

- The implementation of the entire biorisk management system, including evaluating and ensuring that the system is working the way it was designed. Another aspect of performance is the process of continually improving the system.



Slide 4



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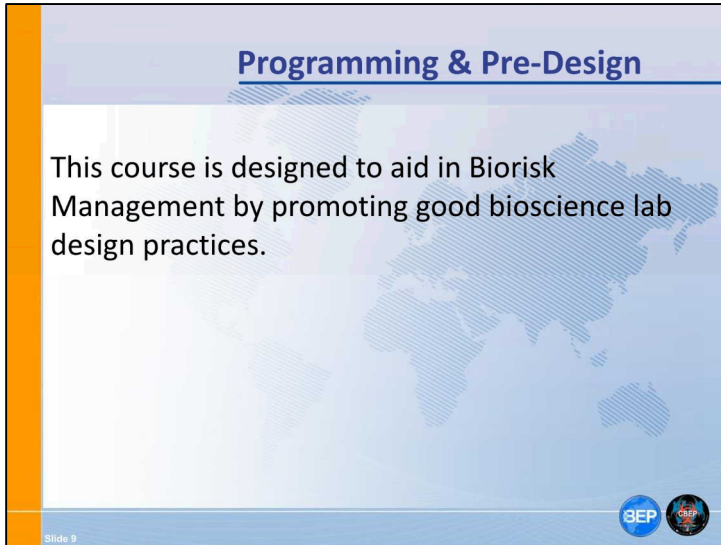
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**Class Discussion**

**Class Activity:**


We're designing a bioscience lab.



What do we need to know before we can start?

Please share your ideas with the class.

Slide 10



What do we need to know before we start?

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**Programming & Pre-Design**

**Programming** is recording information about the needs, wants and aspirations of all parties involved in a construction or renovation project, balancing these with budget, codes and regulations.

**Pre-Design** is organizing criteria for design into diagrams, drawings and charts that will help to give shape to the project.



Slide 11

Notes:

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**Programming & Pre-Design**

Programming and Pre-Design activities give form to the ***problem***, in order to inform the design activities which will later provide the ***solution***.



Slide 12



Think about how programming and pre-design activities differ from design.

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**Laboratory Types**

- Research
- Diagnostic
- Forensic
- Containment
- Human Health
- Animal Health
- Others...



**What are some unique requirements for each ?**  
**What might be some of the biological risks inherent in each?**

Slide 13



What are some unique programmatic requirements for these lab types?

What are some of the inherent risks?

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**Biosafety & Biosecurity**

Regardless of the type of lab, each will have *spaces, personnel* and *protocols* dedicated to addressing  **biorisk**  through a combination of  *biosafety*  and  *biosecurity*  measures.

**Biosafety** – preventing the *unintentional* exposure to or release of biological agents or toxins.

**Biosecurity** - preventing the *intentional* theft or release of biological agents or toxins.



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Notes:

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# Programming and Pre-Design

# Programming scenario for group activities

## Programming Scenario

**Diagnostics Facility Programming Scenario**

The Institute for animal health protection in north \_\_\_\_\_ is developing a new diagnostic laboratory on their scientific campus in response to increasing concerns over occurrence of a disease which affects poultry and other birds. Most cases of the disease can be transmitted to humans resulting in severe illness & in some cases death where the patients are elderly or have compromised immune systems, however most human strains of the disease do not pose a significant risk to human health. The role of the laboratory will be to test samples submitted by local farmers & other agencies to determine the presence of the disease and to catalogue the strain, if present, by means of using its genetic code and providing a record of the disease. Diagnostic examinations cover a wide variety of tissue, which can occur in the birds.

The institute has advised that the new facility should be sited at the end of the site and hopes it will be able to begin building within 6 months. The institute has also advised that the presence of infectious disease work on the campus is best limited to the new facility. Diagnostic work on the campus has been completed for the last 10 years as the old disease are not well regulated and become contaminated with samples when submitted, or even from old cages, and workers have long been advised to wear office clothing and work areas which are meticulously cleaned. The new facility will provide them with much needed space.

The institute is seeking advice on the proposed site plan which includes a parking area which needs to be confirmed before any approval for a building project is granted.

At the time the campus entry, adjacent to a large animal diagnostic facility, has been proposed on the best. Diagnostic work with large animals have advised about the potential of housing large or very large animals new facility as it is anticipated that the new facility will have superior containment features and might be able to deal with highly infectious diseases. The building agency has also indicated that the project needs addressing quickly.

An initial feasibility study assessment has indicated that diagnostic work with infectious or high risk virus infection through release of aerosols during certain diagnostic processes. They should wear gloves, body suits, and masks for agents and avoid exposure before leaving the facility. These working with high risk agents within a typical lab environment.

Page 08

**Institute Site Plan**

1. Administration building - 2 story structure
2. Diagnostic laboratory - 2 story structure
3. Multi purpose building with site conference room, offices - 3 story structure
4. Support building - 2 story structure
5. Incubator
6. Large animal facility - 2 story structure (2 working level with overhead floor above)
7. Proposed site
8. Security guard houses
9. Parking
10. Storage shed
11. Abandoned structure
12. Adjacent forestland
13. Adjacent forestland owned by local farmer, retained on future development
14. Adjacent forestland with a row of houses built along the road.

Page 09

Programming scenario – included at the end of this guide.

Page 16



**Programming Exercise**

**Group Activity 1 – Part 1:**

In your groups, please spend **10 minutes** to read the scenario and **identify** all of the project stakeholders.

**Stakeholders** are all parties who have an interest in or will be affected by the project.

List all on your **flip-chart**.



Slide 16

Who are the stakeholders in the programming scenario (diagnostics lab) project?

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*Programming and Pre-Design*


*Group Activity 1 Part 2 – Choose a Stakeholder(s) to Represent*

**Programming Exercise**

**Group Activity 1 – Part 2:**

**Choose** a *stakeholder(s)*, that your group would like to **represent** in a programming interview.

Note the stakeholder(s) you represent can be a singular person or a group with common interests.



Slide 17

Which stakeholder will your group represent?

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## Programming and Pre-Design


## Group Activity 2 Part 1 – Preparing for Programming Interviews

### Programming Interviews

**Group Activity 2:**  
We will now prepare to conduct **two rounds** of **stakeholder interviews**.

Each group will act as **programmers** for one interview session and as the **stakeholders** they have elected to represent for another session.

Slide 18



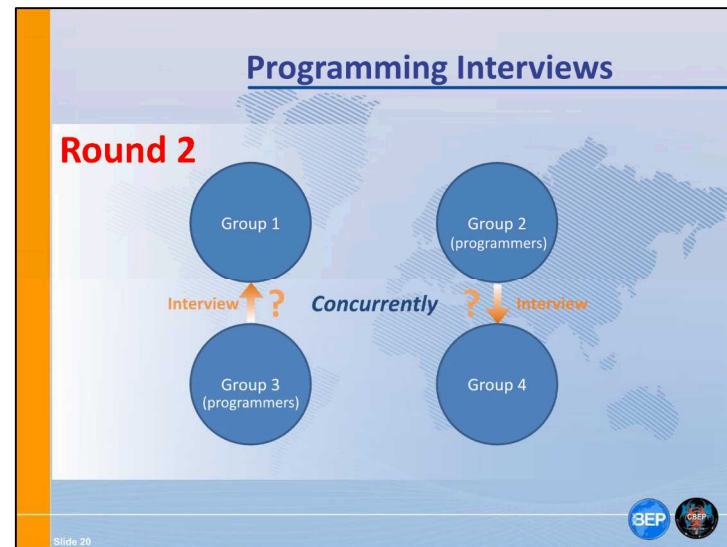
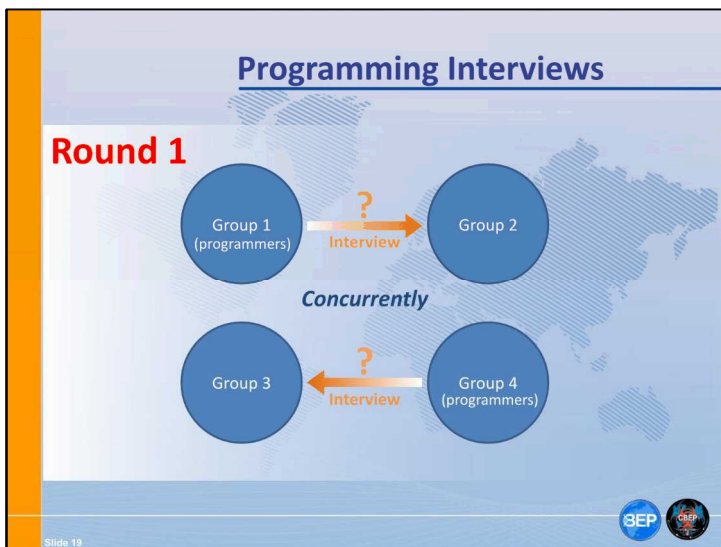
Identify your group. What is your number? \_\_\_\_\_

Who will your group *represent* or *interview* in Round 1?

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Who will your group *represent* or *interview* in Round 2?

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## Programming and Pre-Design

Use the following pages to record the needs, wants and aspirations of the stakeholders you are interviewing. Note that someone in your group should be recording the main points on your flip chart.



### Stakeholder Interviews

**Group Activity 2 – Part 2:**  
**Programmers** – ask questions quickly and clearly - give the stakeholders time to communicate.

**Stakeholders** – give as much information as possible to the programming team (it's ok to make up answers!).

**Programmers** – record all information from the stakeholders in words or diagrams on your *flip chart*.

You have **20 minutes** for *each round* of meetings.



Slide 22

## Group Activity 2 Part 2 – Programming Interviews

Group interviewed:

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**Typical Programming Questions**

Note: Additional questions may be added/modified in the next meeting. Refer to other questions in the next or previous sessions with a view. Even though the meeting questions are not to be asked in their final form, it is for students to discuss how they would be asking and to prepare for what they are and how they are being asked to answer them. This will give you valuable insights into what is needed in their own program.

**For all cases:**

- How many people are in your group? Is growth anticipated? Level of growth?
- What are the goals of the project? What is the organization that needs? Can you be helped?
- What other groups in the facility have your group interest with? Specific objectives required?
- Do you have resources for your own project?
- Describe what needs will affect your current needs.
- Describe what other groups will affect your current needs.
- Describe the different types of activities that your group currently does or anticipates doing.
- Describe the different types of shared resources and group activities, such as anticipatory meeting. Who can share these spaces? Are there groups that share these spaces?
- How do you see the future of the project? What are the anticipated requirements? (Address any specific needs, e.g. "We want...")
- What are the most important things you would like to see in the future? (Address any specific needs, e.g. "We want...")
- What are the most important things you would like to see in the future? (Address any specific needs, e.g. "We want...")

Page 10

Slide 23

BEP CBEP

A list of typical programming questions for differing types of stakeholders has been included in your student guides for future reference.

You may wish to use this page to record important questions you want to remember to ask in future programming discussions.

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**Programming Defined**

**Programming** is recording information about the needs, wants and aspirations of all parties involved...

**Class Activity:** We will now spend **15 minutes** organizing the information we gathered as programmers into these 3 categories.

Pin the flip chart pages showing your **interview notes** to the walls for the class to see.



Slide 24

Notes:

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**Programming Exercise**

**Class Activity:**

What are the needs, the absolute 'must have's of this project?

What are the wants, the things the stakeholders would 'like to have'?

What are the aspirations, the goals or higher vision of the project?



Slide 25

Notes:

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**Programming Exercise**

**Class Activity:**  
Which of these needs, wants and aspirations are critical to **biosafety**?



And to **biosecurity**?



Slide 26

What were some of the needs, wants or aspirations related to biosafety and biosecurity?

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## *Programming and Pre-Design*


## *Organizing Program Information - Vision Statement*

**Programming Documents**

**Vision Statement**

The aspirations or goals of the project should be captured as a 'vision statement' or a series of goals that help to keep the project focused.

For our sample project one such statement might be.. “ “



Slide 27

What might be the vision statement, or goal statement(s) of our programming project?

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**Programming Documents**

**What to do with the wants...**

The wants of the project should be captured as qualitative statements that will influence the design, or as tentative program components that may be included if within budget, or if agreed to be critical elements, should be stated as project needs.



Slide 28

What are some of the wants you heard in your stakeholder interviews?

How would you record this information?

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*Programming and Pre-Design*

*Organizing Program Information - Needs*

**Programming Documents**

**Needs**

The needs of the project should be recorded in the following types of documents:

Slide 29

SEP

SEP

What are some of the needs you heard in your stakeholder interviews?

How would you record this information?

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**Programming Documents**

**Staff assumptions & organizational charts**

The anticipated number of people who will work in the lab should be recorded in a list of staff assumptions.

The manner in which individuals and departments relate to one another should be recorded in an organizational chart(s).



Slide 30

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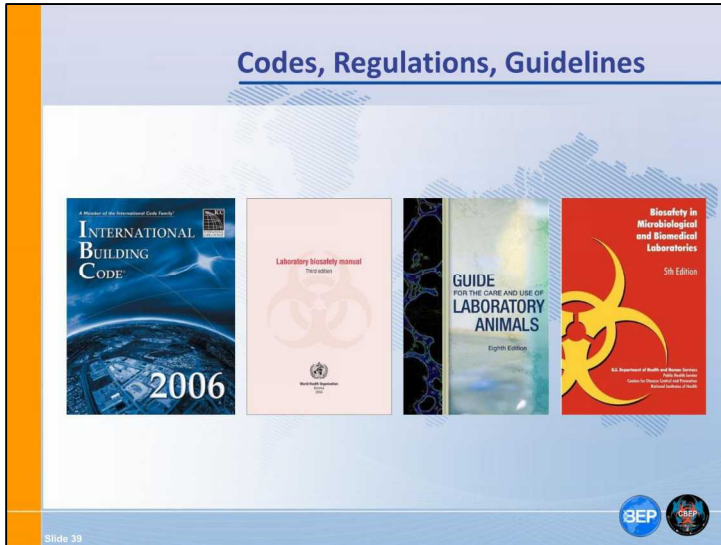
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What are some of the regulations particular to your area or situation?

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**Pre-Design Defined**

**Pre-Design** is organizing criteria for design into diagrams, drawings and charts that will help to give shape to the project.

The slide features a light blue background with a faint world map. At the bottom, there are two circular logos: one for 'BEP' and one for 'OSEP'. The text is presented in a clean, sans-serif font.

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### Pre-Design Documents

**Individual Activity:**

Spent **10 minutes** reflecting upon the space relationships you heard of, or thought of, during the programming meetings, try to draw these in your notebooks.

**Question?** How might these relationships affect Biosafety or Biosecurity?



Slide 43

What are some of the critical relationships you heard of or thought of? Use this and the following pages to diagram the relationships.






**Criteria for Design**

**Pre-Design** is organizing *criteria for design* into diagrams, drawings and charts that will help to *give shape to the project*.

Pre design drawings can record not only the **'big picture'** relationships required in the facility, but also a **'detailed picture'** of the facility components.



Slide 44

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**Criteria for Design**

50 M<sup>2</sup> Lab

Program area

Vs

Criteria for design

Briefly review the [Room Data Sheet](#) in your handouts

The diagram shows a rectangular lab layout with dimensions 6400 mm by 7900 mm. It includes a grid of numbered locations (1-12) for equipment. The requirements are categorized as follows:

- Architectural materials and finishes:**
  - Walls and ceiling gypsum with epoxy paint
  - Floor sheet vinyl
  - Painted hollow metal doors
  - Double glazed hardened glass on exterior and interior windows
- Mechanical requirements:**
  - Directional airflow inward
  - Bioafety cabinets ducted – 100% exhaust
  - Temperature 20-25 C
  - Humidity 50-60%
- Plumbing requirements:**
  - H/C water, eyewash at sinks
  - Point of use water polisher above sinks
  - Emergency shower (tempered water) adjacent exit
- Electrical requirements:**
  - Outlets at 1200 mm above finished floor
  - Overhead power in center of room to service central bench
- Security requirements:**
  - Key Card access to lab
  - CCTV within lab and at corridor

**Equipment & Casework**

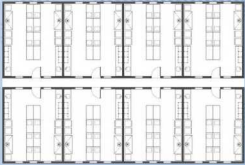
- Fixed bench with cabinets below
- Sink with H/C water, eyewash
- Adjustable shelving
- Refrigerator/Freezer
- Bioafety cabinet
- CO2 incubator
- Mobile lab table
- Mobile storage cart below
- Emergency shower near exit
- 1000mm wide door
- Window to corridor
- Exterior window

Slide 47

A copy of the room data sheet is included at the end of this guide.

**Lab Modules**

Establishing correct room size and accurate design criteria is especially important in laboratory facilities which tend to have multiple repeated elements, usually labs &/or animal holding rooms



SEP

Slide 48

Notes:

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**Pre Design Budget**

Accuracy of a pre-design budget will depend primarily on:

- Completeness of the program
- Level of detail in design criteria
- Accurate gross up factors

Slide 49



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**Gross up Factors**

Gross up factors for labs can be anywhere from 1.6x the program area to 4x the program area depending upon the lab type, construction method and intensity of supporting services required.

Referencing projects similar to yours can help determine accurate gross up factors.

Note that smaller projects can have higher gross up factors due to "one off" components that may have similar requirements regardless of project scale.

Slide 52

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**Gross up Factors**

**Diagnostics Facility – Gross Area Assumptions**

Administration & Amenity Spaces – gross up factor of 1.4 (plan area for structure, walls, circulation).

Avian Diagnostics Lab area – gross up factor of 2.4 (assumes 1.6 x program area in plan + .8 x program for mechanical space above).

Veterinary Services area – gross up factor of 3.3 (assumes 1.8 x program area in plan + 1.5 x program area above).



Building support – gross up factor of 1.4 (plan area for structure, walls, circulation).

Large Animal area – gross up factor of 4.0 (assumes 2.0 x program area in plan + 1.5 x program area above + .5 x program area below).

Department	Net Program area	Gross up factor	Gross area
Administration & Amenity Spaces	295	1.4	410
Avian Disease Diagnostics	583	2.4	1400
Veterinary Services	268	3.3	885
Building Support	147	1.4	205
(net area 1293) Total Gross Area			2900

Large Animal Component	176	4.0	700
(net area 1469) Total Gross Area with Large Animal			3600

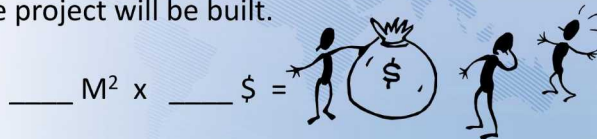
 

Slide 53

Notes these gross up factors are included with the Functional Space Program at the end of this guide.

**Pre-Design Cost Estimating**

Once the building gross area is known an estimate of the cost can be determined by multiplying this by the cost per M<sup>2</sup>. Accuracy of the estimate will depend on the availability of cost data for similar types of buildings in the same market in which the project will be built.



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**Review of Programming & Pre-Design**

**Review**

To wrap-up, let's discuss what we learned about Programming & Pre-Design

What did we learn?	What does it mean?	Where do we go from here?
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### Key Messages

- Programming is recording information about the needs, wants and aspirations of all parties involved in a construction or renovation project, balancing these with budget, codes and regulations.
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- Programming requires input from a well rounded group of stakeholders including building users, safety officers, security personnel, administrators, O&M personnel, owners, regulatory authorities and members of the community.
- A well developed program should include clearly stated goals for the project, a list of the types and numbers of occupants, charts showing how the people and departments are organized, a functional space program or space list, a list of applicable codes and regulations and a project budget.
- Establishing detailed pre-design criteria results in more functional designs, saves time in the design process and allows for more accurate cost estimating.



 

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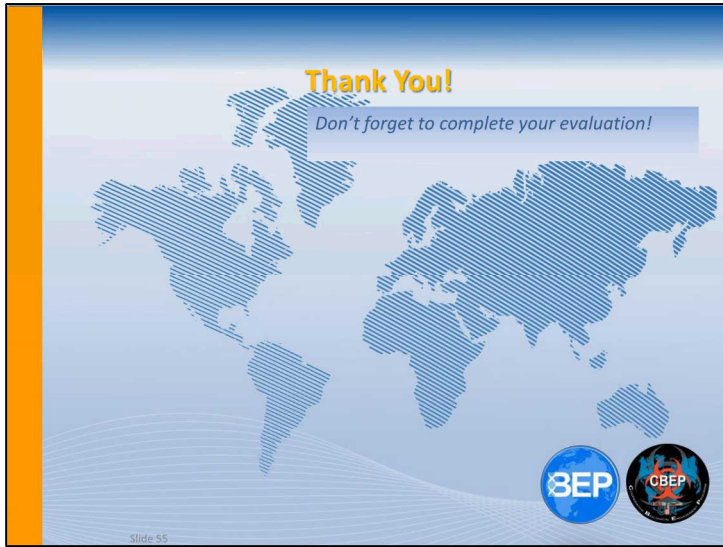
### Action Plan

By the end of this lesson, I would like to:

KNOW	FEEL	BE ABLE TO DO																	
<p><i>Your learning doesn't stop with this lesson. Use this space to think about what else you need to do or learn to put the information from this lesson into practice.</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">What more do I need to know or do?</th> <th style="width: 25%;">How will I acquire the knowledge or skills?</th> <th style="width: 25%;">How will I know that I've succeeded?</th> <th style="width: 25%;">How will I use this new learning in my job?</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>				What more do I need to know or do?	How will I acquire the knowledge or skills?	How will I know that I've succeeded?	How will I use this new learning in my job?												
What more do I need to know or do?	How will I acquire the knowledge or skills?	How will I know that I've succeeded?	How will I use this new learning in my job?																

Use space on back, if needed  

*Remember your action plan!*



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## Reference Materials for Further Study

A Design Guide for Energy Efficient Research Laboratories. Website. <http://ateam.lbl.gov/Design-Guide/>

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Problem Seeking: An Architectural Programming Primer. 5th Edition, 2012. William M. Peña, Steven A. Parshall. John Wiley & Sons, Inc.

Whole Building Design Guide. Website. <http://www.wbdg.org/>



## Typical Programming Questions

Note – whenever possible try to conduct interview in the users' working labs (or other spaces they use) or combine interviews with a tour. Even though the existing spaces may not be ideal in their layout it will be easier for users to describe how they work and by pointing out what they like and don't like about their existing accommodations they will give you valuable insights into what is needed in their new program.

### For all users:

- How many people are in your group? Is growth anticipated? Level of growth?
- How is the group organized? Does an organizational chart exist? Can one be drawn?
- What other groups in the facility does your group interact with? Specific adjacencies required?
- Do you have standards for area per person?
- Describe what works well about your current space.
- Describe what does not work well about your current space.
- Describe all the different types of dedicated spaces your group currently uses or anticipates needing.
- Describe all the different types of shared spaces your group currently uses or anticipates needing. Who can share these spaces? Are there groups that cannot share these spaces?
- How do you see the work you do, the spaces or equipment required, changing over the next 5, 10, 20 years?
- What are two or three important things you feel the new facility must do for your group?
- What two or three greatest concerns? Faults of existing accommodations not to be repeated?



## For facility directors and leaders:

- What is your overall vision for the project?
- How is the new facility intended to advance the work you do?
- How will this new facility fit into your campus/organization? Describe, in broad terms, the work your organization does, and the part of that work this new facility is intended to support.
- What is the overall structure of your organization? Do organizational charts exist? Can they be drawn?
- What are the elements the facility must include? May include? Should include if economically feasible? In other words what are the absolute necessities, and what are the 'nice to have' components?
- How do you see the group utilizing this facility growing over the next 5, 10, 20 years?
- How will the whole campus/organization grow over the next 5, 10, 20 years?
- How many staff is the facility intended to accommodate? Today? In future?
- Should the facility be planned for expansion?
- What are your greatest hopes for the project? Greatest concerns?

## For diagnosticians:

- Include “all users” questions +
- Describe number and type of samples received per day/month/year.
- What types of disease or toxin does your group investigate?
- What are the risks involved in working with these agents?
- Are samples received taken from animals, humans or both?
- Are live animals diagnosed in the facility? Which species? In what numbers?
- If live animals diagnosed do diagnosticians work with animals or does a separate group take care of animal husbandry and all animal manipulations? (see also questions for veterinarians and animal husbandry)
- If live animals housed in the facility what is the ideal relationship between the labs and the animal areas?
- Describe as much as possible the process of receiving, processing, storing, disposal, of samples including equipment used at each stage of the process.
- If human samples received are these delivered? Or do patients come to lab?
- Does the lab receive, or anticipate, surges of samples due to outbreaks?
- Samples received centrally or per lab?
- How are unknowns dealt with?
- Describe any containment equipment (biosafety cabinets, isolators, sterilizers) your group utilizes or requires.
- What measures are, or should be in place, to prevent cross contamination?
- What measures are, or should be in place to prevent theft or accidental loss of sample material?
- What measures are, or should be in place to secure diagnostic information?
- How is access to the lab controlled? Currently? Ideally?
- What safety precautions to users take? PPE (personnel protective equipment) worn? Vaccinations required?
- Does all the work have the same level of risk? Or are some parts higher risk than others? Describe how you think the work should be separated if different levels exist.
- How many users work together in one area? Currently? Ideally?
- What precautions are currently taken for dealing with spills or accidental exposures? Are emergency eyewashes, showers, alarms (audio/visual) required in the lab(s)? Or adjacent the lab(s)?
- How do you communicate with those outside the lab? Under normal conditions? Under emergency conditions? If a spill has occurred, how are others notified to help or to stay out?

## For researchers:

- Include “all users” questions +
- What types of disease or toxin does your group investigate?
- What are the risks involved in working with these agents?
- How many studies are carried out per year?
- Does the research involve animal subjects? Which species? In what numbers?
- If live animals utilized do researchers work with animals or does a separate group take care of animal husbandry and all animal manipulations? (see also questions for veterinarians and animal husbandry)
- If animals utilized for research what is the ideal relationship between the labs and the animal areas?
- Does the research involve volunteer subjects/patients?
- Describe as much as possible your experimental process including equipment used at each stage, the preparation of agents/toxins for use and the storage of biological or toxic materials during and after the study is complete.
- Do laboratory &/or equipment requirements change with different stages of the work?
- Describe any containment equipment (biosafety cabinets, isolators, sterilizers) your group utilizes or requires.
- What measures are, or should be in place, to prevent cross contamination?
- What measures are, or should be in place to prevent theft or accidental loss of research materials?
- What measures are, or should be in place to secure research information?
- How is access to the lab controlled? Currently? Ideally?
- What safety precautions to users take? PPE (personnel protective equipment) worn? Vaccinations required?
- Does all the work have the same level of risk? Or are some parts higher risk than others? Describe how you think the work should be separated if different levels exist.
- How many users work together in one area? Currently? Ideally?
- What precautions are currently taken for dealing with spills or accidental exposures? Are emergency eyewashes, showers, alarms (audio/visual) required in the lab(s)? Or adjacent the lab(s)?
- How do you communicate with those outside the lab? Under normal conditions? Under emergency conditions? If a spill has occurred, how are others notified to help or to stay out?

## For veterinarians and animal husbandry:

- Include “all users” questions +
- Describe the numbers and species of animals your group currently works with? How will these change with the new facility?
- Do animal numbers/space requirements change over the period of a study? At different times of year?
- What diseases or toxins are the animals in your care exposed to? Include those agents studied for research or diagnostics work, as well as other diseases that may be problematic for the species.
- How will the animals be housed? Loose in the room? In cages open to the air? In isolators with controlled airflow?
- How does your group work with the researchers/diagnosticians in the facility?
- Describe your daily routine in working with the animals. Describe work with each species separately if multiple types.
- What types of procedures are carried out? Are these done in the holding room? Or a separate procedure room? How should the procedure rooms relate to the holding areas?
- Are surgeries performed? Post mortem work?
- Do animals survive beyond the studies? If so how are they cared for?
- If euthanized, or deceased from disease or toxic exposure, how are carcasses disinfected and ultimately disposed of?
- How often are holding rooms cleaned? Decontaminated? How often are cages changed? Describe the procedures for all of these.
- What are the space requirements for each species? Specific temperature, humidity, lighting requirements?
- What are the risks involved in working with these species and the diseases they are infected with (or toxins exposed to)?
- What measures are, or should be in place, to prevent cross contamination?
- Is a clean/dirty corridor system desirable?
- What safety precautions to users take? PPE (personnel protective equipment) worn? Vaccinations required?
- How is access to the animal area controlled? Currently? Ideally?
- Is access restricted to certain areas once inside the animal area?
- What precautions are currently taken for dealing with accidents or exposures? Are emergency eyewashes, showers, alarms (audio/visual) required?
- How do you communicate with those outside the lab? Under normal conditions? Under emergency conditions? If an exposure has occurred, how are others notified to help or to stay out?

## For biosafety officers:

- Which diseases or toxins are examined in the facility? What are the risks involved with each?
- Describe the safety precautions, PPE (personnel protective equipment) worn by users, and facility containment features required for working with each.
- If possible map out the protocols currently utilized on a plan or diagram. What works well? What could be improved in the new facility? How can the facility design help to enforce protocols?
- Where are users trained in biosafety protocols? Is a dedicated lab used for this? Or a working lab? If a working lab does it need special features specifically for training?
- Describe the process or processes for decontaminating laboratories and animal areas. Which are done on a daily basis? Weekly? Annually?
- Are labs shut down for decontamination and testing on a regular basis?
- Are there systems in the lab that require continuous operation to maintain safety for users and/or the environment?
- Describe any containment equipment (biosafety cabinets, isolators, sterilizers) utilized or required in the new facility.
- Describe any problems with cross contamination or lab acquired infections your institute has had in the past. How can the facility design help to prevent these?
- Describe how spills and other accidents or emergencies are dealt with. Describe any past events that should be considered.
- Describe any vaccination or health monitoring programs run or anticipated at the facility. Do these require dedicated spaces in the building?
- How is safety in the labs/animal areas monitored? What can the new facility do to support this?
- Do security systems keep track of who is in the labs at all times?



## For biosecurity officers:

- Which diseases or toxins are examined in the facility? What are the risks involved with each?
- Describe security measures in place, or anticipated, to maintain security of biological or toxic materials used or stored in the facility. Include measures to protect against internal as well as external threats.
- How is access to the site controlled and monitored?
- How is access to the building controlled and monitored?
- How is access to secure lab areas controlled and monitored? Are there different levels of security within different lab areas? How are dangerous materials (toxins or biological agents) secured within the lab areas? Are freezers/fridges/cabinets locked and monitored within the labs?
- How do security officers respond to alarms in labs? To other threats? Describe any past events that should be considered.



## For facility managers, operations and maintenance staff:

- Describe how your staff work with your current buildings, are there individuals dedicated to certain facilities? Or does one group take care of all facilities?
- Will staff be located in this building? Describe requirements for any offices, break areas, change rooms, repair shop or storage spaces.
- Describe the daily, weekly, monthly and yearly maintenance activities carried out your existing or a similar facility comparable to the new project.
- Describe the process or processes for decontaminating laboratories and animal areas. Which are done on a daily basis? Weekly? Annually?
- Are labs shut down for decontamination and testing on a regular basis?
- Are there systems in the lab that require continuous operation to maintain safety for users and/or the environment? Describe any system redundancies your current facilities have. Which are anticipated at the new facility?
- Describe any containment equipment (biosafety cabinets, isolators, sterilizers, HEPA filters, effluent treatment) utilized or required in the new facility.
- Describe maintenance and testing, certification procedures for the above systems.
- Describe any maintenance issues or system failures experienced on other facilities that should be considered in the new design.
- Are maintenance staff members required to enter lab or animal areas or can most maintenance be done from outside these spaces? Are there areas where this approach can be improved?
- Are there existing systems on the site/campus that will support the new facility? (Emergency power generators, steam supply, chilled water etc.) If so what is the condition of these systems? What is the capacity? Do any require upgrading to support the new project?



## Stakeholders to consider:

- Diagnosticians, Researchers, Veterinarians and other scientific personnel
- Support staff
- Staff in neighboring facilities on same campus or within same organization who may occasionally use shared areas in the facility
- Facility Directors and Administrators
- Funders
- Biosafety officer(s)
- Security officer(s)
- Operations and maintenance staff
- Regulatory authorities
- Community
- Health, Safety & Security organizations serving the community (fire department, police, nearby hospitals)
- Other design/engineering team members involved in project
- Master plan designer if applicable



## Diagnostics Facility Programming Scenario

The institute for animal health protection in rural \_\_\_\_\_ is developing a new diagnostics laboratory on their scientific campus in response to increasing concerns over occurrences of a disease which affects poultry and other birds. Rare strains of the disease can be transferred to humans resulting in severe illness & in some cases death where the patients are elderly or have compromised immune systems, however most known strains of the disease do not pose a significant risk to human health. The role of the laboratory will be to test samples delivered by local farmers & other agencies to determine the presence of the disease and to categorize the strain, if present, in order to direct the farmers with respect to caring for their animals and preventing spread of the disease. Diagnostic materials may come in the form of blood or fecal samples, sections of tissue, whole carcasses or live birds.

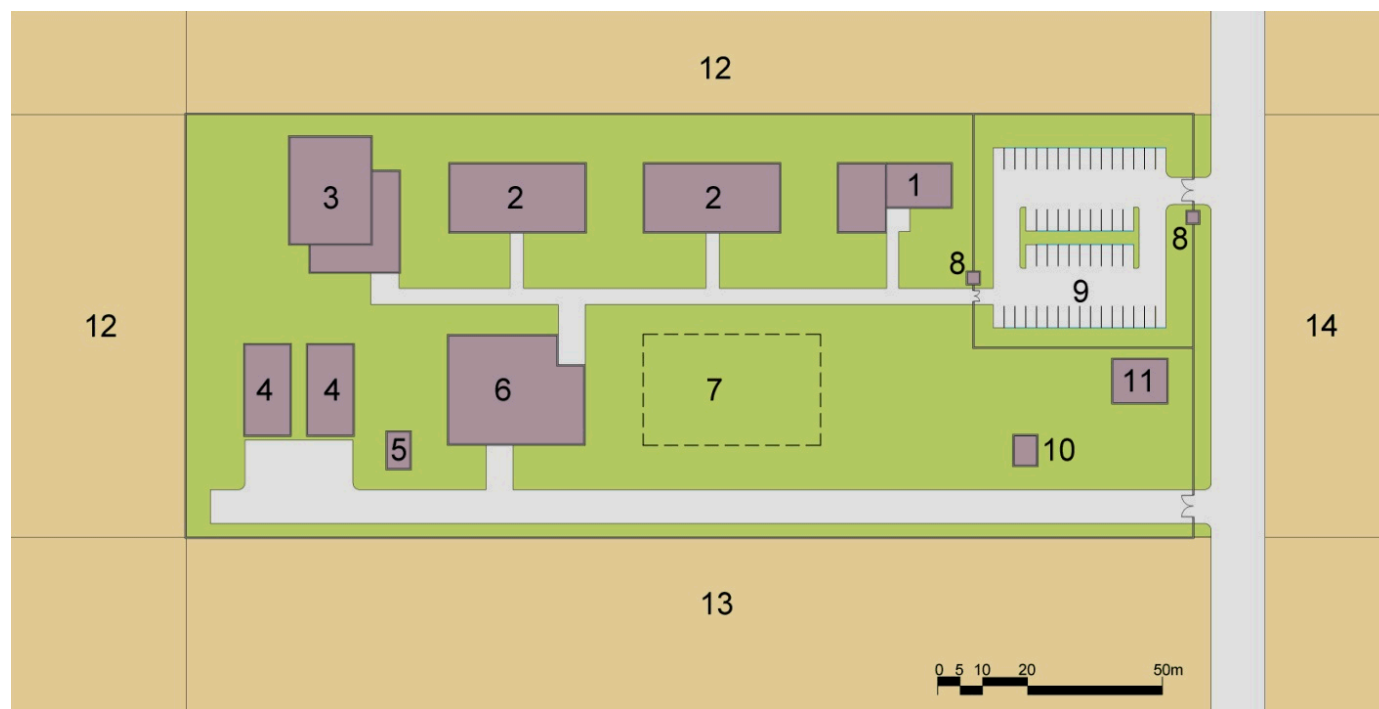
The institute's director has stated that the new facility should be 'state of the art' and hopes it will help to attract top notch scientific personnel. Neighboring farmers have expressed concern over the presence of infectious disease work on the campus fearing diseases may be spread to their livestock or to their families. Diagnosticians on the campus have complained that the lab areas they are currently using for diagnosis of this disease are not well organized and become overwhelmed with samples when outbreaks, or even fears of outbreaks, occur. Throughout the campus, staff members have long been asking for more office, meeting and break spaces which are insufficient in other buildings and many are hoping the new facility will provide them with much needed space.

The institute's funding agency has proposed an initial budget of \_\_\_\_\_ which needs to be confirmed with a pre-design estimate before any approval for a building project is granted.

A site near the campus entry, adjacent to a large animal diagnostics facility, has been proposed as the best location for the building. Diagnosticians working with large animals have asked about the potential of housing one or two large animals (goats or cattle up to 500kg) in the new facility as it is anticipated that the new facility will have superior containment features and might be appropriate for larger animals diagnosed with highly infectious diseases. The funding agency however has indicated that the project funds need to be primarily focused on addressing poultry diseases.

An initial biosafety risk assessment has indicated that diagnosticians working with unknown or high risk strains of the disease may be at risk of infection through release of aerosols during certain diagnostic processes. They should wear gloves, body and respiratory protection when manipulating live agents and should shower before leaving the facility. Those working with low risk strains or inactivated materials can work within a typical lab environment.

## Institute Site Plan



- |  |   |
|--|---|
| 1. Administration building – 2 story structure   | 8. Security guard houses  |
| 2. Diagnostics laboratories - 2 story structures   | 9. Parking  |
| 3. Multi purpose building with labs, conference rooms, cafeteria – 3 story structure       | 10. Storage shed  |
| 4. Support buildings – 1 story structures  | 11. Abandoned structure   |
| 5. Incinerator   | 12. Adjacent farmland   |
| 6. Large animal facility – 2 story structure (1 working level with mechanical floor above) | 13. Adjacent land owned by institute, reserved for future development |
| 7. Proposed site   | 14. Adjacent farmland with a row of houses built along the road       |



## Diagnostics Facility - Functional Space Program

Departments & spaces required	Quantity	Area per space M <sup>2</sup>	Total area M <sup>2</sup>	Notes
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Administration & Amenity Spaces					
A.01	Facility Administrator office	1	15	15	
A.02	Administrative assistants	2	10	20	Should be in open accessible area
A.03	Facility Security office	3	10	30	Should be one shared enclosed area for 3 officers
A.04	Biosafety office	1	10	10	
A.05	Operations & maintenance office	1	10	10	
A.06	Small meeting rooms	2	15	30	To be accessible to both administrative and scientific offices
A.07	Large conference room	1	30	30	With videoconferencing capability
A.08	Cafeteria	1	50	50	
A.09	Lobby	1	100	100	
<b>Subtotal Administration &amp; Amenity Spaces</b>			<b>295</b>		

Avian Disease Diagnostics					
P.01	Department Head office	1	15	15	Enclosed office
P.02	Senior Diagnosticians offices	3	10	30	Enclosed office
P.03	Department Admin Assistant	1	10	10	Should be in open accessible area
P.04	Diagnostic Technicians	15	5	75	Can be one large open area
P.05	Sample Receiving Lab	1	50	50	Accessible to receiving vestibule
P.06	Sample Receiving Vestibule	1	10	10	Users request directly accessible to exterior if possible
P.07	Sample Holding Area	1	5	5	Adjacent vestibule and receiving lab
P.08	Diagnostics Labs	3	50	150	
P.09	Freezer Room (active)	1	20	20	Accessible to all Diagnostics labs
P.10	Freezer Room (archive)	1	20	20	Accessible to all Diagnostics labs
P.11	Special Equipment Labs	2	20	40	Accessible to all Diagnostics labs
P.12	Sterilizer and Glass wash area	1	20	20	Accessible to all Diagnostics labs
P.13	High Risk Diagnostics Lab	1	50	50	
P.14	Change areas (M/F)	4	20	80	One pair (M/F) for general lab areas, the other for high risk area
P.15	Fumigation Room	1	8	8	Adjacent high risk diagnostics
<b>Subtotal Avian Disease Diagnostics</b>			<b>583</b>		

## Diagnostics Facility - Functional Space Program (continued)

Departments & spaces required	Quantity	Area per space M <sup>2</sup>	Total area M <sup>2</sup>	Notes
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Veterinary Services					
V.01	Veterinarian office	1	15	15	
V.02	Animal husbandry staff	6	5	30	Can be one shared area
V.03	Break room	1	15	15	To be within perimeter of animal area
V.04	Poultry Holding rooms	4	15	60	
V.05	Isolation Room	1	15	15	
V.06	Isolation Room entry	1	10	10	Airlock entry with adjacent shower
V.07	Post Mortem Room	1	20	20	
V.08	Change areas (M/F)	2	20	40	
V.09	Fumigation Room	1	8	8	Adjacent Isolation Room
V.10	Animal loading dock	1	20	20	
V.11	Feed and bedding storage	2	10	20	
V.12	Carcass holding area	1	15	15	Accessible to exterior locate for ease of access to incinerator
<b>Subtotal Veterinary Services</b>			<b>268</b>		

Veterinary Services – Large Animal Component (if included)					
V.14	Large Animal Holding	2	25	50	
V.15	Large Animal Room Entry	2	8	16	
V.16	Large Animal Post Mortem	1	50	50	
V.17	Post Mortem change rooms	2	15	30	
V.10	<i>Additional loading space</i>	<i>1</i>	<i>10</i>	<i>10</i>	Added to animal loading if large animal component included
V.11	<i>Additional feed and bedding</i>	<i>2</i>	<i>10</i>	<i>20</i>	2 additional rooms if large animal component included
<b>Subtotal Large Animal Component</b>			<b>176</b>		

## Diagnostics Facility - Functional Space Program (continued)

Departments & spaces required		Quantity	Area per space M <sup>2</sup>	Total area M <sup>2</sup>	Notes
<b>Building Support</b>					
S.01	Security screening room	1	20	20	Adjacent building entry
S.02	Material loading dock	1	20	20	
S.03	Material staging	1	10	10	
S.04	Waste staging	1	10	10	
S.05	Storage rooms	4	8	32	
S.06	Technicians break area	1	15	15	Adjacent mechanical spaces
S.07	Equipment repair shop	1	40	40	
<b>Subtotal Building Support</b>				<b>147</b>	

<b>Area Summary</b>		
	Administration & Amenity Spaces	295
	Poultry Disease Diagnostics	583
	Veterinary Services	268
	Building Support	147
	<b>Total Net Area</b>	<b>1293 M<sup>2</sup></b>
	Large Animal Component	176
	<b>Total Net Area with Large Animal</b>	<b>1469 M<sup>2</sup></b>

### Diagnostics Facility – Gross Area Assumptions

Administration & Amenity Spaces – gross up factor of 1.4 (plan area for structure, walls, circulation).

Avian Diagnostics Lab area – gross up factor of 2.4 (assumes 1.6 x program area in plan + .8 x program for mechanical space above).

Veterinary Services area – gross up factor of 3.3 (assumes 1.8 x program area in plan + 1.5 x program area above).

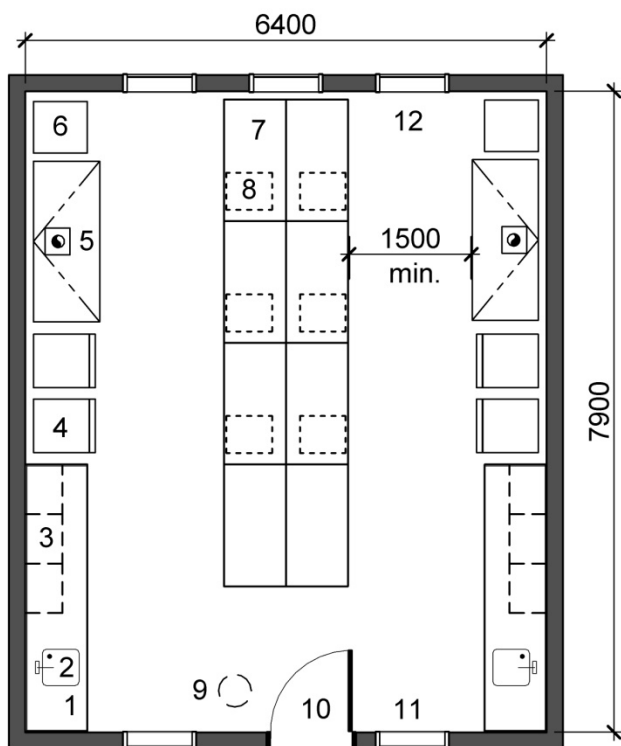
Building support – gross up factor of 1.4 (plan area for structure, walls, circulation).

Large Animal area – gross up factor of 4.0 (assumes 2.0 x program area in plan + 1.5 x program area above + .5 x program area below).

Department	Net Program area	Gross up factor	Gross area
Administration & Amenity Spaces	295	1.4	410
Avian Disease Diagnostics	583	2.4	1400
Veterinary Services	268	3.3	885
Building Support	147	1.4	205
(net area 1293) <b>Total Gross Area</b>			<b>2900</b>
Large Animal Component	176	4.0	700
(net area 1469) <b>Total Gross Area with Large Animal</b>			<b>3600</b>



## Room Data Sheet



Laboratory

### Equipment & Casework

1. Fixed bench with cabinets below
2. Sink with H/C water, eyewash
3. Adjustable shelving
4. Refrigerator/Freezer
5. Biosafety cabinet
6. CO<sub>2</sub> incubator
7. Mobile lab table

8. Mobile storage cart below
9. Emergency shower near exit
10. 1000mm wide door
11. Window to corridor
12. Exterior window

### Architectural materials and finishes

- Walls and ceiling gypsum with epoxy paint
- Floor sheet vinyl
- Painted hollow metal doors
- Double glazed hardened glass on exterior and interior windows

### Mechanical requirements

- Directional airflow inward
- Biosafety cabinets ducted – 100% exhaust
- Temperature 18-25 C
- Humidity 30-70%

### Plumbing requirements

- H/C water, eyewash at sinks
- Point of use water polisher above sinks
- Emergency shower (tempered water) adjacent exit
- CO<sub>2</sub> gas to all incubator locations

### Electrical requirements

- Outlets at 1100 mm above finished floor
- Overhead power in center of room to service central bench

### Security requirements

- Key-Card access to lab
- CCTV within lab and at corridor