Functional Narrative Document and Laboratory Schematic Design

Submitted as Partial Fulfillment for the Requirements
in MT 23 BB- Laboratory Management

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Laboratory Schematic Design

Some potential factors to consider when designing the architecture of a laboratory might include:

1. The types of experiments or procedures that will be conducted in the laboratory, and the equipment and materials that will be needed. This can help to determine the layout and flow of the laboratory, as well as the placement of equipment and other features.

2. The size and dimensions of the laboratory space, and the need for flexibility to accommodate changes in the laboratory's operations or equipment. This can help to determine the best layout and flow of the laboratory to maximize the use of space and to allow for flexibility in the future.

3. The safety and security of the laboratory, including the need for adequate ventilation, fire prevention measures, and emergency exits. This can help to ensure that the laboratory is a safe and secure environment for conducting experiments and working with hazardous materials.

4. The accessibility and usability of the laboratory, including the need to accommodate individuals with disabilities and the need to provide clear and easy-to-follow signage and labels. This can help to ensure that the laboratory is accessible and user-friendly for all individuals who will be using it.

In conclusion, the best architectural schematic design for a laboratory will depend on the specific needs and goals of the laboratory, as well as the available space and resources. By considering factors such as the types of experiments that will be conducted, the size and dimensions of the laboratory space, and the need for safety and accessibility, individuals and organizations can develop an architectural schematic design that meets their specific needs and goals.

WorkFlow and Laboratory Design Project

Development and Review Process

Phase 1: Laboratory Responsibility

Project Design and Construction

A. **Functional Narrative Document (FND) –** A document prepared by the project design team to describe the purpose, functions, relationships, and activities that will be conducted in an area, with the specific goal of providing architects and engineers with the information needed to prepare the formal plans and construction agreements.

Specific detailed information must be provided in the functional narrative document about space, spatial relationships, utilities, ventilation, and so on. These factors can be organized by discipline (hematology, chemistry) or function (clerical, specimen processing, supply storage, waste disposal, personnel lounges), but each component must be addressed. The following list contains a sample of the topics that should be reviewed in the FND:

➔ Types of tasks and movements, especially in terms of space and coordinated efforts.

There are many different types of tasks and movements that can be performed in a laboratory setting. Common tasks and movements include:

- **Handling and manipulating equipment and materials:** This can involve tasks such as assembling and disassembling equipment, pouring and measuring liquids, and handling samples.
    - Assembling and disassembling equipment: This may involve tasks such as setting up a microscope, installing a pipette, or attaching components to a machine.
    - Pouring and measuring liquids: This may involve tasks such as measuring out specific volumes of solutions or transferring liquids between containers using pipettes or other measuring tools.
    - Handling samples: This may involve tasks such as collecting samples from various sources, preparing samples for analysis, and storing samples for future use.

- Working with hazardous materials: This may involve tasks such as handling and disposing of chemicals or biological materials, following safety guidelines and procedures to prevent accidents and contamination.
- Using specialized tools and equipment: This may involve tasks such as using a Bunsen burner to heat a solution, using a centrifuge to separate components of a sample, or using a spectrophotometer to measure the concentration of a substance.

- **Conducting experiments:** This can involve tasks such as setting up experimental setups, collecting and analyzing data, and making observations.
    - Setting up experimental setups: This may involve tasks such as preparing solutions, assembling equipment, and organizing materials according to the protocols of the experiment.
    - Collecting and analyzing data: This may involve tasks such as taking measurements, observing and recording results, and using statistical analysis to interpret the data.
    - Making observations: This may involve tasks such as observing the behavior of cells or other biological specimens, or noting changes in physical or chemical properties of materials being tested.
    - Troubleshooting: This may involve tasks such as identifying and correcting problems that arise during the course of the experiment, in order to ensure that the results are accurate and reliable.
    - Reporting results: This may involve tasks such as preparing graphs, tables, and written reports to document the findings of the experiment and communicate the results to others.
- **Maintaining a clean and organized workspace:** This can involve tasks such as cleaning and sterilizing equipment, disposing of hazardous materials, and organizing supplies and materials.
    - Cleaning and sterilizing equipment: This may involve tasks such as washing and disinfecting lab glassware, instruments, and surfaces to prevent contamination of samples and experiments.

    - Disposing of hazardous materials: This may involve tasks such as properly handling and disposing of chemicals, biological materials, and other hazardous substances in accordance with safety guidelines and regulations.
    - Organizing supplies and materials: This may involve tasks such as restocking supplies, labeling containers, and keeping track of inventory to ensure that materials are readily available and easy to find.
    - Maintaining a safe and orderly work environment: This may involve tasks such as keeping walkways and work areas clear, properly storing equipment and materials, and following safety procedures to prevent accidents and injuries.
- **Using computers and other electronic devices:** This can involve tasks such as entering data, running simulations, and analyzing results using software programs.
    - Entering data: This may involve tasks such as recording observations, measurements, and results using software programs or databases.
    - Running simulations: This may involve tasks such as using computer models to simulate experiments or analyze data.
    - Analyzing results: This may involve tasks such as using statistical analysis software or other specialized programs to interpret and visualize data.
    - Communicating with colleagues: This may involve tasks such as sending emails, sharing documents, or participating in online meetings to collaborate with other laboratory staff.
    - Accessing and managing electronic records: This may involve tasks such as searching for and retrieving electronic records, updating electronic databases, or ensuring that electronic records are accurate and secure.
- **Working in a team:** This can involve coordinated efforts with other lab workers to complete tasks, share resources, and communicate results.

It is important to follow safety guidelines and procedures when performing tasks and movements in a laboratory setting. This can help to prevent accidents and ensure the integrity of experimental results.

➔ Volume of activities including the amount of traffic generated by the number of tests performed, supply restocking, specimen processing, telephone and other communication transactions, and the movement of people.

The desired volume of activities in a laboratory will depend on the specific goals and needs of the laboratory. The factors affecting the volume of activities in a laboratory include:

- **The number of tests being performed:** A laboratory that performs a large number of tests may have a higher volume of activities, such as handling and processing samples, analyzing results, and preparing reports.
- **The frequency of supply restocking:** A laboratory that consumes supplies at a high rate may require more frequent restocking, which can generate additional traffic and movement in the laboratory.
- **The volume of specimen processing:** A laboratory that processes a large volume of specimens may have a higher volume of activities, such as handling and storing specimens, preparing samples for analysis, and analyzing results.
- **The volume of communication transactions**: A laboratory that receives a large volume of communication transactions, such as phone calls or emails, may have a higher volume of activities related to responding to these transactions.
- **The movement of people**: A laboratory that has a high number of staff and visitors may generate more movement and traffic inside the laboratory.

Overall, it is important for a laboratory to balance the volume of activities with the available resources and time, in order to maintain efficiency and accuracy.

➔ The nature and structural needs (power, utilities, counter space, protective equipment such as hoods and safety showers, waste disposal, and so on) of the tests and procedures to be performed in the area.

- **Power**

The tests or procedures being performed may require a specific type or amount of power, such as electricity or gas. It is important to ensure that the laboratory has the necessary power resources to support these needs.

Generators

A generator is a piece of equipment that turns mechanical energy into electricity. Generators are often used as a backup power source in case the power goes out or to provide power in places where the grid doesn't reach. In a laboratory, a generator may be used to provide backup power in case of an outage or to power equipment that requires a large amount of electricity. It is important to choose the appropriate type of generator for the specific needs of the laboratory and to ensure that it is properly maintained and used safely.

- **Utilities**

In addition to power, the laboratory may also need utilities like water and air, depending on the tests or procedures that are being performed. Some of the most common things needed in a laboratory are:

Electricity: Most equipment (i.e. centrifuge, fume hood) and lights in a laboratory need electricity to work.

Water: Water is needed for many things in a lab, like cleaning surfaces, making solutions, and washing glassware.

Gas: Gas, like compressed air or natural gas, can be used to power equipment or heat things up.

Vacuum: A vacuum system might be needed to make a vacuum or get rid of gases or vapors in the lab.

Compressed air: Compressed air can be used to power pneumatic equipment or make a flow of air in the lab.

Cooling: If you want to keep equipment or materials in the lab at the same temperature, you may need a cooling system.

- **Counter Space**

In a laboratory, the availability of counter space is essential since it serves as a work surface for carrying out various processes and examinations. When constructing counter space in a laboratory, there are various issues that should be considered, including the following:

Size: The size of the counter space should be sufficient to accommodate the necessary tools and supplies for the tests and processes that are being carried out.

Material: The material used for the countertop has to be one that is both long-lasting and simple to clean, such as stainless steel or a composite that is resistant to chemicals.

Position: The counter space ought to be situated in a location that is both handy and easy to reach, so that employees may move about freely between workstations.

Storage: The counter space you have should contain storage facilities, such as drawers or cabinets, for storing away equipment and materials when they are not in use.

Workflow: The structure of the counter space should be planned to optimize workflow and efficiency, with objects that are needed for the current procedure being easily accessible. This will allow for the most effective use of the space.

When constructing counter space, it is essential to give careful consideration to the demands and requirements of the laboratory. This will guarantee that the counter space is both functional and satisfies the particular requirements of the research that is being carried out.

- **Protective Equipment**

Protective equipment is important in a laboratory to help ensure the safety of personnel and prevent accidents or injuries. Some common types of protective equipment that may be used in a laboratory include:

Protective eyewear: Protective eyewear, such as goggles or safety glasses, is used to protect the eyes from hazards such as chemical splashes or flying debris.

Protective clothing: Protective clothing, such as lab coats or aprons, is used to protect the skin from hazards such as chemical splashes or spills.

Gloves: Gloves are used to protect the hands from hazards such as chemical splashes or cuts. Different types of gloves are appropriate for different hazards, so it is important to choose the appropriate type of gloves for the specific work being performed.

Respirators: Respirators, such as masks or respirator cartridges, are used to protect the respiratory system from inhaling hazardous materials or gasses.

Footwear: Closed-toe shoes are often required in a laboratory to protect the feet from hazards such as chemical spills or falling objects.

Hoods: Hoods are enclosures that provide ventilation and protect the face and head from hazardous materials or gasses. There are several types of hoods, including fume hoods, biosafety hoods, and chemical hoods.

Safety showers: Safety showers are used to decontaminate personnel or equipment in case of a chemical spill or exposure.

Waste disposal: Waste disposal facilities, such as hazardous waste containers or sharps disposal bins, are used to safely dispose of hazardous materials or sharp objects.

Emergency equipment: Emergency equipment, such as fire extinguishers or eye wash stations, should be readily available in the laboratory in case of an emergency.

It is important to use the appropriate protective equipment for the specific hazards present in the laboratory and to ensure that it is properly maintained and used correctly.

➔ The kinds of instruments and equipment that will be present and their space specification.

The kinds of instruments and equipment that will be present in a laboratory will depend on the specific types of tests and procedures being performed. Some common instruments and equipment that may be present in a laboratory include:

Microscopes: Microscopes are used to magnify and view small objects, such as cells or microorganisms.

Balances: Balances are used to accurately measure the mass of small objects.

Incubators: Incubators are used to provide a controlled environment for the growth of microorganisms or cell cultures.

Centrifuges: Centrifuges are used to separate different components of a sample based on their density.

Pipettes: Pipettes are used to accurately measure and transfer small volumes of liquids.

Spectrophotometers: Spectrophotometers are used to measure the amount of light absorbed or transmitted by a sample.

Refrigerators and freezers: Refrigerators and freezers are used to store samples and reagents at specific temperatures.

Ovens: Ovens are used to heat or dry samples or materials.

pH meters: pH meters are used to measure the acidity or basicity of a solution.

Glassware: Glassware, such as beakers, flasks, and test tubes, is used to hold, mix, and measure liquids.

Computers: Computers are often used in a laboratory to record data, perform calculations, and analyze results.

- ➔ Communication links both inside and outside the laboratory, including telephone, intercom, fax machines, and all parts of the LIS.

Many organizations must recognize the importance of effective internal communications in their marketing and outreach efforts. Keeping updated on the most recent research news and advancements is one of the obstacles the communications team must face. Therefore, it is advantageous for laboratories to maintain open lines of communication.

Laboratory management is responsible for ensuring that information flows in both directions. In addition to sending out information, memos, policies, and procedures, the laboratory should have a method for obtaining feedback from its clients. The administration should have a communication strategy – a plan to be implemented whenever the laboratory has information to disseminate. Hence, here are the communication links both inside and outside the laboratory:

- Telephone
  - In clinical laboratory reporting areas, the telephone is the primary tool used. Its purpose is to remain in contact with the patients, increase mobility and productivity, and allow you to work remotely.
- Intercom
  - It was built specifically for laboratories that need to interface with cleanrooms, white spaces, and sectors where operators cannot touch any buttons due to health and safety regulations.
- Fax machines
  - Like a cross between a telephone and a printer, fax machines may copy papers in one area and print them in another, even if thousands of kilometers separate the two locations.
- Laboratory Computers
  - Computers in laboratories manage the management of test requests and the collection of specimens, the control of instruments, the collection of data, the translation of that data into meaningful results, the collation of all analyses on an individual patient, and the generation of reports for physicians' use and inclusion in patients' medical records.
- Electronic Health Record
  - Include the patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiological images, and laboratory and test findings. Provide providers with access to evidence-based tools that can be used to make decisions on patient care.

➔ The number of personnel and the staffing patterns (24-hour coverage, number of persons on each shift, and so on) and their support needs.

- **Clinical Units**
    1. Medical Specialist II - 5
    2. Medical Officer IV - 1
    3. Medical Officer III - 5
- **Clinical Laboratory**
    1. Medical Specialist II - 1
    2. Medical Technologist II - 1
    3. Medical Technologist I - 2
    4. Laboratory Technician - 1
- **Blood Station**
    1. Medical Technologist I - 2
    2. Laboratory Technician - 1
- **Health Information Management**
    1. Administrative Officer III - 1
    2. Data Controller I - 2

➔ Supply requirements in consideration of requisitioning, storage and dispensing.

Proper reagent and supply management in the laboratory is oftenly a difficult task. Creating and implementing purchasing and inventory control systems, on the other hand, can enable cost savings while also ensuring supplies and reagents are available when needed. The purchasing and inventory management procedures should be designed to ensure that all reagents and supplies are of good quality and that they are used and stored in a way that preserves their integrity and reliability.

It is crucial to achieve the correct balance between keeping the smallest essential inventory levels and preventing stock outages since lab efficiency and production are impacted when supplies unexpectedly run out or expire. The most effective way to do this is to assess previous data on testing demand, supplier lead times, and validation timeframes.

- **Ordering Metrics and Inventory Control**

Every item controlled by our automated point-of-use inventory system has particular characteristics that determine the quantity and timing of reorders. Expiration dates, relative

storage space, validation durations, production lead times, and even length of delivery lead times are a few examples of these distinctive qualities. The ordering procedure is nearly fully automated, therefore laboratory staff is heavily relied upon to determine the appropriate inventory levels. These levels have an impact on inventory turnover rates, the value of the inventory quantity on hand, and scores for system compliance and reconciliation.

In order to address large deviations from defined targets promptly, as well as to assist prevent waste and undue overhead, these indicators are given in our monthly Supply Chain Inventory Dashboard and reviewed monthly with all laboratories.

Excess inventory, backorders, outdated goods, and the creation of a substantial amount of physical labor to maintain supplies on the shelf are just a few of the waste products that can result from poor inventory management. All of these waste types should be reduced with the aid of efficient inventory operations, which should also support SOPs and good laboratory practice recommendations. For instance, we were able to lower inventory levels and the quantity of human work required by eliminating superfluous stages from the procedure used to validate a fresh lot of reagent received in a laboratory.

- **Supply Chain Continuum**

To guarantee the precision and effectiveness of product ordering, receiving, and payment, automated processes must be implemented throughout all supply chain support teams. We use an electronic data interchange (EDI) approach to send an order's details to the appropriate vendor right away. To eliminate the need for human intervention and, consequently, problems related to human error, EDI is frequently employed in supply chains for large facilities. Transparent order tracking is also made possible by EDI; after the vendor receives the order, the electronic document is retrieved and compared to the actual product supplied. Distribution handlers employ bar code scanning to verify delivery to the right laboratory location after receiving positive confirmation of the item.

- **Important Vendor Terms and Conditions**

The most significant variables and conditions that influence supply operations relate to how well businesses operate (keep in mind, these terms address operational issues and do not take product price into consideration). Consequently, the following terms require careful review:

- ➢ Billing cycles (daily, monthly, quarterly)
- ➢ Pricing file format (easy of uploading into the system of the facility)
- ➢ The use of enterprise resource planning (ERP) with electronic commerce (EDI)
- ➢ Changing prices is possible (frequency, method, caps [percent or critical program information])
- ➢ Service and advocacy for problem-solving (single point of point of contact at the corporate level, appropriate numbers of local representatives with knowledge and empowerment to make decisions)
- ➢ Freight (who pays, what carrier is utilized, who insures, free on board destination vs. origin) (who pays, what carrier is used, who insures, free on board destination vs. origin)
- ➢ Notification (specified time frames for recalls, discontinued product, back-orders) (specific time frames for recalls, discontinued product, back-orders)
- ➢ Assurance of supply (order by 10am receive by 3pm the next day)

- **Staffing for Inventory Management**

Key personnel should be identified for specialized tasks such as placing new product orders and overall system maintenance. This specialization improves supply ordering consistency and frees up lab technicians to focus on testing operations.

Individuals in charge of supplies must have access to the information needed to place orders, such as vendor names and contacts, as well as order quantities. A better scenario is if they have access to data that can be used to identify areas for process improvement. A report that shows inventory turnover rates, for example, could be used to highlight products that require updated inventory levels. Similarly, the use of perpetual inventory systems, which can be manual, card-based, or computer-based, is intended to trigger orders when supplies fall below a predetermined reorder level.

As with any other area, management must thoroughly assess the need for each position in the workplace. In the case of staffing to oversee inventory, a lab must justify the position's benefit, so the lab management team must evaluate the potential cost savings associated with a well-managed inventory system (eg, less waste, less excess inventory, etc).

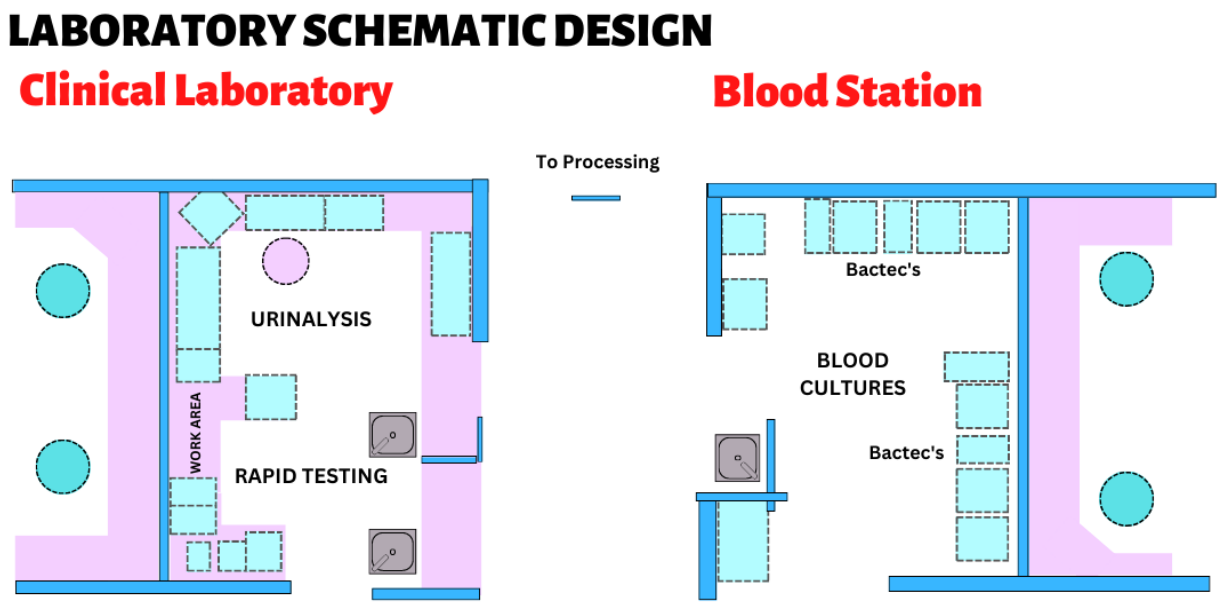
➔ Detailed description of the plans for the computer system (LIS) including wiring, location of the central processing unit and terminals, as well as outside linkage.

A laboratory data computerized system is frequently referred to as a laboratory data computerized system. The acronym LIMS or LIS refers to an information management system. In laboratories all over the world, the use of a computerized system is becoming more common.

A properly designed and installed LIMS improves the accuracy and accessibility of sample and data flow in the clinical laboratory.

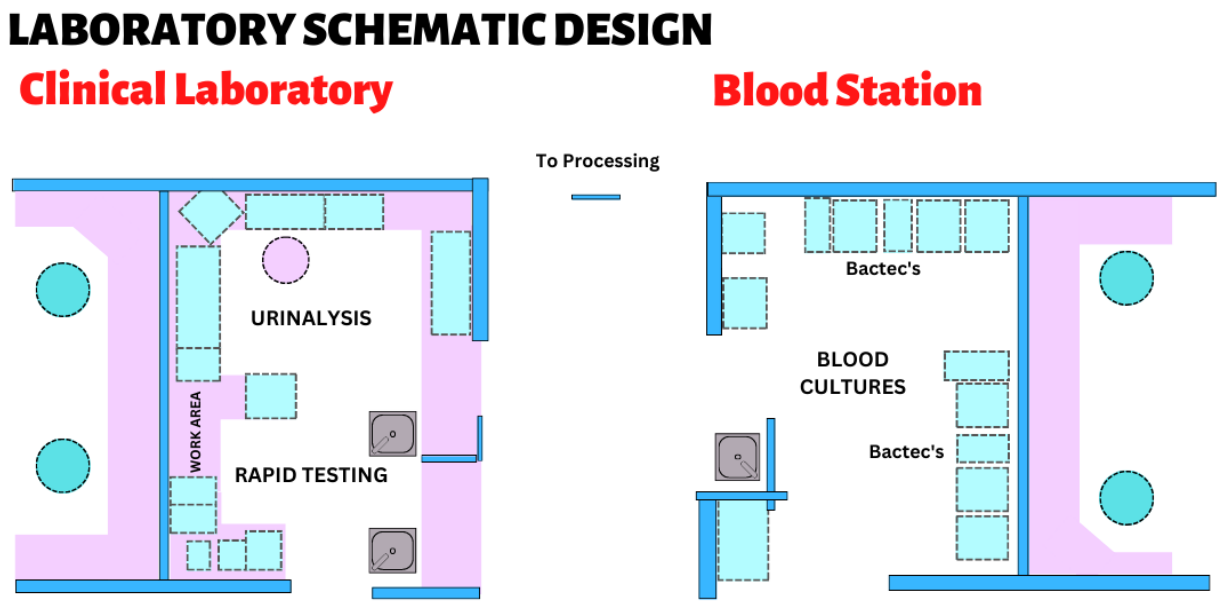
A LIMS with adaptability, ease of evolution and support, and system integration. The laboratory will benefit the most from speed. Laboratorians will not use something that is slow or awkward, but if it saves time, they will quickly accept the project and aggressively move the process forward.

Initial Schematic Drawing

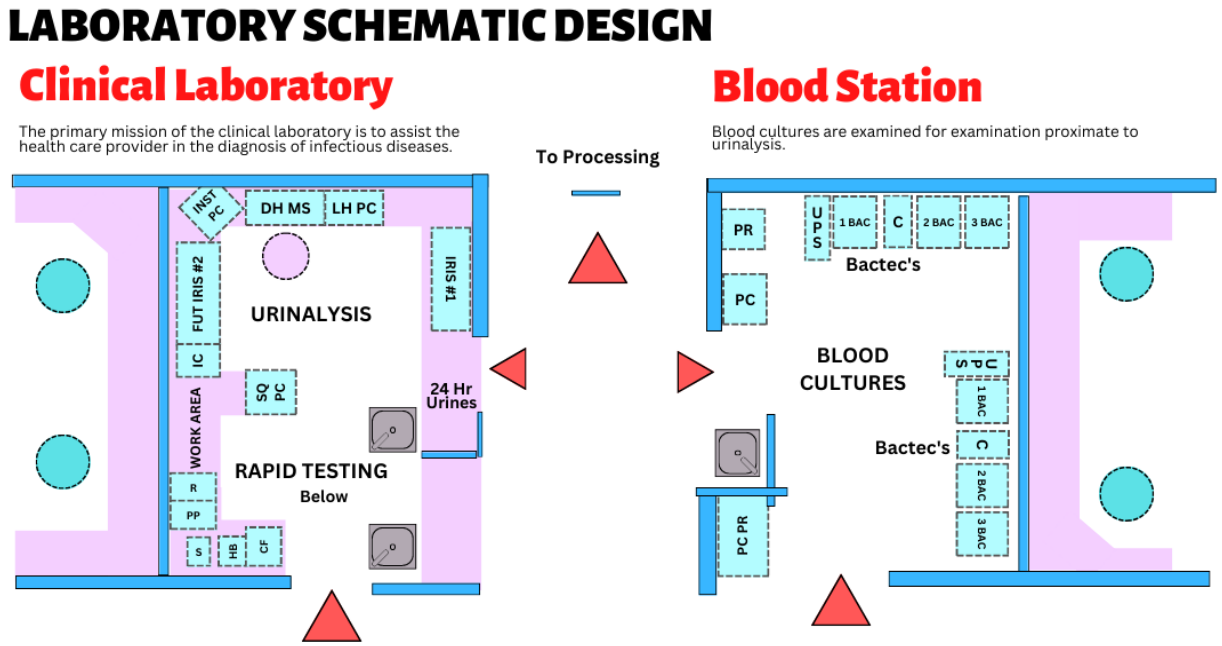


Phase 2
Architectural and Engineering Responsibility

Design Development Drawing



Final Schematic Drawing



PROJECT MANUAL

Detailed Project Scope Statement

General Information

Project Name: Laboratory Schematic Design Project

Location: Ethel Chapman Building, Silliman University

Project Manager: AKAP Organization

Project Objectives

The objective of this laboratory schematic design project is to create a detailed plan for the layout and functionality of laboratory space. Thus the specific objectives are the following:

1. Providing a safe and efficient workspace for researchers and technicians to conduct experiments and analyze data.
2. Ensuring that the laboratory meets all necessary regulatory and compliance standards.
3. Maximizing the use of space and resources to support the research activities of the project.
4. Designing a functional and visually appealing workplace that promotes collaboration and creativity.
5. Planning for the future growth and development of the laboratory as research needs and technologies change.

Overall, this laboratory schematic design aims to create a well-planned and functional laboratory space that supports the research activities and goals of the organization.

Project Scope Description

This project will conduct a need assessment to determine the research activities that will be conducted in the laboratory and the necessary equipment, materials, and facilities to support those activities. Furthermore, it will develop a detailed layout plan for the laboratory, including the location and arrangement of equipment, workstations, storage areas, and other facilities. Specify the materials, finishes, and other design elements that will be used in the construction and installation of the laboratory, and develop a budget and timeline for the project, including the cost of design, construction, and equipment installation. In addition, it will also coordinate with

relevant stakeholders, such as researchers, technicians, facility management, and regulatory agencies, to ensure that the laboratory design meets the needs and goals of the organization. Also it will obtain necessary approvals and permits for the construction and installation of the laboratory. Along with that, this will also manage the construction and installation process to ensure that the laboratory is completed on time and within budget.

Project Boundaries

The project boundaries for establishing a laboratory schematic design project refer to the limits or constraints within which the project must be completed. Hence, the following are the considered project boundaries:

- Budget: The fixed budget that can be spent on design, construction, and equipment is 15, 000 000 Philippine peso.
- Timeline: The fixed timeline for completion is within 5 years.
- Regulatory requirements: The laboratory may be subject to a variety of regulatory requirements, such as building codes, health and safety regulations, and environmental standards. These requirements may impose limitations on the design and construction of the laboratory.
- Resource constraints: The project may be limited by the availability of resources such as personnel, equipment, and materials. (this boundary will be addressed upon the construction of the laboratory.

Project Deliverables

The project deliverables for establishing a laboratory schematic design project are the products or outputs that are produced as a result of the project. These deliverables may include both tangible and intangible items.

Some common project deliverables for a laboratory schematic design project might include:
A schematic design plan: This is a detailed plan that outlines the layout and functionality of the laboratory, including the location and arrangement of equipment, workstations, storage areas, and other facilities.

- A budget and timeline: The project team may develop a budget and timeline that outlines the costs and schedule for the design, construction, and installation of the laboratory.
- Equipment and materials lists: The project team may create lists of the equipment and materials that will be needed to construct and equip the laboratory.
- Construction documents: These documents may include plans, specifications, and other details that are needed to guide the construction and installation of the laboratory.
- Initial and Final Drawings: These are detailed drawings that show the actual construction of the laboratory as it was completed.
- User manuals: The project team may produce user manuals or other instructional materials to help researchers and technicians understand how to use the equipment and facilities in the laboratory.

Overall, the project deliverables for a laboratory schematic design project will depend on the specific needs and goals of the organization or institution establishing the laboratory.

Project Acceptance Criteria

The evaluation by laboratory users are the basis for the product acceptance by the use of surveys. The laboratory staff will assess the complete mitigation plan. They will evaluate the mitigation plan before the project is accepted.

Project Constraints

The students, with the help of their adviser, researchers, and laboratory staff, are most primarily involved in the laboratory. Due to their work schedules and the schedules of the students involved, this project's timetable is constrained. Budgetary restrictions and a deadline for project completion are additional constraints on our endeavor.

Project Assumptions

It is assumed that this project already provides the layout and laboratory advice necessary for setting up a clinical laboratory. It is also assumed that it gives a well designed floor plan of the laboratory and equipment recommendations.

Initial Project organizations

The main coordinators contain a doctor who serves as our customer, and another pathologist who will oversee the lab technicians. These two coordinators have already done feasibility analyses for this project. They have already assessed the objectives and the viability of the project.

Initial Project Risks

The timetables for the other laboratories that will move at the same time as these labs are not yet available. Risks related to the change of plans, as well as any unforeseen costs or scheduling delays, may be associated with this uncertainty.

Schedule Milestones

- Project Definition (Dec. 23)
    1. Project Layout
    2. Project Plan
    3. Project Environment
    4. Registration
- Partial Outline Report Progress (Dec. 27)
    1. Outline of Progress Report
- Complete Final Report (Dec. 30)
    1. Summary of Complete Project Layout Plan
    2. Laboratory Skeletal Diagram
    3. Breakdown Structure
    4. Financial Report
    5. Quality Management Plan
    6. Flow Chart/Diagram
    7. Risk Management Plan
    8. Estimation for the Whole Project
    9. Project Charter
    10. Risk Register

Fund Limitation

This project has been allotted a budget of ₱15,000,000. We have been informed that this budget is variable; nonetheless, we must remain close to this amount, so we will assume it is the top limit. This allotted budget will necessitate the creation of a cost estimate for the entire project.

Cost Estimate

There will be no need for additional paid movers; the equipment and materials will be moved by students and lab technicians, resulting in minimum moving expenses. Therefore, the majority of anticipated expenditures will be for procurement. This is the price of student workstations in a sanitary environment.

Project Configuration Management Requirements

The scope is well-defined, and any modifications are anticipated to be limited. There may be a few new or unexpected procurement provisions in researcher surveys, but they are only expected to be slightly extensive.

Approval Requirements

Mr. Reuben Los Banos, our client, has final approval authority over this project. All scope, cost, quality, and timeline changes require his approval.

Project Success Factors

The success of this project is contingent upon the thoughtful, conscientious, and diligent completion of our five deliverables. These five deliverables need to be comprehensive, detailed, and functional. Mr. Reuben Los Banos will evaluate these deliverables, including the first and final deliverables.

Phase 3: Construction