Session 002-003 — Planning

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Course: High-Containment Laboratory Design

Purpose of the document:

This lecture map is designed to help participants navigate the content of Lecture 002-003. It identifies the main conceptual sections, decisional points, and logical transitions of the course. It functions as an orientation and study tool and does not replace the lecture.

SECTION 1 — The laboratory as a life-cycle system

Main focus: Introduce the high-containment laboratory as a living installation governed by a full life cycle, and establish planning as the fundamental framework of the course.

Key points:

- The high-containment laboratory is not a conventional construction project.
- It is conceived as a repetitive cycle of evaluation, validation, training, and operation.
- The typical analysis horizon is 20 to 25 years.
- Operation and maintenance constitute the longest and most costly phase of the cycle.

Rhetorical questions / Attention signals:

- Why can a laboratory not be understood as a straight line of design and construction?
- What does it mean to plan for decades rather than only for inauguration?

Orientation signal: Establishes the temporal and conceptual framework from which all subsequent decisions will be evaluated.

SECTION 2 — Planning failures as the origin of problems in high containment

Main focus: Dismantle the idea that problems in BSL-3 laboratories are primarily technical failures.

Key points:

- Most problems are not errors in calculation or equipment selection.
- Failures arise when critical decisions are made too early, too late, or without sufficient information.
- Planning errors propagate into design, construction, operation, and maintenance.

Rhetorical questions / Attention signals:

- When a BSL-3 does not work, what actually failed?
- Why are early errors difficult to correct later?

Orientation signal: Introduces the central thesis of the course: planning is deciding, and poor decisions have irreversible consequences.

SECTION 3 — Viability as the central objective of the lecture

Main focus: Clearly define what kind of lecture this is and what kind of lecture it is not.

Key points:

- It is not a lecture on architectural design.
- It is not a normative or regulatory compliance lecture.
- It is not a technology selection lecture.
- It is a lecture about viability.

Emphasis:

- Assessing whether a laboratory can be built, operated, and maintained safely and sustainably.
- Viability precedes design.

Rhetorical questions / Attention signals:

- Can this project be sustained technically, operationally, and financially for 20–25 years?
- Orientation signal: Defines the scope of the lecture and aligns participant expectations.

SECTION 4 — Budget as a result, not as a starting point

Main focus: Reorder the traditional logic used to initiate laboratory projects.

Key points:

- The budget cannot be the starting point.
- It is the explicit result of the planning process.

- Early numbers are hypotheses, not commitments.
- Many costly decisions are fixed early without being recognized as financial decisions.

Rhetorical questions / Attention signals:

- Why does asking for numbers before decisions generate structural errors?
- Which decisions fix costs without us realizing it?

Orientation signal: Connects planning with long-term financial consequences.

SECTION 5 — Sequential chain of decisions in planning

Main focus: Present the lecture's logic as a structured sequence of decisions.

Key points:

- Each step reduces uncertainty.
- Each step fixes technical and financial decisions.
- Real options close progressively.
- The order of steps matters.

Rhetorical questions / Attention signals:

- What happens when this order is reversed?
- Which decisions cannot be undone later?

Orientation signal: Introduces the logical diagram of the lecture and prepares the transition to client inputs.

SECTION 6 — Initial client inputs: value and limits

Main focus: Distinguish between preliminary inputs and validated technical requirements.

Key points:

- Proposed scientific program.
- Preliminary pathogen list.
- Available site.
- Target budget.
- Institutional timeline.

Central concept:

- These inputs are not wrong, but they are not sufficient.
- At this stage, they are hypotheses, not requirements.

Rhetorical questions / Attention signals:

- What happens when we treat hypotheses as requirements?

- What information is still missing?

Orientation signal: Prepares the transition toward validation and biological risk analysis.

SECTION 7 — Validating is not questioning: translating intentions into consequences

Main focus: Explain what validation means during planning.

Key points:

- Validating is not stopping the project or questioning client authority.
- It is translating intentions into technical consequences.
- Biology → space → systems → costs.
- Failing to validate pushes consequences forward, where they are more expensive.

Rhetorical questions / Attention signals:

- What does “we want to work with influenza” really mean?
- What does operating 24/7 imply in practical terms?

Orientation signal: Closes the input phase and opens the path to biological risk.

SECTION 8 — Biological risk assessment as a decisional event

Main focus: Present biological risk analysis as the project’s inflection point.

Key points:

- It is not an administrative requirement.
- It is the most important decisional event of the project.
- It transforms institutional intention into technical obligation.
- Biology ceases to be abstract and begins to impose physical conditions.

Rhetorical questions / Attention signals:

- What changes after risk analysis?
- What happens if this step is superficial?

Orientation signal: Marks the moment when the project becomes biological.

SECTION 9 — Activity-based risk, not pathogen-based risk alone

Main focus: Dismantle automatic classification by pathogen or BSL level.

Key points:

- The same pathogen can imply different risks.
- Risk depends on activities, frequency, personnel, and context.

- Evaluating only the pathogen is a common cause of failure.

Rhetorical questions / Attention signals:

- What happens when we evaluate the pathogen but not the activity?
- How does risk change between culture, animal work, or diagnostics?

Orientation signal: Introduces the direct relationship between risk and spatial design.

SECTION 10 — From risk to space, flows, and containment

Main focus: Show how risk fixes irreversible spatial decisions.

Key points:

- Laboratory size is not defined by the budget.
- It is defined by flows, separations, and SOPs.
- Risk changes the budget, not the other way around.
- Space imposes a containment strategy.

Rhetorical questions / Attention signals:

- What happens when risk requires showers, airlocks, and decontamination?
- Why must the building still remain abstract at this stage?

Orientation signal: Leads into the definition of containment as an integrated system.

SECTION 11 — Containment as an integrated system

Main focus: Define containment beyond a single isolated element.

Key points:

- Physical barriers.
- Mechanical systems.
- Operational procedures.
- Human behavior.
- If one fails, the entire system fails.

Rhetorical questions / Attention signals:

- Where does the containment barrier really exist?
- Can a procedure correct poor geometry?

Orientation signal: Prepares the transition toward envelope, HVAC, and performance.

SECTION 12 — Integrated design and early decision-making

Main focus: Introduce the Integrated Design Process (IDP).

Key points:

- Multidisciplinary teams from the outset.
- The greatest cost impact occurs during planning and schematic design.
- Oversizing is paid for over decades.
- Planning decides which risks are accepted.

Rhetorical questions / Attention signals:

- What happens when disciplines work sequentially?
- Why must the building absorb human errors?

Orientation signal: Closes the lecture by establishing planning as a strategic decision, not a design exercise.