DO OUR PERSONNEL CHANGING ROOMS REALLY WORK?

Diagnostic Guide
GD-014

A technical diagnostic guide to entry, exit, PPE transitions, clean/dirty interfaces, and personnel movement in high-containment laboratories

A practical guide to evaluating whether changing rooms, showers, airlocks, and PPE sequences support the real movement of people through a containment facility.

DIAGNOSTIC GUIDE

HOW TO USE THIS GUIDE

A CHANGING ROOM CAN HAVE THE RIGHT NAME AND STILL SUPPORT THE WRONG SEQUENCE.

This guide was created for facilities whose personnel transitions look correct on drawings but become awkward, contradictory, or prone to contamination when people actually use them.

Why we developed it

Changing sequences in high containment are often reduced to room names: clean changing room, shower, dirty changing room, airlock, corridor. The real containment function, however, depends on what personnel do in each space, what clothing or PPE is stored there, where contaminated items are removed, how doors behave, and whether clean and dirty activities overlap.

A technically elegant sequence may fail in operation if there is nowhere to sit, no storage for clean PPE, no route for waste, incompatible door swings, insufficient space for doffing, or pressure relationships that do not support the intended movement.

The purpose of this guide is to evaluate the transition as an operational containment system rather than as a succession of rooms.

Who can use it

The guide is intended for architects, biosafety personnel, facility managers, laboratory operators, commissioning teams, industrial hygienists, engineers, and project teams responsible for personnel transitions in high-containment facilities.

It may be used during planning, design review, commissioning, SOP development, operational-readiness assessment, or retrospective assessment of an existing facility.

HOW TO USE IT IN PRACTICE

Map the complete personnel journey from street clothing to laboratory work and back again. For each transition, identify clothing status, PPE status, contamination assumption, hand contact, storage, waste handling, door interaction, and airflow relationship.

The objective is not to impose one universal changing sequence. It is to make the sequence internally coherent, compatible with the risk basis, and physically achievable by the people who must perform it every day.

01 MAP

02 SEPARATE

03 TEST

04 REFINE

HOW THIS GUIDE MAY BE USED — AND WHAT IT DOES NOT AUTHORIZE

This guide is a general diagnostic-orientation tool. It is designed to help structure technical questions, organize evidence, and define what requires more specific evaluation.

Acceptable use

It may be used to:

- structure preliminary technical investigations;
- prepare internal reviews and multidisciplinary discussions;
- identify missing information, measurements, and documentation;
- support definition of the scope of a subsequent evaluation;
- serve as educational and internal technical reference material.

It does not constitute

This guide does not constitute a universal SOP for entry, donning, doffing, exit, or decontamination, nor a site-specific PPE assessment, certification, authorization to operate, or site-specific recommendation.

Technical and operational decisions

No decision regarding entry or exit sequences, shower requirements, PPE placement or removal, waste handling, personnel circulation, or return to operation should be based solely on this guide.

Applicable technical basis

The content should be interpreted together with the risk assessment, institutional SOPs, PPE requirements, occupational-health and decontamination requirements, the Basis of Design, emergency procedures, regulatory requirements, and other site-specific documentation.

Competent personnel

Transition sequences should be developed and reviewed by competent personnel, tested with users under realistic operating conditions, and adjusted to maintain functional separation between clean and potentially contaminated activities.

Responsibility

BioLab Solutions assumes no responsibility for decisions, modifications, interventions, or actions carried out outside a site-specific evaluation and without review by competent personnel.

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01 Map the complete change in personnel state

Start with the people and their clothing/PPE status, not with room names.

At each point in the journey, define what the person is wearing, what may be contaminated, and what must happen before crossing the next boundary.

Transition point	Questions that should be answered
Arrival	Where are street clothes, personal items, phones, bags, and outer garments stored?
Clean changing room	Where is facility clothing put on? Which items remain clean? What seating/storage is required?
PPE donning	What PPE is put on before entering containment, and where is clean PPE stored?
Entry transition	Which doors, showers, or airlocks are crossed, and in what clothing/PPE state?
Laboratory work	Which PPE becomes potentially contaminated, and which items must remain inside?
Doffing	Where are potentially contaminated PPE and garments removed, contained, discarded, or sent for decontamination?
Exit / shower	When is showering required, and what contamination state is assumed before and after?
Return to clean side	Where are street clothes put back on, and what prevents contaminated items from returning to the clean zone?

02

Explicitly define clean, transition, and dirty functions

Room names are useful only if the activities taking place inside are compatible with the intended contamination status.

Clean-side functions may include

- street-clothing storage;
- facility-clothing storage;
- clean PPE storage;
- personal-item storage;
- hand hygiene;
- pre-entry checks.

Dirty-side functions may include

- doffing potentially contaminated PPE;
- temporary containment of used garments;
- waste collection;
- shoe/boot transition;
- undressing before showering where required;
- decontamination-related activities.

Diagnostic question: are clean supplies being stored in a space where contaminated PPE is routinely removed, or are contaminated items being carried back through a clean zone because the architecture provides no other route?

CLEAN AND DIRTY SHOULD DESCRIBE FUNCTIONS AND CONTAMINATION ASSUMPTIONS — NOT JUST SIDES OF A DRAWING.

03 Place clean PPE where it can remain clean

Storage location should follow the contamination logic of the sequence.

PPE intended to be donned before entry should not normally be stored where contaminated PPE is removed unless the facility has a specific control strategy that preserves its cleanliness.

Storage environment

Is clean PPE protected from splashes, contact contamination, dust, and contact with used garments or waste?

Donning sequence

Can personnel complete the required donning without crossing into a space already used for doffing?

Reusable items

Where are reusable respirators, PAPRs, footwear, or protective garments stored after decontamination?

Sizing / replenishment

Can PPE be replenished from the clean side without carrying boxes through dirty zones?

Emergency stock

Is additional PPE available without compromising clean/dirty separation?

Visual control

Can users clearly distinguish clean, used, and pending-decontamination equipment?

CLEAN PPE STORAGE SHOULD SUPPORT THE DONNING SEQUENCE — NOT CONTRADICT IT.

04 Evaluate whether the dirty side is large enough for safe doffing

Doffing requires space, sequence, and places to direct contaminated items.

Check physical capacity

- space for one or more users;
- seat or stable support where needed;
- waste receptacles;
- laundry / garment containers;
- hand hygiene;
- space for handling PAPR or reusable PPE;
- clear floor area away from doors.

Observe actual body movement

Doffing is not an abstract sequence. Users bend, turn, sit, remove footwear, reach for waste bins, and manipulate fasteners.

If the room is too small, the likelihood of clean/dirty contact increases and the written SOP may be physically impossible to perform as intended.

SPACE IS PART OF THE PPE CONTROL SYSTEM.

05 Review the function of the shower

When a shower forms part of the transition, it should have a defined function within the sequence and respond to the facility's risk basis and procedures, rather than exist solely because of a generic expectation associated with the containment level.

Where showers exist or are required, define whether they are used routinely, activated by risk, intended for emergencies, associated with decontamination, or part of a specific clothing transition.

When is showering required?

On every exit, for selected activities, after a contamination event, for maintenance entry, or during emergency response?

What happens before the shower?

Which PPE and garments are removed before the person enters the shower zone?

What crosses the shower?

Are footwear, towels, clothing, or equipment carried across, and how are clean items protected?

Drainage

Is shower drainage connected to an appropriate wastewater strategy for the facility?

Privacy / accessibility

Can the requirement be used routinely by the full personnel population without encouraging shortcuts?

Emergency use

Can emergency decontamination or medical response occur without obstructing normal evacuation?

> A shower is not automatically a contamination barrier. Its effectiveness depends on what contamination remains on the user when entering and what clean functions occur on the other side.

06 Coordinate personnel flow with the pressure cascade

The transition sequence and the airflow sequence should reinforce one another.

Review

- pressure relationship across each door;
- directional airflow during normal movement;
- disturbance from door opening;
- interlock logic where present;
- recovery time;
- door force;
- effect of multiple users.

Do not overinterpret pressure

A correct pressure cascade does not by itself demonstrate that the changing sequence is hygienic or operationally appropriate.

Likewise, a good donning/doffing SOP may fail if doors or airflow make it difficult to perform safely.

PERSONNEL TRANSITION IS BOTH A BEHAVIORAL SEQUENCE AND A PHYSICAL AIRFLOW EVENT.

DOOR AND INTERLOCK BEHAVIOR

DO THE DOORS SUPPORT THE SEQUENCE OR WORK AGAINST IT?

Conflicting door swings

Door leaves may block benches, waste bins, PPE stations, or the next door in the sequence.

Interlock that traps the user

Users may be unable to move normally if door logic does not account for realistic dwell times or multiple occupants.

Excessive door force

Large pressure differentials or poorly adjusted closers may make doors difficult to operate, especially while carrying equipment.

Door held open

If normal workflow routinely requires defeating closers or holding doors open, the transition design should be reviewed.

Sensor location

Door-position sensors and interlock components should reflect actual closure, not only commanded status.

Emergency release

Normal interlock logic should not create an unsafe evacuation condition during emergencies.

> **A TRANSITION THAT REQUIRES USERS TO DEFEAT OR OVERRIDE THE DOORS IS NOT WORKING AS DESIGNED.**

07 Separate personnel flow from material and waste flow

People should not have to carry all dirty items back through the same route they use to return to a clean state.

Poorly resolved material flows can compromise an otherwise logical personnel transition.

Item	Flow question
Used PPE	Where is it discarded, retained, disinfected, or sent to laundry without returning through the clean side?
Reusable respirators / PAPR	Where are they decontaminated, inspected, charged, and stored before reuse?
Laboratory clothing	How does used clothing leave containment and how does clean clothing enter?
Waste	Does waste leave through a dedicated treatment/transfer route rather than accompanying personnel through changing rooms?
Samples / equipment	Are pass-throughs or decontamination routes available so personnel transitions do not become material-transfer routes?
Maintenance tools	How is the entry and exit of tools into containment controlled and decontaminated?

> Personnel flow becomes much more difficult to keep clean when material and waste routes have not been resolved independently.

08 Test the sequence with real users

Operational-readiness testing should include the body mechanics and timing of actual entry and exit.

Entry simulation

Have users store personal items, change clothing, don the required PPE, and enter using the intended sequence.

Exit simulation

Have users doff, discard PPE, manage reusable equipment, and return to street clothing.

Two-person use

Test what happens when more than one person enters or exits at the same time.

Maximum occupancy

Evaluate queues, storage demand, door conflicts, and available clean/dirty separation.

PAPR / bulky PPE

Repeat the sequence using the largest or most complex PPE ensemble expected in the facility.

Contamination event

Walk through the response to a spill, damaged PPE, or unexpected contamination during exit.

> **IF THE SOP CANNOT BE PERFORMED COMFORTABLY IN THE AVAILABLE SPACE, THE PROBLEM IS NOT ONLY THE SOP.**

COMMON PERSONNEL-FLOW FAILURES

WHAT OFTEN GOES WRONG

“Clean PPE goes in the dirty room.”

If doffing occurs there, clean PPE storage requires a specific protection strategy or a different location.

“Everyone showers on exit.”

A universal shower requirement still needs a coherent sequence for doffing before the shower and clean clothing after it.

“The rooms are in the right order.”

The correct room order does not demonstrate that storage, door swings, PPE handling, and waste movement are compatible.

“The interlock prevents mistakes.”

Interlocks control doors; they do not correct an incoherent contamination sequence.

“Users will adapt.”

Repeated shortcuts usually indicate that the designed sequence does not fit real operation.

“The pressure cascade makes it clean.”

Air direction cannot compensate for contaminated PPE crossing into a nominally clean function.

ARCHITECTURE, PPE, AIRFLOW, AND SOP SHOULD DESCRIBE THE SAME TRANSITION.

THE ENTRY ROUTE DOES NOT ALWAYS HAVE TO BE THE EXIT ROUTE

In some facilities, separate entry and exit routes can simplify contamination control. In others, a shared sequence works perfectly well if functions are clearly separated in time and space.

Separate routes may help when

- exit doffing is complex;
- showering is routine;
- large PPE ensembles are used;
- clean and used garment logistics must remain separate;
- occupancy is high;
- crossing flows are difficult to control.

Shared routes may work when

- the risk and PPE sequence are simpler;
- spaces can be functionally separated;
- clean storage is protected;
- occupancy is limited;
- operating procedures prevent overlap;
- the sequence has been verified through representative use.

> **THE BEST FLOW IS THE ONE THAT PRESERVES THE REQUIRED SEPARATION WITH THE LEAST OPERATIONAL CONTRADICTION.**

EMERGENCY EVACUATION IS A DIFFERENT OPERATING CONDITION FROM ROUTINE EXIT

The routine doffing and shower sequence should not prevent safe evacuation when life safety requires immediate exit, but emergency movement still needs a defined containment response once people are safe.

Define in advance

- which doors or interlocks are released;
- what PPE may remain in place during evacuation;
- where potentially contaminated people assemble;
- how exposure or contamination is assessed;
- how emergency responders enter and leave;
- how affected spaces are subsequently restored.

Do not force emergency movement through the routine sequence

Life-safety evacuation and routine contamination-control sequences have different priorities during an emergency.

The design and SOPs should make that difference explicit rather than leaving users to improvise when an alarm occurs.

EMERGENCY EVACUATION TAKES PRIORITY OVER THE ROUTINE SEQUENCE — IT DOES NOT ELIMINATE THE NEED FOR A POST-EVENT CONTAINMENT RESPONSE.

REUSABLE PPE CREATES A RETURN PATH THAT MUST BE DESIGNED

Respirators, PAPRs, protective footwear, and reusable garments do not disappear after doffing. Their route back to a clean, ready state forms part of the personnel-transition system.

Step	Diagnostic question
Doffing	Where is the item removed without contaminating clean storage or the user?
Intermediate containment	Where is it placed before cleaning or decontamination?
Decontamination / cleaning	What method is used, where does it occur, and is it compatible with the item?
Inspection	Who confirms that the item is clean, intact, and ready for reuse?
Charging / servicing	For PAPRs or powered equipment, where can batteries be charged and components serviced without mixing clean and dirty states?
Clean storage	How is the item protected from recontamination before its next use?

> A changing-room sequence is incomplete if it defines how a person returns to a clean state but not how reusable protective equipment returns to a clean and functional state.

DIAGNOSTIC SEQUENCE

DO THE CHANGING ROOMS ACTUALLY SUPPORT CONTAINMENT?

01

Is the complete sequence of personnel state changes documented?

No → map clothing, PPE, and contamination status from arrival through exit.
Yes → continue.

02

Are clean and dirty functions physically and operationally separated?

No → reorganize storage, doffing, waste, and reusable-PPE handling.
Yes → continue.

03

Can the donning and doffing sequence actually be performed in the available space?

No → review room layout, furniture, occupancy, or SOP.
Yes → continue.

04

Do doors, interlocks, and pressure relationships support the sequence?

No → correct airflow, controls, or door configuration.
Yes → continue.

05

Are material, waste, and reusable-equipment flows resolved separately?

No → personnel transitions are likely carrying an additional contamination burden.
Yes → continue.

06

Has the sequence been tested with real users under realistic conditions?

No → operational-readiness evidence is incomplete.
Yes → document and refine the verified flow.

WHAT SHOULD BE AVAILABLE?

Risk / procedure basis

- PPE requirements;
- clothing policy;
- shower requirements;
- contamination assumptions;
- emergency-exit logic.

Architecture

- room sequence;
- door swings;
- benches/storage;
- clean/dirty zones;
- showers;
- pass-throughs;
- occupancy capacity.

Mechanical / controls

- pressure cascade;
- door recovery;
- interlock logic;
- alarm behavior;
- emergency release;
- ventilation in changing spaces.

Operational evidence

- entry/exit walkthroughs;
- user feedback;
- training observations;
- records of deviations/shortcuts;
- incident history;
- approved SOPs.

Review objective: demonstrate that architecture, PPE, airflow, and procedures support a coherent personnel transition without routine cross-contamination or shortcuts.

RETROSPECTIVE REVIEW

WHAT IF THE FACILITY IS ALREADY OPERATING?

Operational shortcuts are valuable diagnostic evidence. They often reveal where the original flow does not match real use.

Observe first without correcting

- where personnel actually change;
- where clean PPE is actually stored;
- where doffing actually occurs;
- which doors are routinely held open;
- where queues form;
- where used PPE accumulates;
- which items cross between zones.

Then compare with the intended flow

Identify where users have created unofficial storage, altered the sequence, bypassed an interlock, or changed the use of a room.

Treat those adaptations as diagnostic evidence of a possible discrepancy between design, procedure, training, and actual operation, rather than automatically as operator noncompliance.

> **THE REAL PERSONNEL FLOW IS THE ONE PEOPLE CAN ACTUALLY PERFORM — NOT THE ONE THAT EXISTS ONLY ON THE DRAWING.**

DOES THE ACTUAL HUMAN SEQUENCE MATCH THE INTENDED CONTAINMENT LOGIC?

Use this checklist as a diagnostic-support tool. A checked item does not constitute acceptance; each element must be interpreted against the risk basis, facility configuration, and applicable criteria.

□ Map the complete personnel journey from street clothing to work in containment and back again.

□ For each transition, define clothing status, PPE status, and the contamination assumption associated with each side of the interface.

□ Confirm that clean PPE is stored and handled where it remains protected from doffing activities and contaminated contact.

□ Verify that sufficient space, seating, storage, and body clearance exist to perform donning and doffing without improvisation.

□ Check door swings, interlocks, and simultaneous door use against the intended movement sequence.

□ Confirm that pressure relationships and transfer-air paths reinforce the operating sequence rather than substitute for it.

□ Trace waste, reusable PPE, and potentially contaminated items so their route does not conflict with clean personnel movement.

□ Review the decontamination / cleaning / charging / storage cycle for reusable respirators, PAPRs, footwear, and garments.

□ Walk the sequence with representative users and observe where contact, congestion, backtracking, or ambiguous clean / dirty states occur.

□ Confirm that emergency-evacuation arrangements preserve life safety and define how potentially contaminated personnel will be managed after evacuation.

> **Technical-use note:** This review checklist is a diagnostic-support tool. It does not establish site-specific acceptance criteria, replace risk assessment or professional judgment, constitute certification, or authorize operation or return to service.

If the review identifies a condition requiring site-specific evaluation, BioLab Solutions can support technical assessment, verification, and definition of the required evidence.

RELATED BIOLAB RESOURCES

EXPLORE TRANSITIONS, ENVELOPES, OPERATIONS, AND TRAINING IN GREATER DEPTH

NT-007–009
Penetrations, doors, and transfer interfaces

NT-010–011
Directional airflow and pressure cascades

NT-029–031
Personnel transitions and operational interfaces

NT-036
Operation as a continuous containment activity

NT-038
Training as a design dependency

NT-039
Lifecycle drift in containment systems

NT-040
Risk assessment as a design input

NT-043–044
Why cleanroom logic and metrics do not automatically transfer to biosafety containment

BIOLAB DIAGNOSTIC GUIDES

Short technical resources organized around real containment problems rather than individual disciplines.

Series concept: symptom → system → evidence → restoration.

CLOSING DIAGNOSTIC PRINCIPLE

A CHANGING SEQUENCE WORKS ONLY WHEN PEOPLE, PPE, SPACE, AND AIRFLOW ARE ALIGNED.

Personnel transitions are not solved by naming rooms “clean” and “dirty.”

The containment function emerges from the relationship between contamination assumptions, clothing and PPE status, available space, storage, doors, airflow, material routes, and the sequence personnel can realistically perform.

A good transition is legible to the user. Clean items remain protected, potentially contaminated items move toward controlled handling, the architecture supports the body mechanics of donning and doffing, and the pressure cascade reinforces rather than substitutes for the operational logic.

BIOLAB SOLUTIONS

Independent technical support for planning, design, commissioning, assessment, and lifecycle management of high-containment laboratories.

For site-specific evaluation, BioLab Solutions can support technical review, verification, and definition of evidence requirements.

ENTRY → TRANSITION → WORK ZONE → EXIT → DECONTAMINATION