

ENGINEERING THE HAND OUT OF THE HAZARD

Where Hands Enter the Task — And What Replaces Them

PSC HAND SAFETY DOCTRINE v1.0

Hand safety has improved. It has not fundamentally changed.

The direction of protection has remained constant.
The structure of the task has not.

WHAT THIS DOCUMENT COVERS

- **Protection has improved**
The hand remains inside the hazard.
- **Exposure persists**
Risk concentrates at the final control moment.
- **Risk peaks during precision work**
Not during lifting. At placement.
- **The hand is the control point**
Because no other interface has been provided.
- **The missing layer is the interface**
The engineered gap between the hand and the load.

SAFETY STILL STARTS WITH PROTECTION

In most organisations, hand safety begins at the same place: protection.
Gloves. Better gloves. Task-specific gloves. Cut-resistant. Heat-resistant.
Over time, materials improve. Standards tighten.

But the underlying assumption does not change.

The hand will be inside the hazard.

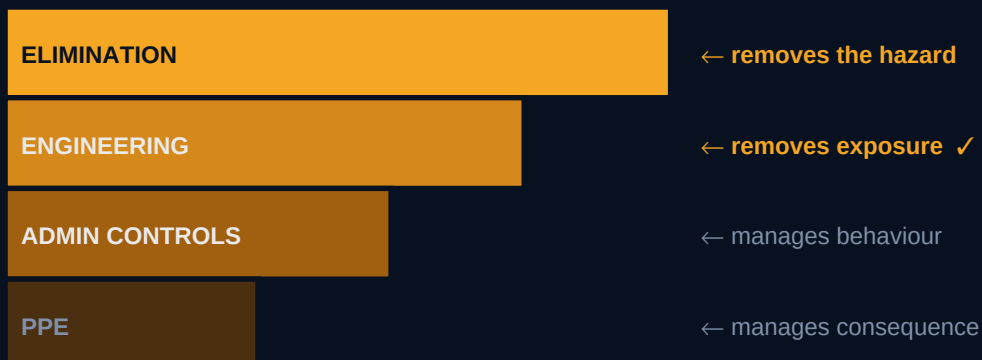
Protection does not remove exposure.
It manages the consequence of exposure.

That difference is not semantic. It is structural.

In most operations, the hand does not enter during planning.
It enters during execution — at the moment precision is required.

At that point, gloves are no longer a control.
They are the last layer before contact.

PPE IS THE LAST LAYER, NOT THE SOLUTION



Conceptual Model (Field Observed)

Most hand safety programs operate at the bottom of this hierarchy.

THE HAND DOES NOT ENTER DURING LIFTING

The common assumption: injuries occur during high-force activity.
This is also where most safety controls are concentrated.

Field observation shows a different pattern.

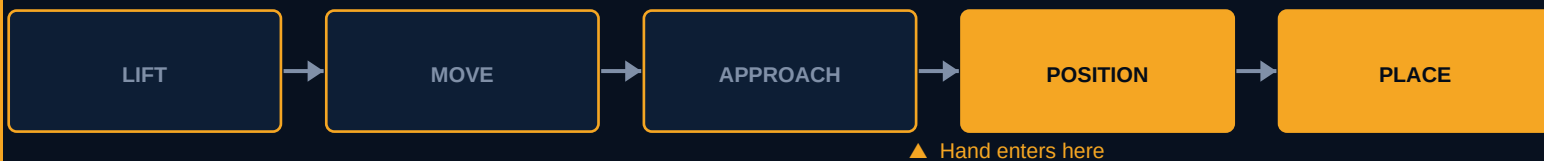
The hand does not enter during the lift.
It enters at the precision stage — alignment, positioning, placement.

These are not the heaviest moments of the task.

They are the most precise.

And precision is the condition under which
the distance between the hand and the hazard disappears.

EXPOSURE ENTERS AT THE FINAL STAGE



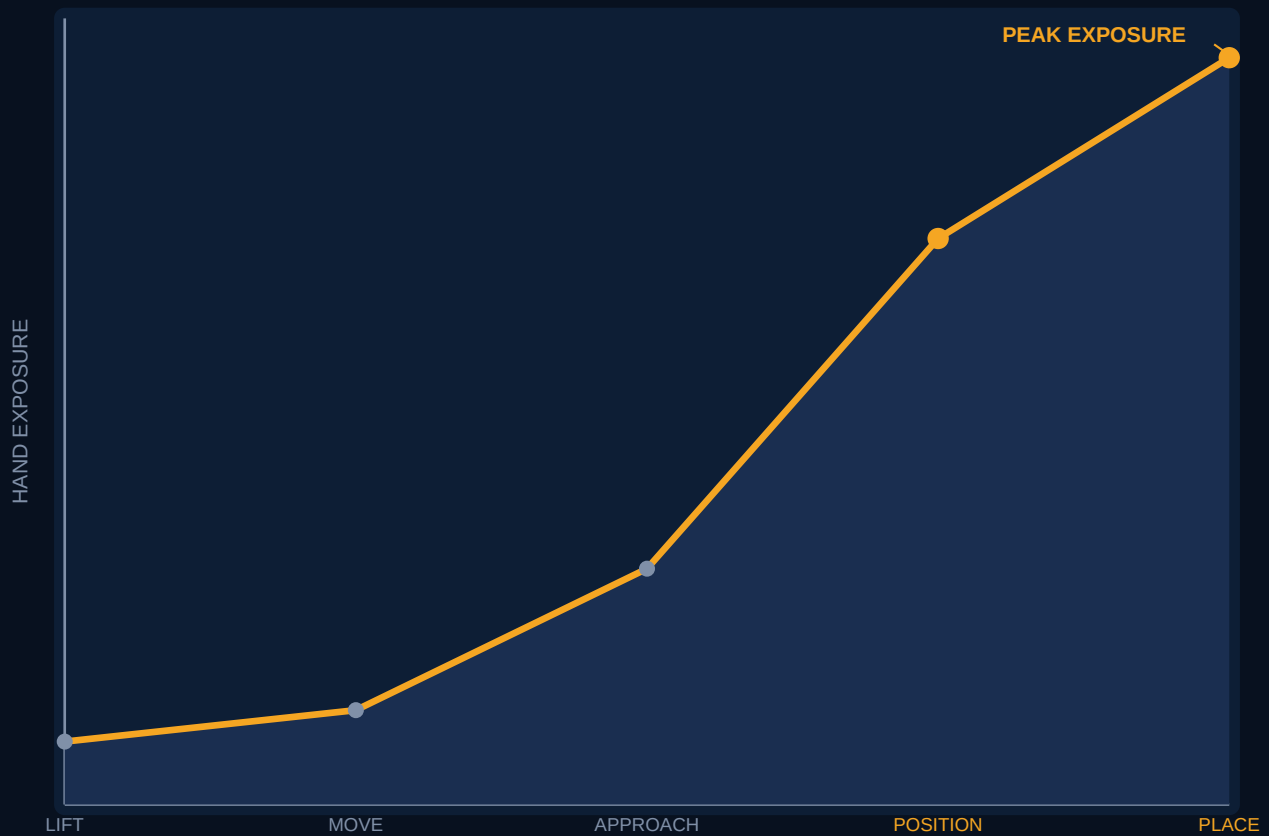
At the final two stages, three conditions converge: *Conceptual Model (Field Observed)*

- Precision is required
- Contact increases
- Variability remains

This is the moment the hand becomes the control mechanism.
Likelihood of contact increases over repeated exposure cycles.

If control requires the hand, the task has not been engineered.

EXPOSURE CURVE — WHERE RISK PEAKS



Conceptual Model (Field Observed)

Controls are concentrated where risk is lowest. The critical moment remains unaddressed.

CONTROL IS REQUIRED WHERE EXPOSURE IS HIGHEST

EARLIER STAGES

Broader movement
Wider tolerances
Indirect control possible

FINAL CONTROL MOMENT

Precise movement
Tight clearances
Direct control required

Only one mechanism is available at this stage:

The hand.

A structural condition, not a behavioural one.
The system has not provided an alternative.

WHAT WE ACTUALLY SEE ON THE SHOPFLOOR

Across operations, the pattern is consistent.
Hand contact is rarely part of the planned task.

It enters during execution.

Most often, this occurs during:

- Alignment of components before fitment
- Positioning under limited visibility or clearance
- Placement tasks where precision is required

In these moments: one hand stabilises, the other guides.
Contact is maintained until the task is set.

Where reach is required and no interface exists,
improvised extensions appear — rods, bent bars, fabricated hooks.
Not specified. Not tested. Not standardised.
But used — because the job must be done.

This is not an exception.

This is the operating reality.

"This is not written in SOPs. This is how work actually gets done."

THE HAND IS THE CONTROL INTERFACE

At the point of component alignment and final placement, the task is not complete. It still requires control.

In most task designs today, there is only one mechanism available.

The hand.

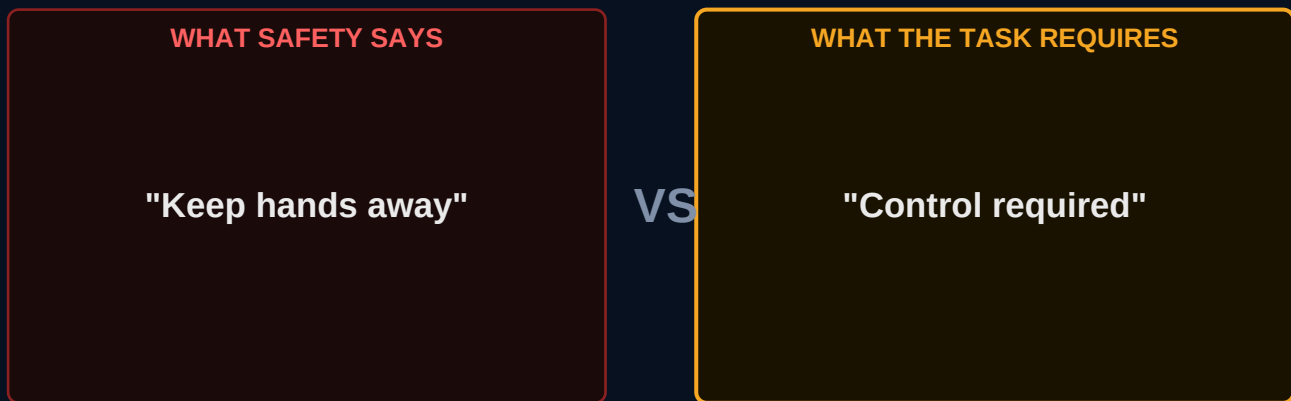
This creates a structural condition — not a behavioural one.

Once the hand becomes the control point:

- Distance is lost
- Exposure increases
- Reaction replaces anticipation

**Remove the hand without replacing the control,
and you have not solved the problem — you have lost the function.**

THE INSTRUCTION CONFLICTS WITH THE TASK



The worker is left to choose between following the rule and completing the task correctly.

In most cases, the task wins.

Not because safety is ignored.

Because the system has not provided an alternative.

Both cannot be true at the same time.

THIS IS NOT BEHAVIOUR. THIS IS DESIGN.

Training can instruct:

- Keep hands clear
- Maintain distance
- Avoid pinch points

But at the final control moment:

- Distance reduces control
- Lack of control increases error
- Error increases operational risk

So the instruction conflicts with the requirement.

The system has not provided an alternative control point.

Control is required. The hand provides it.

No other interface exists.

So the hand is used.

TASKS PERSIST BECAUSE THEY WORK

In industrial operations, change is not driven by possibility.
It is driven by necessity.

If a task produces output, meets timelines, and does not
fail consistently — it is rarely redesigned.

Three reasons tasks remain unchanged:

IT WORKS

The load is placed. The job is done.

IT IS FAMILIAR

This is how it has always been done.

IT HASN'T FAILED ENOUGH

Near misses do not trigger redesign.

RISK BECOMES PART OF THE TASK

Over time, repetition creates acceptance.

"This is how we do it"

becomes

"This is the way it must be done."

At that point, the method is no longer questioned.
Even if it involves exposure.

The hand entering the hazard is no longer seen as an exception.
It is seen as part of the task.

And because it is part of the task,
it is no longer treated as a design problem.

It becomes a behaviour problem.

So the response shifts to training and supervision,
while the task itself remains unchanged.

ASSISTANCE ≠ ELIMINATION

Most tools in use today are designed to assist the task:

- Reduce effort
- Improve grip
- Aid handling

This is useful. But it does not address the core issue.

Assisting the task is not the same as eliminating exposure.

A tool may make the task easier.

But if the hand still enters the hazard zone —

the exposure remains.

Assistance supports the existing method.
Elimination changes the method.

ASSISTANCE vs. ELIMINATION

DIMENSION	ASSISTANCE	ELIMINATION
Objective	Improve how task is done	Remove contact from task
Hand position	Remains in hazard zone	Removed from hazard zone
Exposure	Reduced but present	Eliminated
Task structure	Unchanged	Redesigned
Risk level	Managed	Removed
Long-term outcome	Plateau in improvement	Structural change

A safety tool is defined by what it removes.

Not by what it improves.
Not by what it assists.
By what it removes.

THE MODEL SHIFT

OLD MODEL



NEW MODEL



Conceptual Model (Field Observed)

Control is transferred through the interface. Not through contact.

WHAT THE INTERFACE MUST PROVIDE

REACH

The operator acts without entering the hazard zone.

CONTROL

The load is guided without direct contact.

STABILITY

Position is held without physical support from the hand.

FEEDBACK

Adjustments remain possible without proximity.

If any of these are absent, the hand returns.

THIS IS NOT A TOOL. IT IS A SYSTEM.

No task exists in isolation. A load is not only positioned — it is lifted, moved, approached, placed.

Each phase has a different control requirement.
A single tool cannot address all phases.

This is where most interventions fail: a tool is introduced and expected to resolve the entire task.

What is required instead:

MOVEMENT

→ Broad control — maintain distance

POSITIONING

→ Directional control — reduce drift

PLACEMENT

→ Precise interface — eliminate contact

Gaps in the system are filled by the hand. That is a design failure, not a human one.

WHY TOOLS ARE NOT USED

Tools are adopted only when they fit within the workflow,
do not reduce control, do not increase effort,
and do not slow the task.

If these conditions are not met, the tool is set aside.
Not rejected. Just not used.

The pattern is consistent:

- 1 Used initially
- 2 Then set aside
- 3 Task reverts to hand contact

Common reasons for non-adoption:

- Too heavy for sustained use
- Poor control at the point of placement
- Not accessible when needed

If control reduces — even slightly — the hand returns.

Adoption is driven by **fit,** not instruction.

A tool that does not fit the task will not be used.
Availability is not the same as usability.

A FULLY ENGINEERED TASK

When a task is fully engineered, four conditions are met.



No hand inside the hazard zone

The operator acts entirely from outside the point of risk.



Control achieved through interface

Guidance and adjustment occur through a designed mechanism, not contact.



Precision maintained without contact

Tolerances are met without the hand as a corrective instrument.



No reliance on reactive adjustment

The task does not depend on last-moment correction by the operator.

If any of these conditions is absent, the task requires further engineering.

START WITH THE TASK

Implementation cannot be limited to tool introduction.
It must begin with task analysis.

Three questions for every task:

WHERE does the hand enter?

Map the exact point of contact.

WHY does it enter?

Identify the function being performed.

WHAT function does it serve?

Define what the interface must replace.

Without this step, solutions are applied generically. Generic solutions do not fit specific tasks.

THE NEXT STEP IS STRUCTURAL

Hand safety has advanced significantly.
But its direction has remained largely unchanged.

The focus has been on protection, awareness, and compliance.
These have improved outcomes.
But they have not altered the structure of the task.

The hand remains the control point.
As long as that is true, risk remains part of execution.

The shift required is not incremental.

From protection	→ to removal
From behaviour	→ to design
From hand	→ to interface

Until the task is redesigned, the system will manage risk — but not remove it.

A system that requires the hand inside the hazard is not fully engineered.

**IF THE HAND IS REQUIRED
INSIDE THE HAZARD ZONE**

THE TASK IS NOT YET ENGINEERED

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