

01 The Human Hand *Is Not a Tool*™

*Industry would never describe the human hand as a piece of tooling.
Yet every day, across industrial operations, we use it as one.*

We use the hand to guide. To align. To hold.
To stabilise. To retrieve. To position.

The question is not whether the human hand can perform these functions
exceptionally well.

The question is whether it should have to perform them inside a hazard zone.

— THE ARGUMENT

How the Hand Became Industry's Default Instrument

Industrial operations are built around precision. Components must seat correctly. Loads must land in exact locations. Equipment must be aligned within tight tolerances. These demands do not diminish as a task nears completion. In many operations, they increase.

The human hand is, by any engineering standard, a remarkable instrument for meeting those demands. It is dexterous. It is adaptive. It responds to feedback in real time, adjusting grip, pressure, angle and position with a degree of sensitivity no current industrial tool fully replicates. This is not an accident. The hand evolved specifically as a precision interface between intention and environment.

Industry knows this. And so industry uses it. The hand guides the suspended load into its final position. It holds the struck tool against the pin while the hammer falls. It reaches into the restricted space to retrieve the fallen component. It corrects the misaligned flange by feel. It stabilises the rotating part while the fastener is driven home.

None of this is reckless. None of it is the result of inadequate training or careless behaviour. In most cases it is the most effective available means of completing the task to the required standard. Workers who use their hands in these ways are not making errors. They are solving engineering problems that have not been solved for them.

The hand is not the failure. The system that places it inside the hazard zone — without asking whether it needs to be there — is the failure.

PSC HAND EXPOSURE CONTROL™ · DOCTRINE 01

This paper examines what happens when that question is finally asked. Why is the hand there? What function is it performing? Could that function be performed from a position where hazardous energy cannot reach it? And if so, what does the engineering intervention look like?

These are not questions about glove selection. They are questions about task design, control hierarchy, and the appropriate boundary between human capability and engineering responsibility.

THE TAXONOMY

Eight Functions the Hand Is Asked to Perform

Across industrial sectors — oil and gas, steel, metals processing, mining, marine and offshore, heavy engineering, maintenance — the tasks that place hands in hazardous proximity to energy sources recur in recognisable patterns. The specific equipment changes. The energy sources vary. The hand function being performed is almost always one of eight.

Naming these functions precisely is not a semantic exercise. It is the first step in determining whether an engineering intervention is possible. You cannot engineer a distance between the hand and a hazard until you know what function the hand is performing and why the task currently requires it to be performed from within the hazard zone.

Function 01 Guide Directing a suspended load, component or assembly along a controlled path toward its installed position. Crane landings, structural connections, equipment installation.	Function 02 Align Orienting a component to mate with a fixed interface. Flange alignment, bolt pattern location, bearing housing, valve seat, thread engagement.
Function 03 Hold Maintaining a component, tool or assembly in position while a secondary operation is performed. Struck-tool work, fastening, welding, drilling, cutting.	Function 04 Stabilise Preventing uncontrolled movement, rotation or swing of a load, component or assembly during handling or process operations.
Function 05 Retrieve Recovering a component, tool or material from a location — a confined space, under equipment, between structures — that presents proximity hazards.	Function 06 Position Placing a component into a specific location for subsequent fixing, fastening or process engagement. Includes final corrective placement before securing.
Function 07 Push Applying force to move a load, component or equipment item away from the worker. Includes influencing the orientation or trajectory of suspended loads.	Function 08 Pull Applying force to draw a load, component or equipment item toward the worker or into a required position. Includes retrieval from inaccessible or hazardous locations.

These eight functions are not exhaustive of everything a hand does in industrial work. They are the functions that most consistently place the hand within reach of hazardous energy — suspended mass, struck-by forces, pinch points, crush zones, line-of-fire trajectories. They are the functions this doctrine addresses.

— CAPABILITY

Why Industry Defaults to the Hand — and Why That Is Rational

This doctrine does not argue that workers use their hands carelessly or that industrial operations place the hand in hazardous proximity through negligence. The premise of that argument is false, and it leads to interventions — additional training, additional warnings, additional PPE — that do not address the underlying problem.

The human hand is genuinely exceptional as a precision interface. It integrates proprioceptive, tactile and visual feedback simultaneously. It can apply variable force with fine graduations of pressure. It can correct its own position faster than any conscious decision can be made. It can operate in spaces and orientations that no current tool replicates without significant complexity. When a rigger reaches toward a load to correct its orientation in the final approach to landing, that person is deploying one of the most capable sensing and correction systems available to the operation.

Industry defaults to the hand because the hand reliably solves the problem. The consequence — that the hand is now positioned where hazardous energy can reach it — is understood as a risk to be managed rather than a design failure to be corrected. And so the management response has historically been PPE, which acts after the hand is already in the exposure zone, and training, which asks the worker to behave differently within an unchanged task structure.

Neither intervention changes the fundamental condition: the task requires the hand to be there. Until the task is redesigned — or an engineered interface is inserted between the hand and the hazard — the exposure continues.

The hand is exceptionally capable. That is precisely why industry defaults to it. The engineering failure occurs when that capability is relied upon inside a zone where hazardous energy can reach it.

— PSC HAND EXPOSURE CONTROL™ · DOCTRINE 01

Recognising this is not a criticism of workers, supervisors or safety management systems. It is a recognition that hand exposure is first an engineering problem, and that engineering problems require engineering responses. The starting question is not: how do we protect the hand? The starting question is: why is the hand required to be there?

The answer to that question determines what kind of intervention is appropriate — and at what level of the control hierarchy that intervention should operate.

— LOCATION

The Hand Performing a Function and the Hand Performing It Inside a Hazard Zone Are Not the Same Statement

This distinction is central to Hand Exposure Control™ as a discipline, and it separates the discipline from conventional hand-safety thinking.

Conventional hand safety asks: is the hand protected? It asks this question after accepting that the hand will be in the exposure zone. The glove, the guard, the warning — these are all responses to a hand that is already positioned where energy can reach it. They reduce consequence. They do not reduce exposure.

Hand Exposure Control™ asks a prior question: does the hand need to be in this zone at all? The hand may be performing its function with exceptional capability and complete procedural correctness. If the function is being performed within reach of hazardous energy, the exposure exists regardless of how correctly the function is performed.

Consider the distinction in practice. A worker guides a suspended load into a structural connection using both hands to correct the load's orientation in the final approach. The hand function — Guide — is being performed correctly, with skill and experience. The worker is not in violation of any procedure. And the hand is positioned between a moving mass and a fixed structure, in a zone where the load's movement is still variable and the consequences of contact are severe.

The question Hand Exposure Control™ asks of this scenario is not: does the worker have the right gloves? It is: can the guidance function be transferred to an interface that operates from outside the contact zone? If so, the hand is no longer in the hazard zone during final approach. The function is still performed. The exposure is eliminated or substantially reduced.

The relevant question is not whether the hand is capable of performing the function. It is whether the function requires the hand to be positioned where hazardous energy can reach it.

— PSC HAND EXPOSURE CONTROL™ · DOCTRINE 01

This reframing changes the nature of the assessment. It also changes the nature of the solution set. Once the function is named — Guide, Hold, Align, Stabilise, Retrieve, Position, Push, Pull — the engineering question becomes tractable: what interface can perform this function from a position that the hazard cannot reach?

That question does not always have an answer. There are tasks where current technology does not provide a suitable remote interface, where load geometry precludes the use of available tools, or where the forces involved exceed what any available interface can safely manage. Hand Exposure Control™ acknowledges this explicitly. The discipline's value is not in claiming a universal solution. It is in ensuring the question is asked before the hand enters the zone.

PSC HAND EXPOSURE CONTROL™ · DOCTRINE SERIES

The Human Hand *Is Not a Tool*™

DOCTRINE 01 · FIRST EDITION · 2026

Where an industrial task relies on the human hand to guide, hold, align, stabilise, retrieve, position, push or pull within a zone where hazardous energy can reach it, the hand is performing a function that **should first be examined for engineering intervention.**

Do not begin by asking *how to protect the hand.*

Begin by asking *why the hand must be there.*

— THE ENGINEERING RESPONSE

From a Named Function to a Tractable Engineering Problem

Once the function the hand is performing has been named, the nature of the engineering problem changes. The question is no longer open-ended — how do we make this situation safer? — but specific: what interface can perform this named function from a position outside the hazard zone?

That specificity matters. Vague hazard assessments produce vague interventions. An assessment that records "hand injury risk during load landing" produces recommendations in the same register: additional training, additional supervision, appropriate PPE. An assessment that records "hand functioning as Guide and Stabilise during final load approach, exposure zone extends to approximately 300–400 mm around load perimeter, hazardous energy is suspended mass and load movement variability" produces a different question entirely: what remote interface can guide and stabilise this load geometry from outside that zone?

The engineering response follows the function, not the hazard in the abstract. Different functions require different interface geometries. A function classified as Guide requires an interface that can influence load trajectory. A function classified as Hold requires an interface that maintains position under applied force. A function classified as Retrieve requires an interface that can access a confined or obstructed location. Designing without first naming the function produces tools that may not address the actual exposure.

ENGINEERING PRINCIPLE · HAND EXPOSURE CONTROL™

Name the function.

Identify the energy.

Determine whether the function can be performed from outside the zone where that energy can reach the hand.

If yes — engineer the distance.

If no — document why, and apply the highest available control.

This sequence does not guarantee that every hand-exposure scenario has an engineering solution. It guarantees that the engineering question is asked before the hand enters the zone. That is the discipline.

It also produces a more useful negative finding. When an assessment concludes that no suitable engineering intervention exists for a particular task and exposure, that conclusion is based on a specific understanding of the function being performed, the energy involved, the geometry of the load, and the available interface options. That is a substantively different conclusion from one that simply records: "no practical alternative to manual handling identified." The former produces a documented technical rationale. The latter produces a gap.

Over time, the accumulation of documented assessments — including the negative findings — identifies where engineering solutions are most needed and most commercially valuable to develop. The methodology produces not just safer operations today, but a pipeline for engineering development in the future.

THE METHOD APPLIED

Four Illustrations of the Assessment Sequence

The following cases illustrate how naming the hand function changes the engineering question. No sector, client or specific equipment is identified. The pattern across all four cases is the point: once the function is named and the energy is identified, the question of whether the hand needs to be in the zone becomes precise rather than general.

Illustration 01

SUSPENDED LOAD · FINAL POSITIONING

HAND FUNCTION	GUIDE + STABILISE
HAZARDOUS ENERGY	Suspended mass · load movement variability · pinch between load and fixed structure
WHY HAND ENTERS	Lifting system insufficient for precision of final positional correction
ENGINEERING QUESTION	Can guidance and stabilisation be performed from outside the load contact zone?
CONTROL PRINCIPLE	REMOTE INTERFACE · ENGINEERED DISTANCE

Illustration 02

STRUCK-TOOL WORK · MANUAL OPERATIONS

HAND FUNCTION	HOLD
HAZARDOUS ENERGY	Struck-by force from hammer · glancing strike · tool slip
WHY HAND ENTERS	Tool must be held in precise alignment against workpiece during repeated impact
ENGINEERING QUESTION	Can the holding function be transferred to an interface that removes the hand from the line of strike?
CONTROL PRINCIPLE	HOLDING INTERFACE · LINE-OF-FIRE REMOVAL

Illustration 03

FERROUS COMPONENT · ALIGNMENT AND SEATING

HAND FUNCTION	ALIGN + POSITION
HAZARDOUS ENERGY	Pinch between component and mating surface · component weight · drop energy
WHY HAND ENTERS	Component geometry requires precise orientation to mating interface before fixing
ENGINEERING QUESTION	Where the component is ferromagnetic, can alignment be achieved through magnetic interface rather than direct manual contact?
CONTROL PRINCIPLE	MAGNETIC INTERFACE · CONTACT ELIMINATION

Illustration 04

TUBULAR OR CYLINDRICAL COMPONENT · HANDLING

HAND FUNCTION	GUIDE + POSITION + STABILISE
HAZARDOUS ENERGY	Rolling and rotational movement · pinch between cylinder and fixed surface · component weight
WHY HAND ENTERS	Cylindrical geometry creates rotation under handling; hand used to control orientation during positioning
ENGINEERING QUESTION	Can a dedicated cylindrical-geometry interface control orientation and guide the component without direct hand contact?
CONTROL PRINCIPLE	GEOMETRY-MATCHED INTERFACE · ROTATIONAL CONTROL

The structure is consistent across all four: name the function, identify the energy, understand why the hand enters the zone, ask the engineering question, state the control principle. The answer is not always a PSC or HSF product. The question is always the same.

THE HIERARCHY IMPLICATION

Where Hand Exposure Control™ Sits Within Established Safety Frameworks

The hierarchy of controls is the established framework within which industrial safety interventions are evaluated. Its logic is widely accepted: interventions that eliminate or reduce the hazard at source are preferred over interventions that protect against it after exposure. PPE sits at the base of the hierarchy for a reason — it acts after higher-order opportunities to eliminate, substitute or engineer out the exposure have been considered.

Hand Exposure Control™ does not replace this framework. It operates within it, at a level the framework already specifies but that conventional hand-safety practice frequently fails to reach. When the hierarchy identifies Engineering Controls as the preferred intervention ahead of Administrative Controls and PPE, it is precisely the question this doctrine asks: can the task be redesigned, or an engineering interface inserted, so that the hand is no longer required to enter the hazard zone?

Preferred	ELIMINATION <i>Remove the hazard</i>	The task or process is redesigned so that the hazardous energy source is removed entirely. The hand exposure does not occur because the hazard no longer exists in the operation.
	SUBSTITUTION <i>Replace the hazard</i>	A less hazardous process or material replaces the original. The energy source or its magnitude is reduced so that hand exposure consequences are substantially reduced.
	ENGINEERING CONTROLS <i>Isolate from hazard</i>	The task structure is changed or an engineered interface is inserted so that the hand performs its function from outside the zone where the hazardous energy can reach it. This is the primary level at which Hand Exposure Control™ operates. ← HAND EXPOSURE CONTROL™ OPERATES HERE
	ADMINISTRATIVE CONTROLS <i>Change behaviour</i>	Procedures, permits, supervision, training and work sequencing reduce the probability of exposure events. The hand may still enter the hazard zone; controls aim to reduce the frequency or duration of that exposure.
Least Resort	PPE <i>Protect against hazard</i>	Personal protective equipment reduces the severity of injury when exposure contact occurs. The hand is in the hazard zone. PPE does not prevent that exposure — it mitigates its consequences. It is the last layer of protection, not the first line of defence.

The practical observation that drives this doctrine is that hand-safety practice in many industrial operations begins at Administrative Controls and PPE and does not consistently reach Engineering Controls. The result is that a well-established preference in the hierarchy of controls — engineering over administration over protection — is routinely inverted for hand exposure specifically, even when engineering options exist.

Hand Exposure Control™ asks that the hierarchy be applied in the order it specifies.

— WHAT CHANGES

When the Question Shifts from Protection to Exposure

The practical consequences of adopting Hand Exposure Control™ as an operational discipline are not confined to individual task assessments. The change in question — from how do we protect the hand? to why is the hand required to be there? — propagates through the organisation at multiple levels.

At the assessment level, the starting point of a hand-safety review changes. The assessor is no longer looking for PPE gaps or procedural shortfalls within an accepted task structure. The assessor is examining the task structure itself: where does the hand enter? what is it doing? could that function be performed from outside the zone? This produces different findings and different recommendations from the same operation.

At the procurement level, the question changes from which gloves are appropriate for this task? to what engineering interface, if any, could remove the hand from this exposure scenario? The procurement conversation moves earlier in the risk management process, and it addresses a different level of the control hierarchy.

At the incident investigation level, the findings change. An investigation conducted through the lens of Hand Exposure Control™ does not stop at the immediate cause — the hand was in contact with the energy source when the energy moved. It identifies the function the hand was performing, why the task placed the hand in that position, whether an engineering intervention existed that could have repositioned the hand, and why that intervention was not in place. This produces systemic findings rather than behavioural ones.

At the leadership level, the conversation changes most fundamentally. The question hand safety most often presents to senior leadership is about compliance and incident rates. Hand Exposure Control™ presents a different question: where, in this operation, are we routinely using human hands to perform functions that engineering should be performing? That question does not require an incident to motivate it. It is a design question, and it belongs in the same conversation as process engineering, equipment procurement and plant layout.

An organisation that asks where its workers' hands are going — before anyone is hurt — has adopted a fundamentally different relationship with hand risk than one that asks what caused the injury after the fact.

— PSC HAND EXPOSURE CONTROL™ · DOCTRINE 01

This is not a theoretical distinction. It determines whether hand-safety investment is reactive or proactive, whether it addresses consequence or exposure, and whether it produces lasting reduction in hand risk or a continuing cycle of incident, investigation and revised procedure.

THE DISCIPLINE

PSC Hand Exposure Control™

Hand Exposure Control™ is the intellectual framework within which PSC organises its approach to industrial hand safety. It holds that hand exposure is first an engineering problem, that the appropriate level of intervention in the hierarchy of controls is engineering before administration and protection, and that the starting question for any hand-safety assessment is not how to protect the hand but why the hand must be positioned where hazardous energy can reach it.

The framework rests on five connected elements, each of which has been developed through field application across industrial sectors over seventeen years.

FIVE ELEMENTS · PSC HAND EXPOSURE CONTROL™

Find The Hand™ → Where is the hand?

Eight Hand Functions → What is it doing?

The Last 300 mm Rule™ → When does exposure become particularly significant?

Engineered Distance → Can the function move outside the hazard zone?

Application Knowledge → Which intervention belongs there — and which does not?

PUBLICATION REGISTER

FOUNDATION	17 Years of Hand Safety Engineering <i>The field-experience and intellectual history behind PSC Hand Exposure Control™. From impact protection in 2009 to a systematic engineering methodology in 2026.</i>	PUBLISHED
DOCTRINE 01	The Human Hand Is Not a Tool™ <i>The foundational principle: where a task uses the hand as a clamp, guide, alignment device, stabiliser or positioning tool inside a hazard zone, that function should first be examined for engineering intervention.</i>	THIS DOCUMENT
METHOD 01	The Hand Exposure Audit™ <i>A formal field assessment methodology: Find the hand → Classify the function → Identify the energy → Measure the exposure → Engineer the distance → Verify. A structured system for discovering where hands are going before an incident requires it.</i>	FORTHCOMING
DOCTRINE 02	The Last 300 mm Rule™ <i>A dedicated technical doctrine on the final approach and positioning phase — why precision demands increase hand exposure, and what intervention types belong in that zone.</i>	FORTHCOMING
DOCTRINE 03	The Hand Exposure Hierarchy™ <i>A technical paper mapping the full progression from PPE through administrative controls to engineered distance and exposure elimination — and where each intervention type belongs.</i>	FORTHCOMING

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