

03 The Hand Exposure *Hierarchy*™

The hierarchy of controls is not new. How it applies specifically to hand exposure is less consistently understood.

For hand safety, the hierarchy is well understood.

The difficulty is reaching its higher-order controls consistently.

Gloves, procedures and training are readily identifiable controls.

Engineering opportunities are harder to identify — because they require a different question:

What is the hand doing there? And can that function be performed differently?

— THE HIERARCHY

A Well-Understood Framework. A Specific Gap in Its Application to Hands.

The hierarchy of controls is the foundational framework of industrial safety intervention. Its ordering principle is well established and widely accepted: eliminate the hazard at source before attempting to substitute it; engineer out the exposure before attempting to administrate around it; administrate before relying on personal protection. Each level of the hierarchy is preferred over those below it, because each higher level acts earlier in the chain of events that leads to injury.

For hand safety, the hierarchy is well understood. The difficulty is reaching its higher-order controls consistently.

The reason is diagnostic. Engineering controls are the stated preference ahead of administrative controls and PPE. But identifying an engineering opportunity for hand exposure requires a specific question to be asked first: what function is the hand performing, and can that function be performed from a position where the hazardous energy cannot reach it? Without that question, the engineering level of the hierarchy is not accessible — not because engineering solutions do not exist, but because the exposure has not been described with sufficient precision to generate an engineering response.

Gloves, procedures, training and supervision are readily identifiable responses to a hand-safety observation. They do not require detailed analysis of the hand's function or the task structure. They can be applied to a general description of hand exposure — "worker's hands near suspended load" — without needing to understand what the hands are specifically doing, why they are there, or whether the task could be restructured to remove them from the exposure zone.

An engineering response requires more. It requires knowing the function. It requires understanding the geometry. It requires asking whether the function can move. Without Find The Hand™, without the eight-function taxonomy, without the Hand Exposure Audit™, the engineering question cannot be reliably formulated — because the information it requires is not collected.

Engineering controls are not consistently reached for hand exposure because the diagnostic question that surfaces engineering opportunities is not consistently asked.

— PSC HAND EXPOSURE CONTROL™ · DOCTRINE 03

This doctrine examines each level of the hierarchy as it applies specifically to hand exposure — what each level means in practice, what it can achieve, what it cannot achieve, and where Hand Exposure Control™ as a discipline is positioned within it.

— HIERARCHY LEVEL 01 • MOST PREFERRED

01 PREFERRED	ELIMINATION Remove the need for hand entry entirely	HEC RESPONSE REMOVE THE HAND-ENTRY EVENT FROM THE TASK
Elimination, applied to hand exposure, means redesigning the task so that the hand-entry event does not occur. The hazardous energy source is not managed, controlled or protected against — the hand no longer enters its proximity because the task no longer requires it to. Elimination is the most powerful level of control because it removes the exposure entirely rather than managing it. It is also the level most dependent on upstream design authority — the ability to change not just how a task is performed but whether it needs to be performed in its current form at all. In practice, elimination of hand exposure takes several forms. A process change that eliminates a manual handling step removes the associated hand-entry events entirely. Automation of a task phase that previously required manual contact eliminates the exposure for that phase. Pre-assembly of components that would otherwise require manual alignment during installation can eliminate the final-approach exposure entirely by reducing the installation task to a single mechanical connection rather than a multi-step manual procedure. Elimination is less commonly achievable than the other levels of the hierarchy, not because the principle is inapplicable but because it requires design intervention at a stage — process design, equipment specification, plant layout — that safety teams rarely have authority over in operational environments. It is most accessible during the design phase of a new process or facility, and least accessible as a retrofit to an existing operation. The Hand Exposure Audit™ identifies hand-entry events and the functions the hand performs. Where those functions could be eliminated by process or task redesign — rather than merely relocated to a remote interface — that finding should be escalated as an elimination opportunity, not defaulted to engineering control.		

— HIERARCHY LEVEL 02

02

SUBSTITUTION

Change the task, process, sequence or energy source

HEC RESPONSE

**CHANGE WHAT THE HAND IS
ASKED TO INTERACT WITH**

Substitution, at the hand-exposure level, means changing the task, the process, the work sequence or the energy source so that the nature or magnitude of the hazard the hand encounters is substantially reduced — even where the hand still enters the task.

Substitution is distinct from elimination in that the task continues in some form, but its fundamental character changes. Where elimination removes the hand-entry event, substitution changes what the hand enters proximity to. The hand may still perform a function; what has changed is the energy environment in which it does so.

Examples of substitution for hand exposure include: changing the sequence of a task so that a component is secured before its full suspended mass is transferred, reducing the energy present during the hand-entry phase; substituting a lighter component or assembly for a heavier one to reduce the energy present at the installation point; pre-positioning an alignment feature — a pin, a guide, a locating bracket — so that the hand-entry function changes from Align under load to a lighter task performed before the load is present; or breaking a single large lift into staged sub-assemblies that individually present lower energies during the final approach.

Work sequencing is one of the most underused forms of substitution for hand exposure. The question — if the sequence of this task were changed, would the hand encounter less energy when it enters the exposure zone? — does not require new equipment or new procedures. It requires analysis of the task's phase structure and the energy present at each phase, which is precisely the information the Hand Exposure Audit™ is designed to produce.

Substitution does not remove the hand from the exposure zone. It changes what is in that zone when the hand enters it. Where substitution substantially reduces the energy present during the hand-entry phase, it may enable higher-level administrative controls or appropriate PPE to provide adequate residual protection — controls that would have been insufficient against the original energy level.

03

ENGINEERING CONTROLS

Move the function outside the exposure zone

HEC RESPONSE

SEPARATE THE FUNCTION FROM THE HAND'S POSITION IN THE HAZARD ZONE

Engineering control, applied to hand exposure, is achieved when the function the hand was performing inside the hazard zone is transferred to an interface that operates from a position where the hazardous energy cannot reach the worker's hand. The hand still controls the task. The hand is no longer at the point of contact with the hazard.

This is the level at which Hand Exposure Control™ primarily operates. It is also the level the hierarchy specifies as preferred over the two levels below it — administrative controls and PPE. The gap between the hierarchy's preference and common hand-safety practice is therefore most visible here: engineering controls for hand exposure exist and are deployable across a wide range of industrial tasks, but they are not reached consistently because the diagnostic question that would identify them — what function is the hand performing, and can that function be performed from outside the exposure zone? — is not systematically asked.

Engineering control begins when the function is separated from the hand. This principle connects PSC Doctrine 01, Method 01 and Doctrine 02. Doctrine 01 establishes that the hand should not be the default precision interface inside a hazard zone. Method 01 provides the systematic method for identifying what function the hand is performing and what energy it is exposed to. Doctrine 02 identifies one recurring phase — the final approach — where the separation between function and hand position most critically fails. Doctrine 03 places all three within the hierarchy: they are the diagnostic and engineering apparatus for reaching Level 03 consistently.

Engineering controls for hand exposure include rigid remote interfaces, push/pull tools, alignment jigs and pins, guide channels and locating surfaces, magnetic interfaces for ferrous components, lift-assist and handling attachments, and task sequencing changes that reorder the point at which the hand enters proximity to energy. What all of these share is that they transfer a named hand function — Guide, Align, Hold, Stabilise, Retrieve, Position, Push, Pull — to an operating position that is physically separated from the zone where the energy can reach the hand.

Engineering control does not require that a PSC tool or a commercially available interface exists for every scenario. It requires that the engineering question is asked — and that the answer, whether it is a commercial tool, a site-fabricated fixture, a task redesign, or a documented finding that no suitable engineering intervention currently exists — is recorded and acted upon.

The Hand Exposure *Hierarchy*™

DOCTRINE 03 · FIRST EDITION · 2026

Can the hand-entry event be eliminated? *Redesign the task so the hand does not need to enter the exposure zone.*

Can the hazard or task be changed? *Reduce the energy present, or change the sequence so the hand encounters less when it does enter.*

Can the function be engineered outside the exposure zone? *Provide an interface. Separate the function from the hand's position in the hazard.*

Can the remaining exposure be administratively reduced? *Change frequency, duration, access or conditions — not documentation alone.*

What protection is required for the exposure that remains? *PPE is the last layer, not the first response.*

Do not begin with the hand.

Begin with the exposure.

— HIERARCHY LEVEL 04

04

ADMINISTRATIVE CONTROLS

Reduce frequency, duration, access or conditions

HEC RESPONSE

**CHANGE HOW THE EXPOSURE
OCCURS — NOT ONLY HOW IT IS
RECORDED**

Administrative controls, at Level 04 of the hierarchy, act on how an exposure occurs rather than on the exposure source itself. They do not remove the hand from the hazard zone. They do not change the energy present when the hand enters. They change the conditions under which the exposure takes place — its frequency, its duration, the access arrangements that determine who enters and when, and the work sequence that determines how many times the hand-entry event occurs in a given operation.

Effective administrative controls for hand exposure include: restricting access to a work zone to the minimum number of personnel required, reducing the frequency of the exposure event; changing the work sequence to reduce how many times a hand enters proximity to a given energy source per shift; establishing minimum-distance protocols during mechanically assisted handling that keep workers back during broad movement phases; and permit-to-work systems that ensure energy isolation is verified before maintenance tasks that require hand contact.

An administrative control should change how exposure occurs — its frequency, duration, access, sequence or conditions. Documentation alone does not change exposure.

This distinction is important in practice. A safe work procedure that accurately describes a task in which the hand enters a crush zone does not reduce the frequency, duration or severity of that entry. The procedure documents the exposure; it does not control it. A procedure that changes the task sequence so that the hand enters the zone fewer times, or for a shorter duration, or under conditions of reduced energy, is an administrative control in the sense the hierarchy intends. The distinction is not semantic — it determines whether the control actually changes the exposure.

Administrative controls are legitimate and valuable at Level 04. The discipline is applying them to the actual exposure characteristics identified in Step 04 of the Hand Exposure Audit™ — proximity, duration, frequency, variability — rather than to a general description of the task. An administrative control that reduces duration from three minutes to forty-five seconds per cycle, confirmed by observation, has demonstrably changed the exposure. One that changes a procedure document without changing the task has not.

— HIERARCHY LEVEL 05 • FINAL LAYER

05

FINAL
LAYER

PERSONAL PROTECTIVE EQUIPMENT

Protect against the exposure that remains

HEC RESPONSE

THE LAST LAYER, NOT THE
FIRST RESPONSE

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. It does not remove the hand from the hazard zone. It does not change the energy present. It does not reduce the frequency or duration of the exposure. It reduces the consequence of contact — the severity of an injury if exposure contact occurs — by placing a protective layer between the hand and the energy source at the moment of contact.

This is a genuinely valuable function. For the exposure that remains after all practicable higher-order controls have been applied, appropriate PPE is the right response and the correct final layer of the control sequence. Impact-protection gloves, cut-resistant gloves, heat-resistant gloves — each addresses a specific energy type and provides meaningful protection against contact with that energy. Selecting the right PPE for the residual exposure profile is a legitimate and important technical exercise.

The structural problem with hand-safety practice is not that PPE is used. It is that PPE is frequently used as the primary response — the first control selected — rather than as the last. When a hand-exposure scenario is assessed and the response is "appropriate gloves required," without prior analysis of whether the hand needed to be in the zone at all, the hierarchy has been applied in reverse order. The hand is exposed, the energy is present, and PPE is the only layer of protection between the two.

PPE acts at the moment of contact. Every control above it in the hierarchy acts before contact. The further up the hierarchy the intervention sits, the earlier it acts in the chain of events that leads to injury, and the more completely it interrupts that chain. Starting the hand-safety response at PPE means starting at the last possible moment before injury occurs — and accepting that every step in the chain from exposure to contact has been left unchanged.

Hand Exposure Control™ does not argue against PPE. It argues for starting the response at the highest practicable level of the hierarchy — and ensuring that PPE is selected for the residual exposure that remains after higher-order controls have been applied, rather than for the full original exposure because no higher-order controls were attempted.

— THE GAP

Why the Hierarchy Is Not Consistently Reached for Hand Exposure

The five levels of the hierarchy are not equally accessible in practice. For most industrial hazard categories, the assessment process surfaces opportunities at each level and applies them in order. For hand exposure specifically, the assessment process most frequently surfaces administrative and PPE controls — not because engineering opportunities do not exist, but because the standard hand-safety assessment does not collect the information those engineering opportunities require.

WHAT STANDARD HAND-SAFETY ASSESSMENT TYPICALLY PRODUCES

LEVEL 04 — ADMINISTRATIVE

Safe work procedure for the task. Permit-to-work requirements. Supervision requirements. Training requirements.

LEVEL 05 — PPE

Glove selection for the task. Impact protection, cut resistance, chemical resistance as appropriate to the general task environment.

WHAT HAND EXPOSURE CONTROL™ ADDITIONALLY PRODUCES

LEVEL 01-02 — ELIMINATE / SUBSTITUTE

Identification of tasks where the hand-entry event could be removed or the energy substantially reduced through task or process redesign.

LEVEL 03 — ENGINEERING

Specific engineering questions: what function is the hand performing, and what interface could perform that function from outside the exposure zone?

LEVEL 04 — ADMINISTRATIVE (IMPROVED)

Controls applied to the specific exposure characteristics — proximity, duration, frequency — rather than to a general task description.

LEVEL 05 — PPE (RESIDUAL)

Protection selected for the residual exposure that remains after higher-order controls have been applied.

The difference is diagnostic. A standard assessment can identify that a hand is near a suspended load. It cannot, from that description alone, formulate an engineering question — because it does not know what the hand is doing there, which of the eight functions it is performing, or whether that function has a geometric and mechanical solution. The Hand Exposure Audit™ collects that information. Once collected, the engineering level of the hierarchy becomes accessible in a way it was not before.

This is not a criticism of existing safety management systems or the professionals who operate them. It is a recognition that the diagnostic tools for reaching the engineering level of the hierarchy for hand exposure have not, until now, been systematically available.

THE CORRECTION

How Hand Exposure Control™ Reaches the Higher Levels of the Hierarchy

The six steps of the Hand Exposure Audit™ are not arbitrary. Each step is designed to collect the information required to reach a specific level of the hierarchy. The method works through the hierarchy from the top, not from the bottom — it asks the elimination question before the engineering question, and the engineering question before the administrative and PPE questions.

STEP 01 FIND	HIERARCHY: LEVELS 01-03 Identify whether the hand-entry event is necessary at all. Observing where and why the hand enters the task is the prerequisite for both elimination and engineering assessment. A hand-entry event that occurs because the task structure requires it may be eliminable through task redesign — but only if it has first been identified precisely.
STEP 02 CLASSIFY	HIERARCHY: LEVEL 03 — ENGINEERING Name the function. Make the engineering question formable. The function classification — Guide, Align, Hold, Stabilise, Retrieve, Position, Push, Pull — converts a general observation into a specific engineering problem. Without the function name, no engineering question can be formulated. With it, the question becomes tractable: what interface can perform this function from outside the exposure zone?
STEP 03 ENERGY	HIERARCHY: LEVELS 02-03 — SUBSTITUTION, ENGINEERING Identify what the engineering response must address. Energy identification enables substitution assessment — can the energy be reduced before the hand enters? — and specifies the engineering requirement: the interface must not only perform the function, it must perform it in the presence of the identified energy, and from a position that energy cannot reach.
STEP 04 MEASURE	HIERARCHY: LEVEL 04 — ADMINISTRATIVE Provide the factual basis for effective administrative controls. Proximity, duration, frequency and variability — the observable characteristics of the exposure — determine which administrative controls will change the exposure rather than merely document it. A control applied to the wrong dimension of exposure does not reduce risk; it adds process.
STEP 05 ENGINEER	HIERARCHY: LEVEL 03 — ENGINEERING Answer the engineering question. Document the result. The decision logic of Step 05 works through whether an interface class exists, whether it is applicable to this geometry, and if not, why not. Documented negative findings are as important as positive ones: they identify where engineering development is needed, and they ensure that the engineering level of the hierarchy was genuinely reached rather than bypassed.
STEP 06 VERIFY	HIERARCHY: ALL LEVELS — CONFIRM THE CONTROL ACHIEVED ITS LEVEL Confirm that the control has done what its level of the hierarchy requires. An engineering control that does not move the hand outside the exposure zone has not achieved Level 03 — it has added equipment to an unchanged exposure. Verification by observation, not by report, is the only way to confirm which level of the hierarchy has actually been reached.

HAND EXPOSURE CONTROL™ · THE FRAMEWORK

The hierarchy of controls, applied to hand exposure — and the PSC method for reaching each level.

HIERARCHY LEVEL	HAND EXPOSURE CONTROL™ RESPONSE
01ELIMINATE	Remove the need for hand entry. Redesign the task so the hand-entry event does not occur.
02SUBSTITUTE	Change the task, process, sequence or energy source so the hand encounters less when it does enter.
03ENGINEER	Move the function outside the exposure zone. Separate what the hand is doing from where the energy can reach it. This is the primary operating level of Hand Exposure Control™.
04ADMINISTRATE	Reduce frequency, duration, access or conditions of the remaining exposure. Change how exposure occurs — not only how it is recorded.
05PROTECT	Protect against the exposure that remains after all higher-order controls have been applied. The last layer, not the first response.

THE PSC METHOD

FIND	CLASSIFY	ENERGY	MEASURE	ENGINEER	VERIFY
Where does the hand enter? What prompts it?	Which of the eight functions is the hand performing?	What hazardous energy can reach it?	Proximity · Duration · Frequency · Variability · Consequence	Can the function move outside the zone? What interface?	Has the hand actually moved? Any new exposures?

SUPPORTING PRINCIPLES

The Human Hand Is Not a Tool™	The Last 300 mm Rule™	Find The Hand™	Eight Hand Functions
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PSC HAND EXPOSURE CONTROL™ · DOCTRINE SERIES

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FOUNDATION	17 Years of Hand Safety Engineering
DOCTRINE 01	The Human Hand Is Not a Tool™
METHOD 01	The Hand Exposure Audit™
DOCTRINE 02	The Last 300 mm Rule™
DOCTRINE 03	The Hand Exposure Hierarchy™ — This Document