

PSC HAND SAFETY · FIELD EDITION

Engineer the Hand Out of the Hazard™

The PSC Guide to Industrial Hand Exposure

FIELD EDITION

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This guide provides a practical engineering framework for recognising and reducing industrial hand exposure. It does not teach readers to select, design or specify engineering controls. That expertise remains application-specific and is addressed through task mapping.

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A note before you begin

I have spent a large part of my working life watching other people work.

Plant visits, application reviews, videos sent by customers, walkthroughs with EHS teams — over the decades, the settings have changed constantly. Steel plants, rig floors, foundries, port decks, extrusion lines, turbine halls. What has not changed is what I keep seeing.

A load arrives at its destination, and a hand reaches in to finish the job. A procedure prohibits contact, and a worker touches the load anyway — not carelessly, but because the alignment has to happen and nothing else on site can do it. A tool bought after the last incident hangs clean and unused, several minutes' walk from the task. A pinch point that every operator can describe precisely is entered, again, on every shift.

For years I asked the question most of us are trained to ask: why did the worker do that? It took me a long time to notice that the question had never once produced a lasting answer. The worker was experienced. The worker was trained. The worker was wearing the correct glove. And the same hand kept appearing in the same place.

FROM THE DIRECTOR · CONTINUED

The better question, when it finally arrived, was simpler. Why did the task require the hand to be there at all?

This book is my attempt to teach that question — the way of looking that sits behind it, the patterns it reveals, and what industrial teams can do once they start seeing their own work through it. It is not a catalogue and it is not an engineering manual. It is what decades of standing in plants have taught me to notice, written down for the engineers, safety leaders and supervisors who stand in them every day.

If it helps your team redesign one task before a hand enters the hazard, it has done its work.

Satish Agrawal

Director, PSC Hand Safety India Pvt. Ltd.

What this guide is · what it is not

This is a field guide to industrial hand exposure — how it is created, where it hides, and how experienced engineers learn to see it. It is written for EHS managers, plant heads, lifting and rigging supervisors, maintenance teams and procurement teams who need to know whether equipment will actually reduce exposure.

This guide is built around one central idea: most hand injuries are not behaviour problems. They are design problems. A task that requires a hand to guide, steady, push, retrieve or seat a load will keep producing hand exposure no matter how careful, trained or well-equipped the worker is. The exposure is built into the method — and what is built in can be engineered out. You will finish this book seeing tasks differently. That is its entire objective.

It is not a glove guide.

Gloves matter and are taken seriously here. But a glove does not change where the worker is standing — and where the worker is standing is the whole subject.

What this guide is · what it is not

It is not a product catalogue.

You will not find models, sizes or specifications here. Tool families appear only as categories of engineering control, because which tool fits which task can only be answered by studying the task.

It is not an engineering manual.

This guide does not teach readers to select, design or specify engineering controls. Choosing the correct control depends on geometry, reach, surface condition, access, worker position and operational constraints — variables evaluated task by task.

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PART ONE

Rethinking Hand Safety

For decades, industrial hand safety has meant better gloves, better training, better behaviour. All of it matters. None of it answers the deeper question: why was the hand near the hazard in the first place? This part is about learning to ask that question — and about why it changes everything that follows.

Why Hand Injuries Still Happen

Walk through any well-run industrial plant and you will see the evidence of a serious hand safety effort. Cut-rated gloves matched to the job. Signage at the pinch points. Toolbox talks that mention hand placement. Audits, campaigns, glove matrices. By every visible measure, the programme is working.

And yet the hands keep getting hurt. Not usually in dramatic failures — in small moments. A plate shifts while being steadied. A load settles while fingers are on its edge. A struck tool slips. A rope is retrieved from under a suspended load because that is where the rope fell.

The reason is not that the programme is careless. The reason is where the hand sits in industrial work.

The hand is the part of the worker closest to the work itself — closest to the load being guided, the pipe being aligned, the punch being held, the tagline being retrieved. Every other part of the body can usually be kept clear of a hazard. The hand, by the nature of manual tasks, often cannot. Positioning, guiding, retrieving and striking all require proximity to the hazard by definition.

The hand was never designed for this role. It was not designed to stop a swinging load, or rotate a crane hook, or push a hot casting, or hold a punch at the point of impact, or reach below a suspended load for a dropped rope. Yet across industrial sites, the hand is used in exactly these ways, every day — quietly, during the small correction, the final push, the last alignment.

Why Hand Injuries Still Happen

There is a hidden assumption buried in many industrial tasks, and it is worth stating plainly: *at some point, a worker will use his hand*. The written procedure rarely says so. The task reveals it. If the job cannot be completed without touching the load, then the hand is built into the method — whatever the procedure says.

This is why hand injuries persist in well-equipped plants. A worker can be experienced and still be exposed. A worker can be trained and still be required to touch the load. A worker can be wearing exactly the right glove and still have fingers in the closing gap, because the task put them there.

If a hand is required to complete a task safely, the task has not yet been engineered. It has been made survivable. That distinction — survivable versus engineered — is the starting point for everything that follows.

KEY TAKEAWAYS

- The hand is the closest and least protectable part of the worker; many tasks build hand contact into the method.
- Experience, training and PPE do not remove exposure that the task itself requires.
- If the hand is required, the task is survivable — not yet engineered.

The Behaviour Trap

After a hand injury, the investigation usually begins with the worker. Did he follow the procedure? Was he paying attention? Was he trained? Was he wearing the right glove? Was he rushing?

These questions may be necessary. They are almost never sufficient.

The behaviour trap is the belief that a hand injury happened only because a worker made a poor decision. Sometimes that is true. Far more often, the worker's decision was shaped by the task long before the shift began. If the load had to be guided by hand, someone was eventually going to guide it by hand. If the provided tool was too heavy, too far away or poorly matched to the job, someone was eventually going to stop using it. If the rope had to be retrieved from below the load, someone was eventually going to reach for it. If the final alignment had no defined method, someone was eventually going to use fingers.

This is not carelessness. It is a worker completing a task with the only method the task actually provides.

The Behaviour Trap

The trap matters because of what it does to the investigation. When the finding is “worker behaviour,” the corrective action is a reminder, a retraining, a campaign — and the task itself goes back to work unchanged, carrying the same exposure, waiting for the next pair of hands. The plant has processed the injury without ever examining the method that produced it.

There is a way out of the trap, and it costs one question. Not *why did the worker do that?* but *why did the task require that hand position?* The first question ends in blame and a poster. The second one ends in design — and design is something a plant can actually change.

KEY TAKEAWAYS

- Worker decisions are shaped by task design long before the shift begins.
- Behaviour-only findings send the task back to work unchanged.
- Ask why the task required the hand — not why the worker used it.

01

The Last Adjustment

Across industries the same moment repeats. The lift is controlled until the final adjustment. Then a hand reaches in — not because the worker forgot the procedure, but because the procedure never defined the last movement.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

Protection Versus Elimination

Most hand safety programmes begin with gloves, and it is easy to see why. Gloves are visible. They are easy to issue, easy to audit, easy to test, rate, compare and stock. Progress in glove engineering has been real, and workers are genuinely better protected than they were a generation ago.

But gloves have also created a quiet limitation, and it deserves to be said clearly: a glove protects the hand *while it remains in the hazard*. It reduces cut depth. It spreads impact load. It improves grip. What it cannot do is change where the worker is standing. It changes what happens *if* contact occurs. It does not change *whether* contact occurs.

That single difference divides hand safety into two different disciplines, asking two different questions.



DIAGRAM 1 · Protection versus elimination

Protection Versus Elimination

A mature programme needs both. But the order matters — engineering the hand out of the task is often never considered at all, because it is not obvious that it is available. The chapters ahead are about making it obvious.

PPE protects the hand that is still in the hazard. Engineering controls keep the hand from needing to be there.

KEY TAKEAWAYS

- A glove changes what happens *if* contact occurs, not *whether* it occurs.
- Protection asks what the worker should wear; elimination asks why the hand is there.
- Full PPE compliance can coexist with unchanged exposure.

The Last 300 mm

Every hand injury has a precise location and a precise moment. Across industries, the location and the moment turn out to be remarkably consistent — and they are not where most of the safety effort is spent.

Watch a lift from beginning to end. The early phases are visibly dangerous, and they are treated that way. The load travels its whole path with no hand anywhere near it.

Then the load approaches its destination, and something changes. The crane slows. Precision starts to matter. The team leans in. A small push seems harmless. A quick correction seems efficient. The distance between the hand and the load closes step by step — until, in the final stage of the task, the hand stops directing the work from a distance and starts touching it directly.

We refer to this final stage as **the last 300 mm** — the closing distance where workers often leave engineered control and return to direct hand contact.

The Last 300 mm

It is worth being precise about why this zone is so dangerous. It is not that the load is moving fast — it is usually moving at its slowest. It is that three things converge at once. The hand is at its closest. The gap is at its smallest. And the team is at its most relaxed, because the job looks nearly finished.

The uncomfortable arithmetic of industrial hand safety is this: most of the safety effort is spent on the whole task, and most of the injuries happen in its last 300 mm. Controls that close that specific distance — rather than generally improving the task — are where the real reduction comes from.

KEY TAKEAWAYS

- Most safety effort covers the whole task; most injuries happen in its last 300 mm.
- The zone is dangerous because closeness, small gaps and relaxed attention converge.
- Controls that close that specific distance produce the real reduction.

02

Improvised Tools

On walkthroughs, improvised tools appear everywhere — bent rods, welded hooks, scrap used as pushers. Workers built them because the task still had to be completed. Improvisation is not indiscipline. It is the workforce reporting exactly where the engineered method is missing.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

PART TWO

Understanding Hand Exposure

Before a tool is selected, before a procedure is rewritten, before anything is purchased — the exposure itself has to be understood. This part gives it a vocabulary: what hand exposure is, where it lives inside a task, and how to trace it precisely enough to remove it.

What Hand Exposure Is

Hand exposure exists whenever a hand enters a zone where energy can injure it. The energy may come from a moving load, a rotating component, a sharp edge, a hot surface, a falling object, stored tension, hydraulic force, gravity, or another worker's hammer blow. The forms vary endlessly. The definition does not.

Notice what the definition does *not* require: an injury. Exposure exists before anyone is hurt. The question is not *who got hurt?* The question is *where could the hand be hurt if the task continues this way?* Prevention begins where that question is asked.

In practice, most industrial hand exposure occurs inside a small number of recognisable zones. **Pinch points**, where the hand can be trapped between two objects. **Crush points**, where a load or moving part can compress it. **Impact zones**, where sudden movement, striking or falling can hit it. **Hot and sharp-edge zones**, where heat burns before the worker can react, or steel edges cut through ordinary handling. **Line-of-fire zones**, where stored energy, pressure, gravity or movement can release toward the worker. And **suspended-load zones** — below, beside or near a load being lifted, guided, landed or positioned.

What Hand Exposure Is

Moving loads are different. They swing, rotate, bounce, drift, settle and shift when released. Touch creates a false sense of control. Because the worker can feel the load, the worker feels able to command it. But touch is not control. Touch is exposure.

Hands get involved because hands are good. They are precise. They feel alignment. They apply small corrections. And they are always available — no walk to the rack, no search, no setup. Where no better method has been provided, the worker's hand fills the gap.

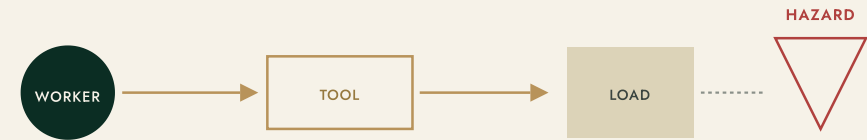
KEY TAKEAWAYS

- Exposure exists before injury — it begins where the task lets the hand enter.
- Touch is not control; a moving load can outpace any reflex.
- Hands fill the gap wherever no practical method has been provided.

2.2

Worker → Tool → Load → Hazard

Underneath everything that follows sits one mental model, simple enough to draw on a whiteboard in ten seconds. Picture the task as a chain of four elements. The **worker**, who decides, communicates and controls. The **tool**, which creates the interface and the distance. The **load**, which responds to the tool. And the **hazard**, which stays separated from the hand.



Hand stays with the worker — never travels past the tool.

DIAGRAM 2 · The interface model — the book's signature image

Worker → Tool → Load → Hazard

Worker → Tool → Load → Hazard. In an engineered task, that is the order of contact. The worker's hand touches the tool. The tool touches the load. The hazard touches nothing that bleeds.

Now look at how many industrial tasks actually run: **Worker → Load → Hazard.** The tool is missing from the chain, and the hand has taken its place. Whenever you see a task arranged this way, you are looking at the hand being used as a control device — a role it was never designed for.

The purpose of an engineering control, in this model, is precisely stated: *restore the missing link*. The worker keeps all their judgement, timing and communication. What changes is the point of contact.

**The hand is not the control.
The tool is the control.**

The Task Exposure Model

Ask a team to point at the dangerous part of a lift and most will point at the load in the air. Watch enough lifts, and a different picture emerges: exposure is not constant across a task. It moves — in the opposite direction from the attention.

Over years of application reviews, we kept seeing the same five phases repeat in every moving-load task:

LIFT → MOVE → APPROACH → POSITION → SEAT

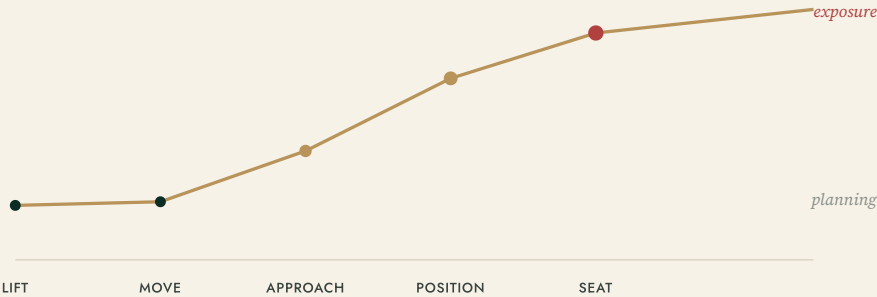


DIAGRAM 3 · The five-phase strip with exposure rising through approach, position and seat

The Five Phases

Lift. The load leaves rest. This phase is usually well controlled, because it is visibly dangerous. What might the load do at first lift, and how will that first movement be controlled without a hand?

Move. The travel phase. The temptation is for workers to walk beside the load with a hand on it. That is not control; it is moving exposure. Can the load travel its full route without a worker's hand travelling with it?

Approach. Exposure starts to climb sharply — precisely because everything *feels* safer. Approach is dangerous because it feels controlled. Where workers will stand, what tool will be used, who signals, when the job stops — all must be answered before the load arrives.

2.3 · CONTINUED

The Five Phases

Position. One of the highest-exposure phases in all of industrial work: positioning requires control, and when no tool provides it, the hand does. If the method is not defined, the hand will define it.

Seat. The most deceptive phase of all. The gap closes. The load settles. It is also the exact moment the team relaxes, because the job looks finished. Seating looks finished before it is safe.

Lay the five phases side by side and the model's central finding appears: **exposure often peaks not during the visible lift, but during approach, position and seat** — the phases that receive the least planning.

KEY TAKEAWAYS

- Exposure moves through a task; it is not constant.
- It peaks at approach, position and seat — the least planned phases.
- A complete plan controls the load through every phase, not just the lift.

03

The Rule Without a Method

Many procedures prohibit hand contact with moving loads. Far fewer describe how the load will be guided without it. A prohibition without a method is not a control — it is a documented expectation that someone will break it.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

The Elimination Framework

By this point the way of thinking should be familiar: start from the task, find where the hand enters, understand what it is doing there. PSC works to a five-question sequence, the Hand Exposure Elimination Framework™.

- 1. What is the task?** Observe the real one — not the procedure’s description of it.
- 2. What is the hand doing?** Name the function precisely — pushing, pulling, guiding, steadying, retrieving. A named function can be replaced; one that has not been named cannot.
- 3. What is the hazard interface?** What, specifically, can injure this hand, at this point?
- 4. Can the hand function be replaced by a tool-based method?** Not *can we buy a tool* — can the *function* be performed from a safer distance? Which tool, at what reach, depends on geometry, load, access and environment — evaluated during task mapping.
- 5. Can the method be written into the work system?** A control that depends on memory is fragile. One written into the SOP or lift plan survives crew changes and shift changes.



DIAGRAM 10 · The elimination framework, five steps

Two Honest Notes

First: sometimes a tool is not the answer. Not every exposure yields to equipment. Sometimes the lifting method must change, or the access, or the load path. Sometimes the safest available answer is to stop the task and redesign it.

Second: the framework's first gift is not a solution but a change of question. *Where is the worker's hand being used as part of the control system?* That question removes blame and reveals design. It does not ask whether the worker was careless; it asks what the task required.

That is the movement this whole part has been building: from protection to elimination, from behaviour to design, from *be careful* to *here is how the task will be controlled without hand contact*.

The next part turns it into practice.

KEY TAKEAWAYS

- Name the hand function first; a named function can be replaced.
- The tool follows the task study — never the other way around.
- A method written into the work system outlives memory, crews and shifts.

04

The Known Pinch Point

Every operator can describe the pinch point precisely — where it is, when it closes. Every operator still enters it, because the task offers no other way to be completed. Awareness was never the missing element. Knowledge does not remove exposure when the method still requires the hand.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

PART THREE

Engineering Better Work

Understanding exposure is the first half of the discipline. The second half is building work that does not require it — methods, standards and lift plans in which the hand's job has been given to something better suited to the hazard. This part is about that construction.

The Hierarchy of Control in Real Work

Every safety professional knows the hierarchy of controls. Eliminate the hazard if possible. Substitute it if not. Engineer it away from the worker. Guard, train and procedurise around what remains. And only then rely on PPE to absorb the residual risk. The theory is not in dispute.

The subject is what happens to the hierarchy on a real shift.

A worker knows that hands should stay away from a suspended load — and still needs to guide it into position. A supervisor knows the pinch point exists — and still needs the job completed before the shift ends. The hierarchy is intact on paper. On the floor, it has quietly collapsed into its bottom layer, because the upper layers were never made *practical*.

3.1 • CONTINUED

The Hierarchy of Control in Real Work

An engineering control that workers avoid does not sit in the hierarchy at all. It sits in a rack, while the task runs on PPE and hope.

So the hierarchy, translated into field language, becomes a simple discipline: before asking what the worker should wear, ask whether the task can be changed. Can the worker stand farther away? Can the hand's function be given to a tool? Only when those questions have been genuinely asked — and answered — has the hierarchy actually been applied.

KEY TAKEAWAYS

- The hierarchy fails in practice when its upper layers are theoretical and only PPE is practical.
- A control workers avoid is not a control; credibility in the field is part of the engineering.
- Ask whether the task can change before asking what the worker should wear.

3.2

Distance, and Safer Distance

Most of what engineering controls achieve reduces to one mechanical idea: increase the distance between the hand and the hazard, without slowing the task down.

Distance is the simplest control there is. It gives the worker time to react, improves visibility, keeps the body out of the line of fire. None of this asks the worker to be more careful. It asks the hazard to be farther away.

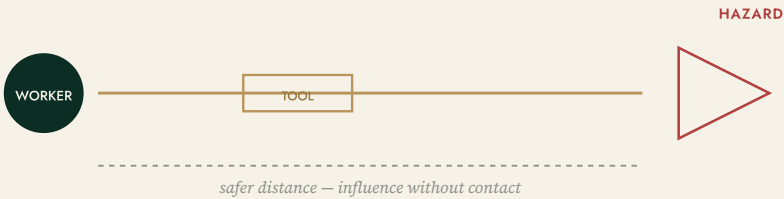


DIAGRAM 4 · Engineered distance — the tool bridges the gap

Distance, and Safer Distance

But distance alone is only half the idea. A worker standing far away still has a job to finish. What the work actually requires is *safer distance*: the worker keeps genuine influence over the load while remaining outside the most dangerous contact area.

Distance without control will fail. Control without distance is exposure. The right method provides both at once.

KEY TAKEAWAYS

- Distance is the most reliable control because it does not depend on attention or experience.
- Distance without control gets abandoned; control without distance is still exposure.
- The goal is safer distance: influence over the load from outside the contact zone.

What No-Touch Really Means

“No-touch” is a phrase that gets used loosely, and the looseness costs it credibility. No-touch does not mean no work, no human judgement. What no-touch means is precise and narrow: **the worker’s hand should not become the physical control point for a hazardous load.**

The worker still observes, communicates, decides, controls the method. What changes is the point of contact. Hands-off work does not remove control. It changes where control happens.

Which leads to the question of why so many no-touch rules fail. A rule says: do not touch the load. But the worker still has a job to complete. If no practical method is available, the worker faces exactly two options: stop the job, or use the hand. In most industrial environments, production pressure, habit and experience push steadily toward the second – and the rule becomes a poster.

What No-Touch Really Means

A no-touch rule without a no-touch method will not survive the shift. The question is never whether the rule exists. The question is whether the method exists.

One operating question compresses all of this: **can the worker complete this task without placing a hand on the load, between loads, below the load, or inside the line of fire?**

KEY TAKEAWAYS

- No-touch changes the point of contact, not the worker's role or judgement.
- A rule without a method leaves workers a choice between stopping the job and using the hand.
- Test every phase: can the task be completed without the hand entering the hazard?

A No-Touch Standard That Works

Good intentions do not survive contact with a difficult shift. Standards do — if they are written to be used at the worksite rather than filed.

Policy language that works.

“Keep hands away from loads” is not enough. Stronger language reads like this: *For suspended, moving, hot, sharp or stored-energy loads, direct hand contact shall be avoided wherever engineered control is practical. Where hand contact is required, the task must be reviewed, the exposure justified, and the safest available method defined.*

The missing section of the lift plan.

Review lift plans across industries and a consistent gap appears: the crane is specified, the rigging calculated, the route drawn — and then the plan ends, at precisely the point where exposure begins to peak. Every moving-load plan should contain a named section: **Final Positioning and Hands-Off Control Method.**



DIAGRAM 5 · The lift plan's missing section

Stop-Work Authority

Stop-work authority is widely established for major, visible hazards. It must apply equally to the small hand exposure everyone has become used to. The trigger is simple to state: *if hands must enter the hazard because no suitable tool or method is available, stop the task and redesign the method before continuing.*

This is why the authority must be explicit, and leadership must treat its use as a good catch, not a delay — and why the correct organisational response to a stop is not a reprimand, but a tool, or a changed method.

IN SHORT

Policy language must define the method, not restate the intention.

Every lift plan needs a named Final Positioning and Hands-Off Control Method section. Stop-work authority applies to routine hand exposure — and the answer to a stop is a method, not a reminder.

No-Touch Lift Plan Checklist

- ☐ **Load path reviewed** — swing, rotation, drift, travel route and line-of-fire exposure considered.
- ☐ **Final positioning method defined** — how will the load be guided, aligned and seated?
- ☐ **Worker standing position defined** — where will workers stand during approach, position and seat?
- ☐ **Tool or tagline selected** — what will touch the load instead of the hand?
- ☐ **Retrieval method defined** — how will ropes, hooks and slings be recovered without reaching below or between loads?
- ☐ **Pinch points identified** — where can the hand be trapped during final placement?
- ☐ **Stop-work trigger agreed** — when must the team pause and redesign the method?
- ☐ **Supervisor confirms the hands-off method** — has the final hands-off control been explained before the lift begins?

05

The Safest Lift

In lift after lift, the most planned phase is the least exposed. Travel is barricaded and watched; then positioning begins, the plan runs out, and workers close in to finish by feel. Exposure concentrates exactly where planning stops.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

Industrial Exposure Patterns

Hand exposure does not look the same everywhere. A rig deck is not a rolling mill; a foundry is not a turbine hall. But underneath the differences, the same patterns repeat — and a team that can recognise the pattern in its own industry is most of the way to removing it.

Oil and Gas

The work. Onshore rigs, offshore installations, pipe yards, vessel decks, supply bases and fabrication yards all share one condition: constant movement of heavy, awkward, high-consequence loads through spaces that were not generous to begin with.

The exposure. It is rarely one dramatic action. It accumulates in small, repeated moments: guiding a suspended load on deck, controlling a cargo basket, steadying a pipe, retrieving a tagline, aligning equipment during installation.

Where hands enter. Cargo handling as baskets and skids swing or shift during landing · pipe and tubular handling during movement and stacking · lifting hardware, where fingers come close to shackles, slings and hooks · tagline retrieval, reaching below or beside suspended loads · equipment installation, where the final alignment is where the fingers arrive.

Control families that usually apply. Push-pull tools for guiding and landing; engineered taglines and anti-tangle lines for swing and rotation; retrieval tools for recovering lines from standing distance; hands-off attachments for hardware handling.

4.1 · CONTINUED

Oil and Gas

TYPICAL SIGNALS YOU'LL HEAR

*“Steady it on the way down.” · “Grab the tagline.” · “Just push it clear of the frame.”
· “Hold the basket.” · “It’s almost seated.”*

WHAT TO OBSERVE

Where hands touch suspended deck cargo · where taglines are retrieved from
· where fingers go during shackle connection and release · where pipes are
steadied by palm · where the final alignment of installed equipment
happens.

Steel

The work. Steel plants concentrate nearly every form of hand hazard in one place: heavy loads, sharp edges, hot surfaces, moving material. Cranes, C-hooks, coils, plates, slabs, billets, trolleys and trucks create a continuous stream of situations where a hand can be used to guide or correct movement.

The exposure. Its defining feature here is *routine*. A steel plant rarely has one large hand-exposure problem. It has hundreds of small, repeated ones, and the opportunity is their systematic replacement, task by task.

Where hands enter. Coil handling — guiding, covering, lashing, aligning · plate and slab movement, where workers push or correct material in motion · truck loading, with its tarpaulin work and belt lashing · crane-hook and C-hook movement, rotated or steadied by hand · maintenance, where heavy assemblies and stored energy create repeated pinch and crush risk.

Two patterns deserve particular attention. The first is **improvisation**: steel plant crews are practical and inventive, and where they see a risk, they build an answer — a welded rod, a bent bar, scrap used as a pusher. The instinct is exactly right; they are trying to create distance. Improvisation reveals the exposure. Engineering makes the solution reliable.

Steel

The second is the **small task**. Not every exposure looks dramatic; sometimes it is a tarpaulin. Workers climb trailers, pull covers across coils, lean over edges, lash and retrieve — none of it a crane lift, all of it real exposure, repeated daily. The subject is not the tarpaulin. The subject is the exposure, and a small exposure repeated every day is not small.

Control families that usually apply. Magnetic no-touch tools for ferrous plate, coil and component positioning; push-pull tools for guiding and correcting; hands-off attachments for hooks and slings; reach-extending methods for truck and tarpaulin work.

TYPICAL SIGNALS YOU'LL HEAR

“Push it a little.” · “Hold the coil steady.” · “Turn the hook.” · “Watch your fingers on the edge.” · “Only the last adjustment.”

WHAT TO OBSERVE

Where workers steady moving plate · where coils are nudged into line · where hands approach suspended loads · where slings are repositioned · where pinch points have become “normal.”

06

Distance to the Tool

The control often exists on site — clean, inspected, and several minutes from the task it was bought for. The hand is always closer. A tool that is not at the point of use competes with the hand on convenience, and loses.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

Aluminium and Extrusion

The work. Aluminium plants move a different population of loads: profiles, billets, bundles, castings, dies, pallets, frames and hot material, through extrusion lines, conveyors, powder-coating lines, casting areas and dispatch bays.

The exposure. It hides in process flow. Long profiles whip, shift and trap fingers; hot material burns before the reflex arrives; extruded edges cut through ordinary handling. Aluminium tasks can appear light compared with steel. That appearance is the hazard's best camouflage.

Where hands enter. Extrusion areas — guiding, aligning, separating and stacking profiles · post-extrusion handling, where long flexible sections slide and rotate · powder coating and finishing, with frames and hooks needing positioning and retrieval · casting areas, combining heat, weight and restricted access · dispatch and packing — bundles, straps, covers, truck loading.

Control families that usually apply. Push-pull tools and guiding heads for profile and bundle control; retrieval tools for racks and hooks; manual lifting aids for repeated handling; heat-suitable methods in casting areas.

4.3 · CONTINUED

Aluminium and Extrusion

TYPICAL SIGNALS YOU'LL HEAR

“Guide the end.” · “Separate those two.” · “It’s still hot — quickly.” · “Straighten the bundle.” · “Hold the frame while I hook it.”

WHAT TO OBSERVE

Where profiles are guided or separated by hand each cycle · where long sections are steadied during movement · where hands work near hot or fresh-cut material · where racks and hooks are positioned by palm · where dispatch crews handle straps and covers on vehicles.

Foundries and High-Heat Operations

The work. Castings, moulds, ladles, scrap, fixtures and trolleys — much of it hot, much of it heavy, much of it moving through spaces where escape room is limited.

The exposure. Heat changes the arithmetic of hand safety. In most industries the hand must touch the hazard to be injured; in a foundry it may only need to be *near* it. Heat also cuts reaction time. The problem is not only contact. It is proximity.

Where hands enter. Small corrections near hot castings and moulds · handling of fixtures and trolleys carrying hot material · scrap and gating work around sharp, still-warm edges · maintenance in and around furnaces, where stored heat outlasts the shift that created it.

Control families that usually apply. Reach-extending and guiding tools built for the thermal environment; holders that keep fingers away from struck or positioned components; revised access and sequence where no tool suffices.

Foundries and High-Heat Operations

TYPICAL SIGNALS YOU'LL HEAR

“It’s cooled enough.” · “Just turn it a bit.” · “Quick, before it sets.” · “Mind the edge — it’s still warm.” · “Hold it there.”

WHAT TO OBSERVE

Where hands make small corrections near hot material · where “cooled enough” is judged by feel · where fixtures and trolleys are guided by palm · where sharp gating and scrap are handled routinely · where limited space leaves no escape line.

Mining, Cement and Heavy Maintenance

The work. Here the load is often not hanging from a crane at all. It is a machine component, a liner, a roller, a chute part, a gearbox, a heavy cover, a jammed assembly, or a tool being struck — frequently during shutdowns, breakdowns, night work and time-critical maintenance.

The exposure. Two forces dominate: stored energy and awkward access. Equipment that has been stopped is not equipment that has been de-energised. The work happens where the worker can barely fit, and escape space is minimal. In cement plants especially, exposure takes the form of many repeated small tasks, worsened by dust, heat and poor visibility.

Where hands enter. Reaching into blocked or jammed assemblies · steadying components during removal and refitting · holding parts and tools in awkward, confined positions · clearing material from chutes and transfer points · handling heavy mechanical spares in cramped access.

Control families that usually apply. Holders, guides and retrieval tools for confined work; supports, wedges and fixtures that take over the steadying function; hands-off impact tools where striking is involved. In heavy maintenance the correct answer is often not a tool at all, but better access or a changed sequence.

Mining, Cement and Heavy Maintenance

TYPICAL SIGNALS YOU'LL HEAR

“Reach in and check it.” · “Hold it while I knock it loose.” · “It’s stuck — give it a push.” · “Clear that build-up.” · “We only have the shutdown window.”

WHAT TO OBSERVE

Where hands enter equipment that “is stopped” · where components are steadied during removal · where struck tools are held by hand · where chutes and transfer points are cleared · where the shutdown clock is visibly driving the method.

Marine, Ports and Logistics

The work. Containers, baskets, pallets, coils, pipes, machinery, ropes, chains, shackles and cargo gear — moved, guided, landed, lashed and released across quaysides, vessel decks and yards.

The exposure. Its signature here is *dynamic conditions*. Wind rotates suspended loads. Vessel motion shifts the worker's balance. Wet surfaces reduce footing. When a load misbehaves, the instinct is to regain control with the hand — which is precisely the exposure. A load does not need to be predictable to be dangerous; its unpredictability is the strongest argument against touching it.

Where hands enter. Final correction of swinging or rotating cargo · lashing and release work between and beside loads · tagline handling and retrieval in confined deck space · hook, shackle and sling work during connection and release · guiding loads through tight clearances.

Control families that usually apply. Anti-tangle taglines with a defined handling method; retrieval tools for lines and gear; push-pull tools for standoff correction; planned standing positions and exclusion space as controls in their own right.

Marine, Ports and Logistics

TYPICAL SIGNALS YOU’LL HEAR

“Catch the line.” · “Push it off the rail.” · “Steady it — the deck’s moving.” · “It’ll land in a second.” · “Grab it before it swings back.”

WHAT TO OBSERVE

Where hands correct swinging cargo · where taglines are caught, held and retrieved · where lashing crews work between loads · where deck space forces workers close · where weather and motion change the method mid-task.

Wind, Power and Heavy Engineering

The work. Gearboxes, nacelle and turbine components, generator parts, fabricated structures, machined assemblies, panels and frames — large, expensive, often fragile, and dimensionally critical.

The exposure. This industry produces a pattern found nowhere else in such pure form: *care for the component creates exposure for the hand*. Workers avoid rough tools because they fear damaging a machined or coated surface — so they guide gently, align carefully, steady by palm. Precision does not justify exposure; it requires a better method.

The second pattern is the contradiction of scale. The component may weigh several tons; the injury happens in a gap of millimetres. The heavy lift is controlled and certified. The last alignment still depends on fingers.

Where hands enter. Final approach and alignment of large components · flange, pin and bolt-hole alignment at the closing gap · steadying of suspended machined parts · panel and frame positioning against fixed structures.

Control families that usually apply. Non-marring guiding tools and contact surfaces; fixtures, guides, stops and spacers that take over alignment; push-pull tools for standoff control; methods that slow and observe the closing gap rather than reaching into it.

Wind, Power and Heavy Engineering

TYPICAL SIGNALS YOU'LL HEAR

“Just hold it.” · “Push from this side.” · “Guide it slowly.” · “Align this hole.” · “Keep it steady.”

WHAT TO OBSERVE

Where delicate components are guided by bare hand · where fingers work at flange and pin alignments · where “don’t damage it” has quietly become “use your hands” · where the last centimetres of large assemblies are controlled · where fixtures could hold what fingers currently hold.

07

Shift to Shift

Watch the same task across shifts and the method changes: different positions, different tools, different moments when a hand touches the load. Each crew believes its way is normal. When a method lives in habit, every shift writes its own procedure.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

SUMMARY

The Pattern Across Industries

Set the seven chapters side by side and the differences are real: heat in the foundry, motion on the deck, precision in the turbine hall, routine in the mill. But the exposure question never changed from one industry to the next: **where is the hand being used to control the hazard?**

Oil and gas — workers control suspended loads in high-consequence space. Steel — heavy, sharp, hot material in endlessly repeated operations. Aluminium — exposure hidden inside process flow. Foundries — heat that outruns the reflex. Mining and cement — stored energy and awkward access. Marine — dynamic conditions that make loads unpredictable. Wind, power and heavy engineering — precision that pulls fingers to the closing gap.

The industries are different. The core question is the same. And once the hand function is visible, the control can be designed.

A brief word on tool families. Throughout these chapters, controls have been named by family — push-pull tools, taglines and retrieval tools, magnetic no-touch tools, hands-off and impact tools, holders, manual lifting aids. These families are the vocabulary of the subject, and that is deliberately all they are here. A tool becomes a safety tool because of what exposure it removes — and that can only be established against a real task.

Seeing Exposure

This guide provides a practical engineering framework for recognising and reducing industrial hand exposure — not for selecting, designing or specifying controls. That expertise remains application-specific and is addressed through task mapping. What can be taught on the page is the seeing: the discipline of observation that everything else depends on.

How to Watch Work

Most plant walkthroughs are conducted at the wrong altitude. The eye goes to the big things — the crane, the load, the procedure board, the PPE compliance — and the big things are usually fine. Hand exposure lives lower down and later on, in details a general inspection is not tuned to catch. Experienced observers retune deliberately.

Don't watch the crane — watch the hands. The crane is certified and obvious; it is also where nothing is usually wrong. The hands are where the task's true method is written.

Don't watch the load — watch the worker's instinct. The load tells you what is moving. The worker's instinct tells you what is *about* to happen.

Don't watch the whole task — watch the last correction. Exposure concentrates in the closing moments. Watch the last 300 mm and you have watched the part that matters.

Don't observe the procedure — observe the workaround. The workaround describes actual work, and it exists because the intended method has a gap.

How to Watch Work

Don't count the tools — count the moments the hand still enters. A rack of engineering controls proves purchasing happened; it proves nothing about exposure.

Don't ask where the accident happened — ask where the hand entered. Hand-entry points describe the future — every one of them is an injury that has not happened yet.

Don't ask who made the mistake — ask why the hand became necessary. The first question ends in a name; the second ends in a method.

Don't celebrate a successful lift — examine the final positioning. Success is where risky methods hide best.

How to Watch Work

You have already heard what these observations sound like — the Signals boxes running through Part Four are their soundtrack. Once you start hearing them as signals, you cannot stop — which is the point.

One walkthrough conducted this way will produce a list — and that list is precisely the raw material that task mapping turns into a solution, where the next part begins.

KEY TAKEAWAYS

- Hand exposure is found low and late: in hands, instincts, last corrections and workarounds.
- Count hand-entry moments, not tools; examine successful lifts, not just failed ones.
- Ask why the hand became necessary — the answer is always a method, never a name.

How to Watch Work

Don't watch the crane — **watch the hands.**

Don't watch the load — **watch the worker's instinct.**

Don't watch the whole task — **watch the last correction.**

Don't observe the procedure — **observe the workaround.**

Don't count the tools — **count the moments the hand still enters.**

Don't ask where the accident happened — **ask where the hand entered.**

Don't ask who made the mistake — **ask why the hand became necessary.**

Don't celebrate a successful lift — **examine the final positioning.**

Making Engineering Controls Work

Buying an engineering control is the easy part. The hard part — the part that decides whether exposure actually falls — happens afterwards, on the floor, across shifts, under production pressure. This part is built entirely from patterns watched over many years.

Why Workers Put the Tool Down

Begin with the moment every safety programme dreads and few examine: a good tool, properly purchased, hanging unused while the task it was bought for is done by hand.

The reflex explanation is discipline — the workers won't use it. Years of watching the pattern point somewhere else. A hand is precise, always available, and requires no walk, no search, no setup. Any tool asked to replace it enters a competition, judged during the actual shift — when the load is awkward, the access is poor, the heat is up and the task is on its fortieth repetition.

What makes a tool lose that competition is rarely mysterious. Too heavy for repeated use. Too short, so the worker steps in anyway. It damages the load, so careful workers avoid it. Or it is simply not there — stored minutes away, which in the economics of a working shift means it does not exist.

And underneath all of these sits the deepest reason: **the tool did not replace the hand function.** An engineered control earns its place on the day the missing function is replaced, and not one shift before. A tool that does not will be abandoned — and its abandonment is not a discipline problem. It is field data.

DO THIS

The next time you find an unused safety tool, do not ask who stopped using it. Ask: “What function did the worker's hand replace — and what did this tool fail to give back?”

08

The Protected Component

The more delicate and expensive the component, the more likely workers are to guide it with bare hands at the closing gap. Care for the part quietly displaces care for the fingers. Good intentions can design exposure in.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

Making the Purchase Succeed

A plant does not fail at hand safety by buying the wrong tools, mostly. It fails in the system around the tools. The good news: every failure point has a mirror image — a practice that plants with durable programmes keep getting right.

Put the control at the point of use. The tool exists, and it is somewhere else. Each location sounds reasonable, and each enters the tool in a race against the hand — a race the hand wins every time.

Do this: walk the route from the task to its tool and time it.

Give the control an owner. Tools that belong to everyone are inspected by no one.

Do this: put one name against every rack of hand safety tooling.

Making the Purchase Succeed

Select with the people who will use it. The variables that decide adoption are known only to the people who do the task.

Do this: put at least one operator on the selection for the next purchase.

Buy against the task, not the catalogue. Procurement is usually asked to buy a product when what the plant needs is a function replaced.

Do this: rewrite the next purchase request as a hand function to be replaced.

Make the supervisor the method's sponsor. Whatever the SOP says, the real procedure on any floor is what the supervisor expects to see.

Do this: add one question to the pre-task routine — “What touches the load instead of the hand?”

Making the Purchase Succeed

Protect the programme from its first failed pilot. One trial with the wrong tool, judged in a week, can immunise a plant against engineering controls for years.

Do this: before any pilot, write down what success looks like.

Measure exposure, not equipment. The easiest metric measures activity. The metric that matters measures the thing itself: hand-entry moments removed.

Do this: count hand-entry moments per shift, before and after the control.

Hold the method under pressure. Production pressure rarely deletes a safe method outright; it shaves it, one step at a time.

Do this: audit one task against its written method and log what was shaved.

Standardise what works. Some plants experiment forever. Others convert every validated method into standard work — and get quieter about hand safety every year.

Do this: standardise one proven control this quarter, before starting anything new.

KEY TAKEAWAYS

- Controls succeed through systems: point of use, ownership, selection, supervision, measurement.
- Buy a function replaced, not a product; pilot by design, not by luck.
- Measure hand-entry moments — and standardise what works before experimenting further.

09

One Small Movement

Under production pressure, safe methods are rarely abandoned. They are shortened — one step, one walk to fetch the tool. The remaining movement is done by hand. Nothing happened. The method therefore remained unchanged. Methods erode one small movement at a time.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

What Makes a Control Credible

Everything in this part condenses into a test — two questions that any proposed control, purchased or improvised, should be able to pass. The test takes five minutes and requires no specialist.

First: what hand exposure does it remove? The answer must be precise. Not *“it is safer.”* But: *“it keeps the worker’s hand away from the side of the suspended load during final positioning.”* If the exposure removed cannot be named in one specific sentence, the control has been matched to a feeling, not a task.

Second: does it create a new risk? Does it make the worker overreach? Does it damage the surface? Does it work in the demonstration but not in the awkward, hot, confined version of the job? A control that trades one exposure for another has relocated it, not reduced it.

A control that passes both questions is credible — not because of its colour or price, but because of what it verifiably removes. The value of a safety tool was never in the tool. It is in the exposure it takes out of the task.

DO THIS

Run the two-question test on the three most-used safety tools in your area this week. Write the answers down. Any tool that fails question one belongs back in task mapping, not on the rack.

Implementation

Everything so far has built a way of seeing and a standard to build toward. This part is the working sequence: how a task is mapped, how a programme starts, how a control is validated, and how a validated method becomes permanent. None of it requires a corporate initiative. All of it can begin this month.

Application Mapping

Every plant’s version of “guiding a load” or “retrieving a tagline” is slightly different. A control recommended without seeing the actual task is a guess. Application mapping is not a sales exercise: it is a structured way to study the worker–tool–load–hazard interface before suggesting a method.

1• Share the task. A short video or a few photographs of the task as it is actually performed — footage records what a task actually looks like, not what it is supposed to look like.

2• Map the exposure. The task is traced step by step: where the worker stands, where the load moves, where the hand enters, what the hand is doing.



observe → record → identify the hand function → mark the hazard → define the control

DIAGRAM 8 · The task-mapping sequence

Application Mapping

3• Match hazard to control. With the exposure understood, the control family can be identified — matched to distance, load, surface and access, not pulled from a shelf.

4• Recommend, specifically. The output is a defined method with the tool, size and quantity suited to the task — or, honestly, a revised method, better access, or the finding that the task needs further study.

DO THIS

Choose one task this week where a hand still enters the hazard, and film one full cycle of it on a phone. That two-minute video is the first artefact of your programme.

The First 30 Days

A hands-off programme does not need to begin with a corporate initiative, a budget line or a committee. It can begin with one focused month, run by the people already on site.

Week 1 — Observe. Select five to ten repeated tasks where hands enter moving-load, pinch, impact, heat or line-of-fire zones. Document the hand function in each task. The refusal this week: do not start with product selection.

Week 2 — Map. For each observed task, put the exposure on paper: where the worker stands, where the hazard is, what the hand is doing, what control is missing.

Week 3 — Trial. For the highest-priority tasks, select a tool, a method or a work change — and test it with the workers who do the job, on the job. A trial that fails specifically is a successful experiment.

Week 4 — Standardise. Take what worked and write it into the work system: the SOP, the lift plan, the toolbox talk, the permit.



DIAGRAM 9 · The 30-day programme, week by week

The First 30 Days

Thirty days will not transform a plant. It will do something more useful: produce one task genuinely changed, one crew that has experienced the method working, one written procedure that names a tool — and a template the plant now owns for every task after that.

DO THIS

Put four consecutive weeks in the calendar, name the five tasks for Week 1, and tell the crews what the month is for — understanding the method, not auditing the people.

KEY TAKEAWAYS

- Start with five to ten visible, repeated exposures — observation first, products refused.
- Map until a stranger could point at the exposure; trial with the workers, on the job.
- Week 4 is the point: what worked gets written into the work system.

10

The Absence of Injuries

At site after site, the strongest defence of a risky method is its history: nothing has gone wrong for years. Every uneventful shift strengthens the case. A clean record measures luck as accurately as it measures method — and cannot say which.

A RECURRING PATTERN, NOT A SINGLE INCIDENT

The Paid Controlled Trial

After mapping comes validation, and here an honest word is needed — because the instinct at this stage is often to ask for a free sample, and the instinct is wrong in an instructive way.

A tool that costs nothing is rarely tested with the rigour of one that has been specified, ordered and paid for. It tends to be trialled informally, against no particular task and no particular criteria. Nothing was learned, and the exposure it was meant to remove is still on the floor.

A paid controlled trial produces the opposite dynamics, for a simple reason: a real decision is riding on it. In practice, the trial has three defined elements, agreed before anything ships: **the specific tool suited to the mapped task, a defined trial quantity** sufficient for a genuine controlled trial across real shifts, and **success criteria set by your own team, in advance**.

Your team places the order, runs the trial against the task the tool was specified for, and judges the result against the criteria you set — a real, internally credible application validation.

DO THIS

For your next validation, write the success criteria before the order is placed — three lines, agreed with the crew — and judge nothing until the trial has met the awkward version of the task.

Building It Into the Work System

One tool demonstration will not change a plant. What changes a plant is entry into the work system — the point at which a validated method stops being an initiative and becomes simply how the task is done.

The exposure identified, and the hand function named. The tool or method selected, and the worker's standing position defined. The stop-work trigger agreed. The SOP updated, and the lift plan carrying its final-positioning section. The tool kept at the point of use. The supervisor checking the control before the task.

A programme should be measured by exposure reduction, not by purchase. The goal was never to own more tools. The goal is to reduce the number of times a worker's hand becomes the control.

And the system closes its own loop. Reviewed methods surface new exposures; new exposures enter mapping; mapping feeds trials; trials feed standards.

DO THIS

Take the one method your 30 days validated, and make its five entries this month — SOP, lift plan, point-of-use storage, supervisor check, review date. That is a hands-off programme, running.

PART EIGHT

Where This Leads

Who PSC Hand Safety Is

PSC Hand Safety works with industrial organisations to recognise, study and reduce hand exposure through engineering controls, task mapping and practical implementation. The company's work spans heavy industry including oil and gas, steel, aluminium, marine, mining, power and manufacturing.

PSC has worked in industrial hand safety since bringing impact gloves to the Indian market in 2009, and introduced its hands-free, no-touch tool range in 2014. Hand Safety First® is the platform for the thinking itself — exposure mapping, doctrine and engineering-controls education, built on the same foundations as this guide and developed in considerably more depth.

The PSC brands — RiggerSafe®, LoadGuider™, SafeGuider™, Guide-It™, Load-It™, TubularGuider™, Tagline Retriever Tool™, Lift Assist™, EzyLift™, Handle-Tech™ and FingerSaver™ — each exist for a specific point of exposure. Which one fits the task you are looking at is exactly what application mapping is for.

What Sits Behind This Guide

This guide is deliberately the shallow end of a deeper pool. Behind it sits the Knowledge Library, built for teams that want to go further into their own industry, hazard or task.

The Knowledge Library — the Global Hand Safety Report™, the Hand Exposure Control Encyclopedia™, the SOP Library of task-specific procedures, whitepapers on specific hazards, industry guides for steel, aluminium, foundry, oil and gas, marine, cement, mining and ports, audit frameworks, and training materials and field checklists. Available on request.

The application layer — task studies, specific recommendations, trial design and validation support. This layer is not published: it is built per task, from your footage and your constraints, through the mapping this guide has described. PSC also maintains an Experience Centre where teams can work through tool-to-task questions physically before a field trial.

Three tiers, then: this guide, which teaches the seeing; the Knowledge Library, which deepens it by industry and hazard; and the application work, which turns it into a specific method on your specific task.

The Next Task You Observe

The next time you walk through your plant, don't look for unsafe people.

Look for:

the last 300 mm

repeated hand corrections

improvised methods

workers protecting the product with their hands

tasks where everyone already knows the pinch point

tools that exist but are not used

Every one of these observations is an opportunity to remove exposure rather than simply manage it.

8.4

Send Us the Task

If a task on your site puts a hand somewhere it shouldn't have to be, begin with the real application — not with a product.

Share with us a short video or a few photos of the task as it is actually performed, along with the plant or location; the load, material or part being handled and its approximate size and weight; the surface condition and temperature; the existing tools or methods in use; and the specific concern.

We will come back with our reading of the exposure and a specific recommendation — a tool-based method, a revised control, an application trial, or an honest note that the task needs further study.

The first step is not to buy a product. The first step is to understand why the hand is still required.

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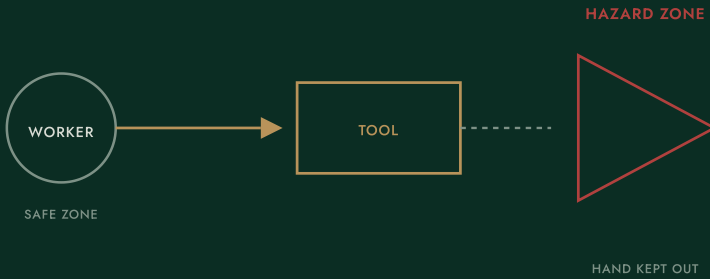


DIAGRAM 11 · The final doctrine diagram

**THE HAND IS NOT THE CONTROL.
THE TOOL IS THE CONTROL.**

ENGINEER THE HAND OUT OF THE HAZARD

Every industrial hand injury asks the same question.

Why did the task require the hand?

ENGINEER THE HAND OUT OF THE HAZARD™

The PSC Guide to Industrial Hand Exposure · Field Edition

A practical field guide for recognising and reducing industrial hand exposure through engineering thinking rather than behavioural correction alone. Written for EHS leaders, plant heads, lifting and rigging supervisors, maintenance and engineering teams, procurement teams and contractors working in heavy industry.

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