ASSP SIF Convening Meeting Analysis, Summary, and Next Steps

Serious Injury & Fatality (SIF) Prevention — Falls from Heights and Lockout/Tagout (LOTO)

Executive Summary

ASSP hosted two independent SIFs Prevention Working Session meetings; one in Chicago and one in Washington DC with the objective of identifying the reasons that existing hazard controls have been unsuccessful in preventing serious injuries and fatalities (SIFs) from falls from heights and lockout/tagout (LOTO) failures. Both meetings used similar techniques whereby the participants were separated into four groups – two focused on falls from heights and two focused on LOTO. Despite different rooms, and different participants, the two meetings agreed on several barriers and solutions. Where input from the two meetings diverged, the differences were largely additive: where each meeting surfaced specifics the other did not, but neither contradicted the other.

Key finding

Across both topics and both meetings, the gap is not a lack of rules, it is a failure to translate hazards, standards, and controls into simple, visible, executable work at the point of task. The most consistent solution direction is to make standards usable (plain-language guides, pictograms, checklists, micro-learning), to move safety upstream (Prevention through Design), and to verify training competence rather than simply track completion.

Top Universal Themes — Present in Both Meetings, Both Topics

Universal barriers

- Training quality is the issue — not training quantity. Generic, infrequent, completion-based, and not task- or role-specific.
- Production pressure, time, cost, and culture systematically defeat written rules.
- Standards are too complex, too expensive, or simply not known by the people who need them such as designers, owners, supervisors, and front-line workers.

- Cultural normalization — "we've always done it this way," "it can't happen to me," false bravado, complacency, shortcuts.
- Subcontractors, temporary workers, and small employers are at greatest risk and hardest to reach.
- Equipment and systems are not designed for safe execution; the worker becomes the compensating control.
- Designers, engineers, and building owners are not trained in or do not apply the relevant standards — Prevention through Design (PtD) remains under-used.
- Communication, coordination, and shift/contractor handoffs fail in multi-employer environments.
- Management buy-in / business case for safety is hard to make.
- Workers are not informed of true risks and thus hazard recognition is weak.

Universal solutions

- Standards-access reform — simpler, cheaper, plain-language guides; pictograms; checklists; "layman's guides to standards."
- Prevention through Design (PtD) — design to remove the need for heroics: anchorages, guardrails, and engineered controls for falls; equipment designed for isolation, automation, and alternative LOTO methods for energy work.
- Training, Hands-on, role-based, task-specific competency training, not annual completion-based delivery.
- Front-line worker engagement in planning, procedure design, and pre-task review.
- Technology as field enabler — QR codes, mobile apps, real-time verification, sensor reminders, micro-learning videos.
- Industry/trade outreach — apprenticeships, NCCER, NECA, IBEW, vocational schools, K–12, youth outreach, military.
- Insurer and economic incentives — workers' comp incentives, safety grants, business case framing.
- Better data and metrics — leading indicators, near-miss reporting, control-quality measures.

1. Falls from Heights — Chicago vs. DC

Falls — what BOTH meetings identified (barriers)

- Training quality and verification gaps — "assumed knowledge," infrequent training, language barriers, weak onboarding, lack of competent persons.
- Equipment, PPE fit, and anchoring design issues — Chicago framed as "PPE design flaws, improper equipment"; DC Falls named specifics (poor anchorage points, missing guardrails, damaged surfaces, suspension trauma, sharp edges, PPE fit by gender/size).
- Economic and time pressure — "cash is king," productivity over safety, deadlines (Chicago); perverse business incentives, prioritizing profit, costs to business not workers (DC).

- Cultural normalization — "it can't happen to me," "we've always done it this way," risk tolerance (Chicago); false bravado, complacency, get-stitches/get-it-done attitude (DC Falls).
- Standards access and complexity — both meetings flagged that standards are not in the hands of the people who need them.
- PtD gaps — designers, engineers, and building owners are not adequately trained in or do not apply fall-protection principles upstream.
- Small employers at greatest risk and hardest to reach.
- Subcontractor and contractor-management issues.
- Planning vs. execution gaps — schedule pressure; setup takes longer than the task; changing environments.

Falls — what BOTH meetings identified (solutions)

- Training reform — standard-based, hands-on, verified, with pre-task planning (Chicago); competent-person training, recurring training, CEUs, tiered qualification (DC Falls).
- Prevention through Design / Z359 education — both meetings called this out by name.
- Front-line involvement and field-level urgency — Chicago: "front-line employee involvement, transparency, pre-qualification beyond bid"; DC Falls: explicit C-Suite buy-in and "articulating the business case."
- Insurance / economic incentive levers — Chicago: "insurance carrier involvement," workers' comp, safety grants; DC Falls: distribute standards through insurance intermediaries; DC Falls: insurance and SBA loans as funding mechanisms.
- Educational outreach to non-traditional audiences — Chicago: K–12 early childhood education; DC Falls: youth outreach (ASSP), military, staffing agency education.
- Partnerships — Chicago: GC + sub partnerships; DC Falls: ASSP-hosted workshops, chapter outreach, vendor partnerships (e.g., Gravitec), Z359 committee engagement.

Falls — Distinctive emphases by meeting

Dimension	Chicago Falls	DC Falls
Solution sequencing	Explicitly separated Short-Term vs. Long-Term solutions on the flipchart	No explicit time-horizon split; solutions grouped by theme
Regulatory teeth	Stiffer penalties for repeat offenders; piercing the corporate veil for fatalities; OSHA-sponsored NEPs for companies under 100 employees	Did not surface enforcement-focused solutions; emphasized voluntary access and outreach instead
Standards access economics	Generally framed as access/cost issue	DC Falls went deeper: subscription pricing by business size, copyright laws, licensing agreements as specific structural barriers
Physical hazard specificity	Equipment & design treated as a single cluster	DC Falls listed specific physical hazards: suspension trauma, sharp edges, gravity, adverse weather,

		missing guardrails, damaged surfaces
Delivery-channel specificity	K–12 early childhood education; insurance carriers; OSHA NEPs	DC Falls named more channels: VR, military, Gravitec, TWI, Z359 committee, CEUs, SBA loans, chapter outreach, youth outreach
Worker-empowerment framing	"This is why we have insurance" attitude as cultural barrier	DC Falls: "keep mouth shut as a new person to show boss they are a team player"; lack of worker empowerment; Falls Group 4: authority — when can a worker call a safety stop?
Articulating value	Captured implicitly through business-case grants/penalties	DC Falls: "articulating the business case" listed explicitly as a CULTURE barrier; "C-Suite buy-in" as ORG barrier

2. Lockout/Tagout (LOTO) — Chicago vs. DC

LOTO — what BOTH meetings identified (barriers)

- Knowledge and training gaps at all organizational levels — engineers untrained in LOTO, workers uninformed of energy risks, minor servicing vs. LOTO confusion (Chicago); lack of worker training, language, awareness of hazards, competence definition unclear (DC).
- Equipment and technology gaps — outdated/ineffective equipment, no real-time information on when LOTO is needed, standardization difficulty, complexity of lock types (Chicago); no zero-energy verification, system installation/maintenance, "we rely on a small little lock that the person applies" (DC LOTO).
- Conflicting and outdated standards — Chicago framed as standardization difficulty and OSHA disconnects; DC named specifics (A10.44 vs. Z244.1; OSHA outdated; 70E too expensive; lack of uniform standard for Construction vs. General Industry).
- Production pressure / cost / time / management buy-in — "production pressure creating goal conflict" (Chicago); "competing priorities (e.g., time)"; "LO/TO takes too long" (DC LOTO).
- Multi-employer, multi-shift, contractor-coordination failures — Chicago: multiple contractors running multiple LOTO programs, multi-shift handoffs; DC: lack of coordination with host employer, temps need to be told about LOTO operations, multi-trade jobsites.
- Cultural shortcuts and "I know what I'm doing" mentality — Chicago: normalization of deviation; DC LOTO: "I know what I'm doing, I don't need LOTO," "I've always done it this way."
- Small-employer resource constraints — both meetings.
- Procedural / administrative burden — Chicago: high turnover keeping procedures current, perception of LOTO as paperwork; DC: incorrect procedures or no procedures, insufficient planning, application questions.

LOTO — what BOTH meetings identified (solutions)

- Technology as a field enabler — Chicago: QR codes for real-time status, mobile verification apps, micro-training videos; DC LOTO: AI Amplifier, sensor reminders, delay-to-restart, "alternative LOTO" methods.
- Prevention through Design / equipment specifically designed for LOTO — both meetings, by name. DC LOTO explicitly: "design of equipment to prevent the need for LO/TO."
- Just-in-time, work-integrated training — Chicago: LOTO procedures built into work orders; DC LOTO: incorporate into JHA and use a checklist; micro-learning content.
- Plain-language and visual guidance — Chicago: low-cost visuals, clear communication; DC LOTO: simple-to-understand pictograms instead of words; layman's guides to standards.
- Standardization toward a single consensus standard — Chicago: standardization implied; DC LOTO: "one consistent standard — Z244.1."
- Apprenticeship and trade-association engagement — Chicago: big-company role models, local outreach; DC: NCCER, community college, NECA / IBEW trade engagement.
- Buddy systems and verification — DC explicit ("buddy system for LO/TO"); Chicago implicit in mobile verification apps.
- Demonstrate VALUE for management buy-in — Chicago's one-word answer; DC LOTO: "must be a value, not just a priority."
- Small-employer support — Chicago: low-cost visuals, big-company role models, insurance resources; DC: free / lower-cost training, data center / renewable jobsite guides.

LOTO — distinctive emphases by meeting

Dimension	Chicago LOTO	DC LOTO
Prioritization	Explicitly voted top 5 problems; Technology/Cost/Equipment ranked #1, Management Buy-in #5	No explicit voting; barriers organized by category but not prioritized
Management buy-in	Single, pointed answer for management buy-in: "Demonstrate VALUE"	DC LOTO: "Must be a value, not just a priority" — same intent, more elaborated
Standards conflict specificity	General statement that OSHA is outdated and standards are hard to use	Named specific conflicts: A10.44 vs. Z244.1; 70E cost; Construction vs. General Industry uniformity gap
Equipment-control specificity	Equipment cluster framed broadly (outdated, lack of real-time info, lock complexity)	DC LOTO went granular: SCADA implementation, sensor reminders, delay-to-restart, test points outside breakers/panels mandatory, electronic off-site control of energy, "alternative LOTO"
AI / technology trust	Captured the sentiment vividly: "At my age, I don't trust AI for LOTO. Convince me!"	DC LOTO: "AI — we keep trying but it's not 100% reliable" — same trust gap, different voice

Procedural-quality framework	Captured implicitly through procedure complexity and turnover	DC LOTO "Rules of Rules": (1) fully known, (2) makes sense, (3) consistently enforced — explicit governance test
Worker role in solution	Chicago: "big-company role models," implied	DC LOTO: "LO/TO workers as teachers / communicators" — explicit
Standards advocacy	Implied in "modernize OSHA resources and standards"	DC LOTO: "Advocating + lobbying for prevention through design"; "Advocacy of building codes / standard integration" — explicit channel for ASSP

3. Cross-Cutting Themes — Both Meetings, Both Topics

When the four sources are read together — Chicago Falls, Chicago LOTO, DC Falls, DC LOTO — ten barrier patterns and ten solution patterns appear in every dataset. The strength of these cross-cutting themes is the most important finding of this combined analysis: they are not artifacts of any one room or any one facilitator.

Ten universal barriers (across both meetings AND both topics)

- 1. Hazards are not visible enough at the point of work — workers, supervisors, and designers do not always see the energy source, the changing anchor condition, or the task-specific exposure.
- 2. Training is generic, infrequent, and completion-based — not task-, role-, or system-specific; competence is assumed rather than verified.
- 3. Production pressure, time, and cost systematically defeat written safety rules.
- 4. Standards are too complex, too expensive, or unknown to the people who need them — designers, building owners, contractors, supervisors, and front-line workers.
- 5. Cultural normalization — "we've always done it this way," "it can't happen to me," false bravado, complacency, shortcuts.
- 6. Subcontractors, temporary workers, and small employers are at greatest risk and hardest to reach.
- 7. Equipment and systems are not designed for safe execution; the worker becomes the compensating control.
- 8. Multi-employer, multi-shift, contractor-coordination failures — host-employer, GC-sub, and shift-handoff dynamics produce ambiguity.
- 9. Management buy-in / business case for safety is hard to make.
- 10. Worker empowerment to stop work, raise concerns, or refuse unsafe assignments is inconsistent.

Ten universal solutions (across both meetings AND both topics)

- 1. Prevention through Design (PtD) — design out the need for heroics; engineer fall protection and energy isolation into equipment, structures, and work methods.
- 2. Standards-access reform — simpler, cheaper, plain-language guides; pictograms; checklists; layman's guides to standards.
- 3. Hands-on, role-based, task-specific competency training — verify ability, not attendance.
- 4. Front-line worker engagement in planning, procedure design, and pre-task review.
- 5. Technology as a field enabler — QR codes, mobile apps, real-time verification, sensor reminders, micro-learning videos, AI-supported and human-verified.
- 6. Industry and trade outreach — apprenticeships, NCCER, NECA, IBEW, vocational schools, K–12, youth outreach, military, staffing agencies.
- 7. Insurer and economic incentives — workers' comp incentives, safety grants, business-case framing, demonstrate VALUE.
- 8. Standardization toward consensus standards — Z244.1 for LOTO, Z359 for falls, Z490.1 for training (DC and Chicago combined).
- 9. Better data and metrics — leading indicators, near-miss reporting, control-quality and readiness measures rather than activity counts.
- 10. Standards advocacy and intermediary-driven access — distribute through insurance, trade associations, ASSP chapters, and consensus committees, especially to small employers.

4. What Each Meeting Uniquely Contributed

Unique contributions from the Chicago meeting

- Explicit problem prioritization — the LOTO group voted top-5 problems with rankings, providing a sequencing signal that DC did not produce, but this was an artifact of the directions the groups received.
- Short-Term vs. Long-Term solution split for Falls — explicit feasibility/sequencing lens.
- Regulatory enforcement levers — stiffer penalties for repeat offenders, piercing the corporate veil for fatalities, OSHA-sponsored NEPs for companies under 100 employees.
- K–12 early childhood safety education as a long-horizon solution.
- The most quotable formulation of two key insights: "Demonstrate VALUE" (one-word LOTO management-buy-in answer) and "At my age, I don't trust AI for LOTO. Convince me!" (captures the AI trust-gap).
- Use of HOP, SIF/PSIF, MOC, P+J, and ESWC technical terminology — practitioner-grade shorthand that signals deep engagement from those participants.

Unique contributions from the DC meeting

- Group-level structural framing — DC produced four distinct organizing schemes (OPS / ORG / CULTURE for Falls; Competing Priorities / Regs+Stds / Training for LOTO; Regulations / Process / Behavior / Equipment / Training for LOTO) that each surface different facets.
- Standards-access economics specificity — Falls named subscription pricing by business size, copyright laws, and licensing agreements as explicit structural barriers.
- Specific delivery channels — VR, military, Gravitec, TWI, Z359 committee, CEUs, SBA loans, data-center and renewable-jobsite guides, NECA / IBEW engagement.
- Equipment-control specificity for LOTO — SCADA, sensor reminders, delay-to-restart, test points outside breakers/panels, electronic off-site control of energy, "alternative LOTO," automated custom-matching tech for locks.
- Named specific standards conflicts that matter most — A10.44 vs. Z244.1; OSHA vs. Z244.1; 70E too expensive; lack of uniform standard for Construction vs. General Industry.
- "Rules of Rules" governance test (DC LOTO) — explicit three-part check: (1) fully known, (2) makes sense, (3) consistently enforced.
- Explicit standards-advocacy framing — DC LOTO: "Advocating + lobbying for prevention through design" and "Advocacy of building codes / standard integration" name a concrete ASSP role.
- Worker-empowerment language as a barrier — "keep mouth shut as a new person to show boss they are a team player" (Falls); "authority — when can a worker call a safety stop?" (Falls) — names a specific cultural mechanism.
- Articulating the business case treated as a barrier in itself, not just a solution gap (Falls CULTURE column).

5. Strongest Convergent Findings — Where the Two Meetings Reinforce Each Other

The following insights appear in both meetings, in both topics, and through multiple groups.

Finding 1: PtD is the highest-leverage upstream intervention

Every group in both meetings named Prevention through Design as the most important upstream solution — for falls (anchorages, guardrails, building design, value-engineering review) and for LOTO (equipment designed for isolation, automated lock-matching, alternative LOTO methods, building codes that reference PtD best practice). The barrier side is equally consistent: designers, engineers, and building owners do not know or do not apply the relevant standards.

Finding 2: Standards must be made usable, not just available

Both meetings concluded that the issue is not access to rules — it is converting rules into usable decisions at the point of work. Chicago framed this as "compliance vs. execution"; DC named the specific economic and legal barriers (subscription pricing, copyright, licensing) and the consensus

solutions (Z244.1 single standard, Z359 alignment, Z490.1 for training). The shared answer is plain-language guides, pictograms, checklists, and layman's translations distributed through trusted intermediaries.

Finding 3: Training quality, not training quantity, is the gap

Both meetings rejected annual completion-based training as sufficient. Both called for hands-on, role-based, system-/task-specific competency verification. Both named apprenticeship integration, micro-learning, and just-in-time field aids as the delivery model. DC adds VR, CEUs, tiered qualification, and military/staffing-agency partnerships as specific channels.

Finding 4: Small employers and contractors are the underserved population

Both meetings flagged small employers and subcontractors as the population at greatest risk and hardest to reach. Both pointed to the same delivery-channel mix: insurance intermediaries, trade-association outreach, low-cost visual tools, big-company role models, consensus-based templates. Chicago added regulatory levers (OSHA NEPs for <100 employees) that DC did not surface.

Finding 5: Technology is both a barrier and a solution — design it around the worker

Both meetings treat technology with measured optimism. The solution side names QR codes, mobile apps, real-time verification, sensor reminders, micro-learning videos, and AI-amplified tools. The barrier side names AI distrust, integration failures, and the risk that technology adds complexity rather than removing it. Both meetings agreed: technology should reduce cognitive load, not become another layer the worker must work around.

Finding 6: Management buy-in answers to one word — VALUE

Chicago answered the management-buy-in question with a single word: VALUE. DC LOTO phrased it as "Must be a value, not just a priority." DC Falls named the inverse barrier: "articulating the business case" and "C-Suite buy-in." The convergence is striking. Across two meetings, the diagnosis and the prescription are the same — safety must be framed as operational value, not as a compliance cost.

Finding 7: Worker empowerment and "speak-up" culture are foundational

Both meetings surface this from different angles: Chicago through "unwillingness to hold others accountable" and "front-line employee involvement" as a solution; DC through "keep mouth shut to show boss they are a team player," "authority for safety stop," and "LO/TO workers as teachers/communicators." The shared prescription is to bring front-line workers and worker reps into design and planning — not just into execution.

6. Implications for ASSP

Two independent meetings, with different participants and different facilitation formats, produced the same diagnosis and the same solution direction. That convergence is itself a finding: it gives the meetings a high confidence that the following priorities would be supported by the broader practitioner community.

Recommended priorities for cross-society action

- Lead an industry push for Prevention through Design adoption — particularly in building codes, value-engineering decisions, and equipment procurement. Both topics, both meetings.
- Reform standards access and delivery — pursue plain-language guides, pictograms, checklists, and "layman's translations" of A10/A35, Z244.1, Z359, Z490.1, and 70E. Examine subscription-pricing, copyright, and licensing models that limit small-employer access (DC Falls specific).
- Lead a campaign to redefine training as competency verification, not completion. Develop and endorse role-based, task-specific, hands-on training pathways with tiered qualification (DC Falls specific) and just-in-time field aids (Chicago LOTO specific).
- Build and validate small-employer / contractor delivery channels — insurance intermediaries, trade-association partnerships, big-company role-model programs, and ASSP chapter outreach. Consider pursuing OSHA NEPs for companies under 100 employees (Chicago specific).
- Define and promote control-quality and readiness metrics that measure whether safe work is actually achievable, not whether forms were completed. Pair with near-miss learning loops.
- Use technology to simplify, not impress — QR-coded procedures, real-time verification, sensor reminders, micro-learning, AI-supported and human-verified tools.
- Engage front-line workers and worker reps as designers of work — not just executors. Strengthen psychological-safety and stop-work norms.
- Frame safety as operational VALUE — not a compliance cost — in every executive-facing communication. Equip safety professionals with the data and language to make this case.

Suggested Next Steps

Reform Standard’s Access and Usability

Both meetings concluded that the problem is not a lack of standards and regulations but that the rules are not usable at the point of work, especially for small employers.

Actions:

- Produce free, plain-language “Layman’s Guides” to Z359 (falls), Z244.1 (LOTO), and Z490.1 (training) — with pictograms, checklists, and decision trees targeted at supervisors and front-line workers.

    - Formally examine and propose reforms to subscription-pricing models, to develop a tiered standards-access program — scaled pricing and/or free access for employers under a certain number (eg 50 employees)
- Pursue harmonization of LOTO standards: advocate for a single, unified standard reconciling OSHA, Z244.1, A10.44, and NFPA 70E, with a consistent framework covering both General Industry and Construction.
- Create concise field guides or short videos optimized for mobile viewing that highlight essential standard requirements.

Redefine Training as Competency Verification, Not Completion

Both meetings rejected annual completion-based training as insufficient. The preferred model is hands-on, role-based, task-specific, and verified.

Actions:

- Develop and endorse a tiered qualification framework for fall protection and LOTO
    - competent person, and authorized person levels — with observable performance criteria, not just attendance records.
- Create a library of micro-learning videos (2–5 minutes) for just-in-time delivery: pre-task fall planning, LOTO procedure steps, hazard recognition scenarios. Make customizable templates freely available via QR codes on ASSP's website and partner platforms.
- Integrate ASSP fall and LOTO training modules into NCCER, NECA, IBEW, and vocational school apprenticeship curricula.
- Publish a white paper and model training standard built on Z490.1 that operationalizes the shift from "completion" to "competency" — giving employers a concrete replacement framework.

Build Delivery Channels to Reach Small Employers and Contractors

Small employers and subcontractors are the highest-risk, hardest-to-reach population identified across all groups.

Actions:

- Encourage ASSP chapters to conduct targeted outreach workshops for small contractors (e.g. with fewer than 100 employees.)
- Partner with the Small Business Administration (SBA) and workers' compensation insurers to bundle ASSP plain-language falls and LOTO resources into safety incentive and grant programs.
- Develop and host a "Big Company Role Model" program encouraging large employers and GCs to share their LOTO and fall protection templates with their supply chains and subcontractors at no cost.
    - Consider hosting in-person meeting events to support the program.

- Create a “Safety Resource Kit for Small Contractors” — a single-page visual guide, a LOTO procedure template, and a fall protection checklist — distributed through insurance brokers, trade associations, and GC prequalification processes.

Champion Prevention through Design (PtD)

PtD was consistently named across both meetings and both topics as a high-leverage intervention.

Actions:

- Launch a PtD working group led by ASSP to develop model language for building codes and equipment procurement specifications that mandate fall protection anchorages, guardrails, and energy-isolation design features.
- Develop a free “PtD Checklist for Designers and Building Owners” — a one-page tool covering the most common fall and energy hazard decision points during design and value-engineering review.
- Advocate for building codes to explicitly reference PtD best practices for fall hazard controls and energy isolation, particularly for data centers and renewable energy jobsites where trades are rapidly expanding.

Deploy Technology to Simplify, Not Add Complexity

Both meetings expressed measured optimism about the use of technology, paired with a clear warning that it must reduce cognitive load, not add to it.

Actions:

- Develop a QR-code-based LOTO and fall-protection field reference system that workers can scan at the point of task to access a plain-language procedure, pictogram, or micro-learning clip. This may be piloted through ASSP chapter partnerships.
- Publish a technology implementation guide for safety professionals addressing: QR-coded procedures, mobile verification apps, sensor-based reminders, and AI-assisted tools, including a section specifically on communicating AI reliability limitations to skeptical workers and managers.
- Establish a technology working group to evaluate and endorse tools that meet the “simplify, don’t impress” standard — prioritizing real-time verification, automated lock-matching, and delay-to-restart systems for LOTO.

Appendix A — Side-by-Side Falls Theme Map

Dimension	Chicago Falls	DC Falls
Training & knowledge	Poor quality, infrequent, language barriers, assumed knowledge, weak onboarding	Lack of competent persons; lack of SME in design process; recurring training; CEUs; tiered qualification; highly technical language
Equipment & design	PPE fit/availability, anchoring design flaws, employer failure to provide proper equipment	Falls: poor anchorages, missing guardrails, damaged surfaces, suspension trauma, sharp edges, gravity, weather, PPE fit by gender/size
Economic & cost pressure	"Cash is king," productivity over safety, "this is why we have insurance"	Perverse business incentives; prioritizing profit; risk analysis focused on cost to business not workers
Cultural normalization	"It can't happen to me"; risk tolerance; "we've always done it this way"; shortcuts	Falls: false bravado; complacency; over-confidence; lack of imagination; lack of motivation; "get stitches/get it done"
Planning vs. execution	Schedule pressure; setup takes longer than task; changing environments; conflicting regulations	Lack of preparation; not reading instructions; impractical rules; scope of "fall protection" not clear
PtD / design-side	PtD/Z359 named as solution	PtD will only be "accepted by engineers"; lack of designer/engineer knowledge of standards; building owners not engaged in PtD
Standards access	Generally framed; standards too hard to use	Falls specific: subscription pricing by size, copyright, licensing; intermediary distribution
Delivery channels	K–12; insurance carriers; safety grants; OSHA NEPs; GC+sub partnerships	Falls: VR; military; Gravitec; TWI; Z359 committee; CEUs; SBA loans; chapter and youth outreach
Enforcement	Stiffer penalties; piercing corporate veil	Not surfaced
Worker empowerment	Unwillingness to hold others accountable	"Keep mouth shut to be a team player"; authority — when can a worker call a safety stop?

Appendix B — Side-by-Side LOTO Theme Map

Dimension	Chicago LOTO	DC LOTO
Knowledge & training	Engineers untrained, workers uninformed, minor servicing vs LOTO confusion, knowledge gaps at all levels	LOTO: training, lack of worker training, language, info not in worker's hands, competence; LOTO: provide ANSI standard education, hazard recognition, competence definition
Technology, cost, equipment	Top-voted; outdated/ineffective equipment; no real-time info on when LOTO is needed; standardization difficulty; lock-type complexity	LOTO: no zero-energy verification; system installation/maintenance; "small little lock"; SCADA; test points outside breakers; advances in tech are optional
Standards conflicts	OSHA outdated; standards hard to use	LOTO: outdated regulations, OSHA outdated, awareness of Z244.1, Construction vs General Industry uniformity gap, low awareness of ASSP standard; LOTO: A10.44 vs Z244.1, 70E too expensive, building codes don't reference PtD
Production / cost / time	Production pressure creating goal conflict; management not understanding need	LOTO: competing priorities (e.g., time); LO/TO takes too long; cost; resourcing; financial; timelines
Multi-employer / shift	Multiple contractors running multiple LOTO programs; multi-shift handoffs; contractor vs operator practice gaps	LOTO: multi-trade jobsites — working around electrical; host employer dynamic; LOTO: lack of coordination with host; temps need to be told about LOTO operations
Culture / shortcuts	Normalization of deviation; shortcuts; production > safety	LOTO: "common sense not common practice"; "it's not going to happen to me"; LOTO: "I know what I'm doing," "I've always done it this way"
Procedural / admin	One LOTO per shift change; high turnover; key control; LOTO as paperwork	LOTO: incorrect procedures or no procedures; insufficient planning; application questions; failure to verify
Small-employer support	Low-cost visuals; local outreach; big-company role models; insurance resources	LOTO: free/low-cost training; data-center / renewable-jobsite guides for trades
Technology solutions	QR codes; mobile verification apps; micro-training videos	LOTO: AI Amplifier; sensor reminders; delay-to-restart; alternative LOTO; tech-driven standards; LOTO: automated custom-matching tech for locks
Standardization solution	Implied through standardization theme	LOTO explicit: "One consistent standard — Z244.1"
Management buy-in	"Demonstrate VALUE" (one-word answer)	LOTO: "Must be a value, not just a priority"

Verification / buddy	Implicit in mobile verification apps	LOTO explicit: "Buddy system for LO/TO"
Standards advocacy	Implied in "modernize OSHA resources and standards"	LOTO explicit: advocating + lobbying for PtD; advocacy of building codes / standard integration