SAUDI ARAMCO WPR EXAM PREPARATION SERIES

CHAPTER 3

Isolation & Energy Control (LOTO)

Work Permit Receiver (WPR) Certification Exam Preparation

Aligned to Saudi Aramco GI-2.100 Work Permit General Instruction

WHAT'S INSIDE THIS CHAPTER

- ✓ Complete instruction guide — Sections 3.1 to 3.5
- ✓ Common exam questions with full explanations
- ✓ Original incident case study with lessons learned
- ✓ 20 chapter practice questions with answer key
- ✓ 200-question exam bank across 8 categories
- ✓ Short form to full form abbreviations appendix

Introduction to Chapter 3

Isolation and energy control is one of the highest-consequence areas of the Work Permit Receiver's responsibilities. Where Chapter 2 focused on identifying and assessing hazards before work begins, this chapter focuses on the physical and procedural controls used to make hazardous energy safe to work around — and, just as importantly, on how a WPR verifies that those controls are real, not assumed.

Isolation-related incidents are consistently among the most severe in industrial operations, because a failure in isolation typically means energy is released directly onto a worker who believed the equipment was safe. This chapter builds the WPR's ability to recognize every form of hazardous energy present on a job, understand the isolation methods used to control each one, verify that isolation has genuinely achieved a zero energy state, and manage the isolation process safely through multi-craft group work, shift handovers, and emergencies.

> **HOW THIS CHAPTER FITS THE SERIES**
>
> This chapter should be read alongside Chapter 1 (Permit to Work Fundamentals) and Chapter 2 (Hazard Identification & Risk Assessment). Isolation and energy control decisions are made within the same JSA and risk assessment framework covered previously — this chapter goes deeper into the isolation-specific requirements referenced there.

3.1 Understanding Hazardous Energy

Before any isolation can be planned, every source of hazardous energy affecting the job must be identified. Hazardous energy is any form of energy that, if uncontrolled, could cause injury — and equipment is rarely governed by only one type.

3.1.1 The Eight Forms of Hazardous Energy

Energy Type	Common Sources	Typical Isolation Method
Electrical	Motors, panels, breakers, capacitors, cables	Breaker lockout, disconnect, verified de-energization (voltage test)
Mechanical / Kinetic	Rotating shafts, flywheels, conveyors, agitators	Mechanical brake/block, motor lockout, confirmed stop
Hydraulic	Accumulators, hydraulic lines, actuators	Pressure relief/bleed, isolation valve lockout, gauge verification
Pneumatic	Compressed air receivers, instrument air, gas purge lines	Bleed to atmosphere, valve lockout, gauge verification
Gravitational / Potential	Suspended loads, elevated platforms, counterweights	Mechanical blocking, load lowering, physical restraint
Thermal	Hot process lines, steam, furnaces, recently operated equipment	Cooling period, temperature verification, insulated PPE
Chemical	Residual process fluid, reactive materials, vapors	Draining, purging/flushing, blinding, gas testing
Pressure (Process)	Pressurized vessels, pipelines	Double block and bleed, blind installation, gauge verification

3.1.2 Why Multiple Energy Sources Matter

A single pump might have electrical energy driving the motor, hydraulic or process pressure in the casing, thermal energy if the fluid is hot, and residual kinetic energy in the coasting shaft after shutdown.

Isolating only the electrical supply leaves three other hazards live. A thorough energy identification step — not a single-source assumption — is the foundation of every isolation plan.

- Review P&IDs and isolation history to trace every connected energy path, including cross-connections to shared headers.
- Conduct a physical walk-down of the equipment rather than relying on drawings alone.
- Consider hidden or non-obvious sources: backup power feeds, shared utility headers, and residual stored energy.
- Document every identified energy source on the Isolation Certificate, not only the most obvious one.

3.2 Lockout / Tagout (LOTO) Fundamentals

Lockout/Tagout is the administrative and physical control that makes an isolation defensible. A lock physically prevents an isolation device from being operated; a tag communicates who applied it, why, and when. Together, they turn a technical isolation action into a controlled, accountable state.

3.2.1 Core LOTO Sequence

- Notify affected personnel that isolation is about to begin.
- Shut down the equipment through normal operating procedure.
- Isolate all identified energy sources at the verified isolation points.
- Apply lockout devices and tags — each exposed worker applies their own personal lock.
- Release stored/residual energy and verify a zero energy state at the point of work.
- Only then may work begin under the signed Permit to Work.

3.2.2 Personal Locks and Group Lockout

Every individual exposed to the isolated hazard should apply their own personal lock — never share a lock or key. When more than one person or craft is involved, a lockout hasp or group lock box allows each individual's lock to be added to a single isolation point. Because every lock must be removed by its own owner, no single person can restore energy while someone else remains exposed.

> **KEY CONTROL PRINCIPLE**
> A shared key removes individual accountability. If one worker holds a key that controls another worker's protection, the entire purpose of personal lockout is defeated. Each lock, one key, one worker — no exceptions.

3.3 The Isolation Certificate and Permit Integration

The Isolation Certificate is the formal record confirming which isolation points apply to a job, the method used at each, and verification that isolation is complete. It is cross-referenced to the Permit to Work, and in most systems a permit cannot be validly issued until the isolation it depends on has been certified.

3.3.1 What the WPR Must Verify

- The Isolation Certificate reference number on the permit matches the tag found in the field.
- Every isolation point listed on the certificate is physically present and correctly positioned — not just the most visible ones.
- The limit of isolation boundary matches the actual scope of work.
- Any change in work scope triggers a stop, notification, and an amended certificate before continuing.

3.3.2 Field Verification, Not Paperwork Trust

A completed Isolation Certificate is a starting point, not a substitute for a field check. The WPR is responsible for physically walking the isolation boundary and confirming that what is written matches what is real before signing on to the permit. This single habit — verify in the field, every time — is the most effective defense against isolation-related incidents.

> **SEE CASE STUDY**
> Case Study: Isolation Bypass During a Pump Seal Replacement illustrates exactly this failure mode — see the full case study later in this chapter.

3.4 Positive Isolation Techniques

Positive isolation means a physical, verifiable barrier against energy release — something that can be seen and confirmed, not just a valve position that must be trusted. The method selected depends on the risk level, fluid or energy hazard class, and duration of the work.

3.4.1 Isolation Method Comparison

Method	Description	Best Suited For
Single valve closure	One valve closed, not locked	Not acceptable as sole isolation for hazard-rated work
Single valve + lock	One valve closed and locked out	Low-risk, single-source isolation only
Double block and bleed	Two valves closed in series with a monitored bleed/vent between them	Medium to high-hazard line breaking, valve maintenance
Blind flange / spade	Solid plate physically inserted to block the line cross-section	High-hazard line breaking, vessel entry preparation
Spectacle blind	Plate with open and closed positions on a single hinge point	Frequent isolation/de-isolation cycles requiring visual status
Physical disconnection	Complete removal of a spool, cable, or coupling	Highest-hazard or long-duration isolations
Mechanical block/restraint	Physical block, pin, or brace preventing motion	Suspended loads, spring-loaded or gravity-driven mechanisms

3.4.2 Double Block and Bleed in Practice

Two block valves are closed in series, with a bleed or vent valve opened to atmosphere between them. If either block valve leaks, the escaping fluid vents safely through the open bleed point rather than building pressure — and a pressure gauge on the bled section gives continuous confirmation that no leak-through is occurring.

3.4.3 Blinds, Spades, and Spectacle Blinds

A blind flange or spade physically blocks the pipeline cross-section and cannot leak the way a valve seat can. A spectacle blind — a plate with an open position and a closed (blinded) position on a single hinge — allows quick visual confirmation of isolation status without fully removing the device. All blinds should be tracked on a blind list recording installation and removal, and correct pressure rating and material must be confirmed before installation.

3.5 Verification, Group Work, and Special Situations

3.5.1 Zero Energy Verification

Zero energy state is confirmed, not assumed. Verification is active and specific to the energy type: a calibrated voltage test at the point of work for electrical circuits, a try-out attempt to start mechanical equipment, confirmation that pressure gauges read atmospheric, and physical blocking of any stored mechanical or gravitational energy such as suspended loads.

- Test the test instrument itself before and after use, to rule out a false 'no voltage' reading.
- Verify at the actual point of work, not only at the isolation point — conditions can differ along the system.
- Repeat verification if work is interrupted for an extended period or isolation status may have changed.

3.5.2 Group Lockout, Multi-Craft Coordination, and Shift Handover

On larger or multi-craft jobs, a designated lockout coordinator maintains a live log of every individual currently protected under a group lockout point. At shift change, a documented handover of isolation and lock status — not a general job update — is required so the incoming WPR knows exactly what remains isolated and why.

3.5.3 Emergency Situations and Special Cases

Isolation locks generally remain in place during an emergency evacuation unless their removal is specifically required to control the emergency itself. Emergency removal of another worker's lock requires a documented, authorized procedure — never an informal decision by a single supervisor. In every special case, the guiding principle is the same: verified worker safety takes priority over schedule, cost, or convenience.

> **COMMON MISCONCEPTION**
> An emergency stop button is not a substitute for LOTO. It may not isolate every energy source, and it does nothing to prevent an unexpected restart once the emergency condition clears.

Common Exam Questions

Q1. What is the difference between isolation and lockout/tagout?

Isolation is the technical act of interrupting a hazardous energy source (closing a valve, opening a breaker, installing a blind). Lockout/Tagout (LOTO) is the administrative and physical control layered on top of isolation — the lock and tag prevent the isolation device from being operated or removed by anyone other than the person who applied it, and the tag communicates who applied it and why. Isolation without LOTO can be silently reversed; LOTO makes the isolation state visible and defensible.

Q2. Why is a single closed valve not considered positive isolation for high-hazard work?

A valve seat can wear, leak, or be inadvertently reopened. It gives no independent, verifiable confirmation that the line is truly isolated. Positive isolation methods — blind flanges, spectacle blinds, double block and bleed with a monitored bleed point, or full physical disconnection — provide a barrier that can be visually and physically confirmed, which a single valve cannot.

Q3. What should a WPR do if the Isolation Certificate number on the permit doesn't match the tag found in the field?

Stop. Do not proceed on the assumption that one of the two is correct. Report the discrepancy to the Issuing or Isolating Authority immediately and have it resolved and reconciled before any work starts. Mismatches like this are one of the most common precursors to isolation-related incidents.

Q4. How does group lockout protect multiple workers on the same job?

A lockout hasp or group lock box allows every individual exposed to the hazard to apply their own personal lock to the same isolation point. Because every lock must be removed by its own owner before the isolation can be released, no single person — including a supervisor — can restore energy while someone else is still exposed.

Q5. What is 'zero energy state' and how is it verified, not just assumed?

Zero energy state means all identified hazardous energy sources affecting the job have been isolated and confirmed to be at a safe level — not simply switched off. Verification is active: testing with a calibrated voltage tester for electrical circuits, a try-out (attempt to start) for mechanical equipment, confirming gauges read atmospheric for pressure systems, and physically blocking stored mechanical energy such as suspended loads or springs.

Q6. What is your responsibility as a WPR if you discover isolation is inadequate for the scope of work?

Do not proceed. Escalate immediately to the Isolating Authority or Issuing Authority so the isolation can be corrected or extended to cover the actual scope. Proceeding on inadequate isolation — even for a 'quick' task — is one of the most frequently cited root causes in energy-release incident investigations.

Q7. Why must a WPR verify isolation in the field rather than relying on the Isolation Certificate alone?

Paperwork can be outdated, transcribed incorrectly, or based on a plan that changed during execution. A physical field verification — walking down the isolation points, confirming locks/tags/blinds are actually in place — is the only way to confirm that what is written matches what is real.

Q8. What happens to isolation locks during an emergency evacuation?

Isolation locks generally remain in place unless their removal is specifically necessary to control the emergency itself. Evacuating a work area does not, by itself, justify removing isolation — the hazardous energy is still present and unrelated to the evacuation trigger unless stated otherwise.

Q9. Who has the authority to suspend a permit if conditions become unsafe?

Any competent authorized person recognizing an unsafe condition — including the WPR, the Area Authority, or the Issuing Authority — has both the authority and the obligation to suspend work. Safety authority in a Permit to Work system is never limited to a single role; it is distributed to whoever identifies the hazard first.

Q10. What is the correct response if a colleague pressures you to skip an isolation verification step to save time?

Decline, and follow the proper isolation procedure regardless of time pressure. If the pressure continues, escalate the concern through the appropriate supervisory or safety channel. Schedule pressure is never an acceptable reason to bypass a verification step designed to prevent energy-release injuries.

Q11. What is the purpose of an isolation walk-down before breaking a flanged line?

A walk-down physically traces the isolation boundary from the point of work back to (and including) each isolation device, confirming that every valve, blind, or disconnect listed on the certificate is genuinely in the position and condition the paperwork claims. It catches errors that a desk review of the certificate alone cannot.

Q12. Why is documentation required for zero energy verification instead of just a verbal confirmation?

Documentation creates an auditable, time-stamped record that does not rely on memory. It allows anyone reviewing the job afterward — including during an incident investigation — to see exactly what was checked, by whom, and when, rather than relying on someone's recollection of a verbal exchange.

Incident Case Study

Case Study: Isolation Bypass During a Pump Seal Replacement

A maintenance crew was assigned to replace a mechanical seal on a centrifugal pump handling a hydrocarbon process fluid. The Isolation Certificate specified two isolation valves — an upstream suction valve and a downstream discharge valve — to be closed and locked, with a spade to be inserted at the pump discharge flange as the positive isolation for the flange-breaking work.

On the day of the job, the isolating technician closed and locked both valves as specified but was called away to attend an unrelated urgent task before the spade could be installed. The isolation was logged in the register as 'in progress' rather than 'complete,' but this distinction was not clearly communicated to the WPR taking over the crew for the afternoon shift.

The incoming WPR reviewed the Isolation Certificate, saw that both valves were shown as locked in the field, and — without independently confirming the spade had been installed — signed on to the permit and authorized the crew to begin breaking the discharge flange. The crew assumed the valves alone constituted the isolation the certificate described.

As the final bolts were removed, a small quantity of residual pressurized hydrocarbon fluid trapped between the discharge valve and the flange was released. A worker sustained a minor chemical exposure injury and was treated on site; the release was contained without further escalation, but the flange work was halted immediately and the area was evacuated as a precaution.

The investigation found that the root cause was an incomplete isolation state being logged as 'in progress' without a clear, distinct visual marker in the field, combined with the WPR's field verification stopping at the valve locks rather than checking every isolation device listed on the certificate, including the spade. A contributing factor was the lack of a formal handover between the isolating technician and the WPR when the isolation was left partially complete.

Corrective actions implemented afterward included: a mandatory visual 'isolation incomplete' tag to be displayed at the job site whenever any listed isolation device remains outstanding; a revised WPR field-verification checklist requiring every device on the certificate to be individually checked off, not just the primary block valves; and a formal handover requirement whenever an isolation task is interrupted before all listed devices are installed and verified.

Lessons Learned

- An Isolation Certificate listing multiple devices is only complete when every listed device is verified — partial completion of the 'easy' items (valves) does not substitute for the harder ones (blinds/spades).
- Field verification means physically confirming each device individually, not treating the certificate as confirmed once the most visible devices appear correct.
- An interrupted isolation task must be clearly and visibly marked as incomplete, not just noted in a register that the incoming WPR may not review in detail.
- Handover — of isolation status specifically, not just general job status — is a required step whenever responsibility changes hands mid-task.

Chapter Practice Questions

The following 20 questions test the core concepts covered in this chapter. Attempt all questions before checking the answer key at the end of this section.

1. A vessel has been electrically isolated and drained, but a nitrogen purge line remains connected. What must the WPR confirm before work begins?

A) The nitrogen line is also isolated, blinded/disconnected, and verified at zero pressure
B) Electrical isolation alone is sufficient since the vessel is drained
C) The purge line can remain connected as long as the valve looks closed
D) No further action is needed once the vessel is empty

2. What is the defining feature of a positive isolation compared to a single closed valve?

A) It provides a physical, verifiable barrier such as a blind or double block and bleed
B) It relies only on the valve handle position
C) It requires no documentation
D) It is only used for electrical circuits

3. Before signing on to a permit that references an Isolation Certificate, the WPR must:

A) Physically verify the field isolation matches the certificate
B) Trust the paperwork without a field check
C) Wait until the job is finished to check isolation
D) Delegate verification entirely to the next shift

4. A group lockout hasp is used to:

A) Allow each individual worker to apply their own personal lock to a shared isolation point
B) Replace the need for individual locks
C) Allow one lock to represent the whole crew
D) Indicate the equipment is running

5. Zero energy state for an electrical circuit is confirmed by:

A) Testing with a calibrated voltage tester at the point of work
B) Checking the breaker position only
C) Assuming zero energy once switched off
D) Reviewing the single-line diagram only

6. In a double block and bleed arrangement, the bleed valve is opened to:

A) Confirm no pressure build-up between the two block valves
B) Increase downstream pressure
C) Serve as a permanent drain
D) Replace the need for the second block valve

7. If a WPR finds a valve open that the Isolation Certificate lists as closed and locked, the correct action is:

A) Stop work immediately and report the discrepancy
B) Close it themselves and continue without reporting
C) Continue work since the certificate was already signed
D) Ignore it if it's a small valve

8. Who is generally authorized to remove another worker's personal lock in an emergency?

A) Only through a documented emergency lock-removal procedure with proper authorization
B) Any supervisor at any time
C) Any worker on the same shift
D) Security personnel without further checks

9. A 'try-out' test in LOTO verification means:

A) Attempting to start/operate the equipment after isolation to confirm it does not run
B) Testing a new lock design
C) Trying different isolation points at random
D) A step required only for electrical panels

10. What must happen during shift handover on an ongoing group lockout job?

A) A documented handover of isolation and lock status to the incoming WPR

B) Nothing, since locks remain physically in place
C) All locks removed and reapplied fresh
D) A verbal mention with no documentation

11. Which of the following is an example of stored/residual energy that could remain after a pump is shut down?

A) Pressurized fluid trapped in the discharge line
B) The pump nameplate rating
C) The pump's maintenance history
D) The color of the isolation tag

12. Why is a blind flange preferred over a single closed valve for high-hazard line breaking?

A) It provides a physical block that cannot leak through like a valve seat can
B) It is quicker to install than closing a valve
C) It requires no documentation
D) It eliminates the need for a Permit to Work

13. A spectacle blind allows workers to:

A) Visually confirm isolation status without removing the blind
B) Avoid using bolts
C) Bypass the isolation certificate requirement
D) Skip zero energy verification

14. If hazardous energy is unexpectedly detected at a point believed to be isolated, the WPR must:

A) Stop work immediately, withdraw the crew, and report the finding
B) Investigate personally before stopping work
C) Continue cautiously if no injury has occurred
D) Note it in the shift log at day's end

15. The Isolating Authority's role differs from the WPR's role in that the Isolating Authority:

A) Plans, executes, and certifies the physical isolation
B) Manages only the work crew under the permit
C) Has no defined responsibilities
D) Issues the Permit to Work exclusively

16. A car-sealed valve is used to:

A) Secure a valve in a fixed position and detect unauthorized operation
B) Fully block flow like a blind flange
C) Replace electrical lockout
D) Serve only a cosmetic function

17. Before final de-isolation and restoring equipment to service, the WPR/Isolating Authority must confirm:

A) All personnel, tools, and temporary equipment are clear and the area is safe
B) Only that the permit's listed end time has passed
C) Only a verbal confirmation from one worker is needed
D) No confirmation is required if the shift has ended

18. Why must isolation certificates be equipment-specific rather than generic?

A) Isolation points, sequence, and verification steps vary by equipment configuration
B) One generic certificate works for all equipment
C) Equipment-specific certificates are only needed for electrical work
D) Sequence of isolation has no bearing on safety

19. A pressure gauge installed between two block valves in a double block and bleed setup serves to:

A) Continuously monitor for pressure build-up indicating valve leak-through
B) Measure ambient temperature
C) Replace the need for the bleed valve
D) Serve a decorative purpose only

20. The overarching principle guiding isolation decisions in emergency or special-case situations is:

A) Worker safety and verified zero energy state take priority over schedule or convenience
B) Schedule adherence is the top priority

C) Documentation can be skipped when time is limited
D) Decisions should default to the fastest option

Answer Key — Chapter Practice Questions

Q#	Answer
1-20	1:A 2:A 3:A 4:A 5:A 6:A 7:A 8:A 9:A 10:A 11:A 12:A 13:A 14:A 15:A 16:A 17:A 18:A 19:A 20:A

200-Question Exam Bank

This exam bank is organized into eight categories of 25 questions each, covering every topic area in this chapter. Use it for timed practice, spaced repetition, or full mock exams. The complete answer key follows at the end of this section.

Category A — Hazardous Energy Recognition & Classification

1. Which of the following is classified as stored mechanical energy?
A) A compressed spring under load
B) A running motor
C) An open drain valve
D) A de-energized cable

2. Hydraulic energy hazards are primarily associated with:
A) Pressurized fluid in lines and accumulators
B) Static electricity build-up
C) Radiant heat from furnaces
D) Gravitational fall of a suspended load

3. Which energy type is present in an elevated platform or suspended load?
A) Gravitational (potential) energy
B) Chemical energy
C) Pneumatic energy
D) Electrical energy

4. Thermal energy hazards during isolation work most commonly arise from:
A) Hot process lines, steam, or recently operating equipment
B) Compressed air receivers
C) Grounded electrical panels
D) Empty pressure vessels

5. A pressurized nitrogen purge line left connected to equipment being opened represents which energy hazard?
A) Pneumatic (stored gas) energy
B) Kinetic energy
C) Chemical reactive energy
D) Radiant energy

6. Which of the following best describes chemical energy hazards in isolation work?
A) Residual hazardous or reactive substances trapped in lines or vessels
B) Voltage present in a control panel
C) A flywheel still coasting to a stop
D) Sunlight heating an exposed tank

7. Rotating equipment that has been shut down but not locked out still presents which hazard?
A) Kinetic/mechanical energy from potential unexpected restart
B) Gravitational energy only
C) No hazard once shut down
D) Thermal energy only

8. Which statement about electrical energy hazards is correct?
A) Capacitors can retain a dangerous charge after the circuit is de-energized
B) Electrical energy cannot be isolated using lockout devices
C) Electrical hazards only exist above 1000V
D) De-energizing a breaker always removes all electrical hazard instantly

9. A vessel that has been drained but still contains pressurized inert gas blanketing has:
A) Residual pneumatic energy
B) Zero energy state
C) Only thermal energy
D) Only chemical energy

10. Which of these is an example of multiple, simultaneous energy sources on a single piece of equipment?
A) A motor-driven pump with electrical supply, stored hydraulic pressure, and a hot process fluid
B) A single manual valve with no power supply
C) An empty, cold, depressurized pipe spool
D) A hand tool disconnected from any supply

11. Springs, counterweights, and suspended loads are hazard sources because they contain:
A) Potential energy that can convert suddenly to kinetic energy
B) No hazard unless electrically powered
C) Only thermal risk
D) Only chemical risk

12. Radiant energy hazards are typically associated with:
A) Furnaces, exposed hot surfaces, or high-intensity lighting/welding arcs
B) Compressed gas cylinders
C) Underground cable trenches
D) Drained pressure vessels

13. Why must all forms of hazardous energy be identified before starting isolation, not just the primary one?
A) Secondary or residual energy sources can independently cause injury even after the main source is isolated
B) Only the primary energy source needs isolation per GI-2.100
C) Secondary energy sources are automatically isolated with the primary
D) Identification of secondary sources is optional for routine work

14. A pump that has been electrically isolated but is still connected to a pressurized discharge line has:
A) Residual pneumatic/hydraulic energy despite electrical isolation
B) No remaining hazard
C) Only gravitational hazard
D) Only thermal hazard

15. Which of the following is NOT typically considered a form of hazardous energy?
A) Ambient ventilation air movement at normal building airflow rates
B) Electrical energy
C) Pneumatic energy
D) Chemical energy

16. A tank that has just been emptied of a flammable liquid may still contain:
A) Flammable vapors representing a chemical/fire energy hazard
B) No hazard once liquid is removed
C) Only mechanical hazard
D) Only gravitational hazard

17. Why is it important to review P&IDs before identifying energy isolation points?
A) To trace all connected energy sources, cross-connections, and potential back-feed paths
B) P&IDs are only used for civil works
C) P&IDs replace the need for a walk-down
D) P&IDs are not relevant to isolation planning

18. Static electricity accumulation is most relevant during work involving:
A) Flammable liquid transfer or non-conductive material handling
B) Steam line blowdown only
C) Compressed air receivers only
D) Cold insulated piping only

19. A relief valve tied into a common flare header can introduce which hazard during isolation?

A) Back-flow of pressure or hazardous fluid from the shared header
B) No hazard since relief valves are passive
C) Only electrical hazard
D) Only mechanical hazard

20. Which best explains why a WPR must consider cross-connected systems?
A) Energy can migrate between interconnected systems even after the primary isolation point is closed
B) Cross-connections are irrelevant once the main isolation valve is shut
C) Cross-connected systems are always physically separate
D) Only the equipment tag number matters, not surrounding connections

21. A flywheel that continues rotating after the motor is stopped represents:
A) Residual kinetic energy that must dissipate before work begins
B) Zero energy immediately after shutdown
C) Only thermal energy
D) Only chemical energy

22. Which is an example of a hidden or non-obvious energy source?
A) A backup or standby power supply automatically feeding the circuit
B) A visibly open isolation valve with a lock applied
C) A depressurized and vented line with blind installed
D) A grounded and tested de-energized cable

23. Why must ambient temperature and weather be considered an energy factor in some isolation scenarios?
A) Thermal expansion/contraction can affect pressure in isolated systems over time
B) Weather has no bearing on isolated systems
C) Only electrical systems are weather-sensitive
D) Ambient temperature only matters for civil works

24. Which of the following is the best first step in hazardous energy recognition?
A) Reviewing equipment drawings, isolation history, and conducting a physical walk-down
B) Immediately applying a lock without review
C) Assuming energy sources based on similar past jobs only
D) Skipping recognition if the job appears routine

25. A vessel connected to a common utility header (steam, air, nitrogen) requires isolation consideration because:
A) The header may re-pressurize the vessel through the shared connection
B) Utility headers are always isolated by default
C) Utility connections are not considered energy sources
D) Only the vessel's own nozzles need isolation

Category B — Lockout/Tagout (LOTO) Procedure Fundamentals

26. The primary purpose of a Lockout/Tagout program is to:
A) Prevent unexpected energization or release of hazardous energy during work
B) Track equipment maintenance history
C) Replace the Permit to Work system entirely
D) Simplify equipment numbering

27. Under a typical LOTO procedure, who applies the personal lock at the isolation point?
A) Each authorized worker exposed to the hazard applies their own personal lock
B) Only the area supervisor applies a lock on behalf of all workers
C) Locks are only applied by the control room operator
D) Locks are optional if a permit is issued

28. A tag used in LOTO primarily serves to:
A) Identify who applied the lock and why, providing a warning against operation
B) Replace the need for a physical lock
C) Serve only as decoration on the isolation point
D) Indicate equipment is available for use

29. Which sequence best reflects a standard LOTO process?
A) Notify affected personnel, shut down, isolate, apply lock/tag, verify zero energy, perform work
B) Apply lock, notify personnel, then shut down equipment

C) Perform work first, then isolate afterward
D) Verify zero energy before shutting down

30. Group lockout is used when:
A) Multiple crafts or individuals are working on the same isolated equipment
B) Only one worker is present at the isolation point
C) The job requires no isolation at all
D) Only supervisors are permitted on site

31. A lockout device must be:
A) Substantial enough to prevent removal without excessive force or special tools
B) Optional if a tag is used instead
C) Removable by any worker on shift
D) Made of any lightweight, easily broken material

32. Before removing a lock and tag at job completion, the WPR should verify:
A) All personnel are clear, tools removed, and equipment is safe to be restored to service
B) Only that the shift has ended
C) That the permit paperwork alone has been filed
D) That no verbal confirmation is required

33. Who is generally authorized to remove another worker's personal lock?
A) Only through a documented lock-removal procedure when the worker is unavailable, following strict verification steps
B) Any supervisor at any time without documentation
C) Any worker on the same shift
D) The security department only

34. A single-point-of-isolation lockout is appropriate when:
A) There is one clearly identified and verified isolation point controlling all hazardous energy
B) Multiple energy sources feed the equipment
C) The equipment has no isolation valve
D) Isolation cannot be physically verified

35. What is the purpose of a lockout hasp?
A) To allow multiple individual locks to be applied to a single isolation point
B) To replace the need for individual locks
C) To indicate equipment is running
D) To serve as a warning tag only

36. Why must LOTO devices be standardized and used only for isolation purposes?
A) To avoid confusion between isolation locks and general-purpose locks, and prevent misuse
B) Standardization is not required by GI-2.100
C) Any lock type is acceptable regardless of function
D) Tags alone are sufficient without standardized locks

37. A LOTO procedure should be equipment-specific because:
A) Isolation points, sequence, and verification steps vary by equipment configuration
B) One generic procedure fits every piece of equipment
C) Equipment-specific procedures are only needed for electrical equipment
D) Sequence of isolation does not affect safety

38. If an isolation point cannot be physically locked, the acceptable alternative is:
A) Use a tag-only system supplemented with additional verification and supervision as per procedure
B) Skip isolation and rely on verbal agreement only
C) Proceed with work without isolation
D) Use masking tape as a substitute for a lock

39. During shift change, an in-progress LOTO job requires:
A) A documented shift handover of lock/tag status and job progress to the incoming WPR
B) No handover since locks remain in place automatically
C) Removal of all locks before handover
D) Only a verbal mention with no documentation

40. A key control system for LOTO locks should ensure:
A) Each personal lock has a single key retained only by the worker who applied it
B) All keys are kept in a common unsecured box
C) Keys are duplicated freely for convenience
D) Key control is not necessary once a tag is applied

41. What is a 'try-out' step in LOTO verification?
A) Attempting to start/operate the equipment after isolation to confirm zero energy state
B) Testing a new lock design before purchase
C) Trying different isolation points until one works
D) A step only required for electrical panels

42. Which is a valid reason to conduct a periodic LOTO procedure audit?
A) To confirm isolation points remain accurate and procedures are being followed correctly
B) Audits are not required once initial approval is granted
C) Audits replace the need for daily verification
D) Audits are only for new employees

43. What should happen if a WPR discovers an isolation point locked by someone not listed on the permit?
A) Investigate the discrepancy and resolve it with the area authority before proceeding
B) Remove the unknown lock immediately without investigation
C) Ignore it and continue work
D) Apply another lock without following up

44. Lockout procedures should be reviewed and updated when:
A) Equipment, piping configuration, or process conditions change
B) Only once per year regardless of changes
C) Never, once initially approved
D) Only when requested by contractors

45. The number of locks on a multi-point isolation should match:
A) The number of verified isolation points required to achieve zero energy state
B) A fixed number regardless of the equipment
C) The number of workers present, not the isolation points
D) One lock regardless of how many points exist

46. Why is verbal-only isolation insufficient under formal LOTO requirements?
A) It provides no physical barrier and relies on memory, increasing risk of accidental energization
B) Verbal isolation is equally effective as physical lockout
C) GI-2.100 prefers verbal isolation over physical devices
D) Verbal isolation is required in addition to physical locks, not a substitute

47. A 'danger' tag attached without an accompanying lock is:
A) Generally insufficient alone unless the specific procedure explicitly permits tag-only isolation with added controls
B) Always equivalent to a full lockout
C) Never required alongside a lock
D) Only used for cosmetic purposes

48. When isolating an item of rotating equipment, mechanical stops or blocking devices are used to:
A) Prevent unintended movement even if stored kinetic energy remains
B) Replace the electrical lockout entirely
C) Serve no functional safety purpose
D) Only apply to civil works equipment

49. What should a WPR do if the assigned isolation point is inaccessible or unclear on site?
A) Stop work and clarify with the area authority/isolation authority before proceeding
B) Guess the most likely isolation point and proceed
C) Isolate a nearby similar valve instead
D) Proceed with work without isolation

50. A lockout log or register is maintained primarily to:
A) Track active isolations, responsible persons, and status for accountability and audit purposes
B) Serve as decoration in the control room
C) Replace individual worker locks
D) Track only completed and closed permits, not active ones

Category C — Isolation Certificate & Permit-to-Work Integration

51. An Isolation Certificate is best described as:
A) A formal record confirming the specific isolation points, methods, and verification for a defined scope of work
B) An optional attachment with no bearing on the Permit to Work
C) A document only used for electrical equipment
D) A replacement for the Permit to Work

52. Under GI-2.100 style systems, the Isolation Certificate typically links to the Permit to Work through:
A) A cross-reference number ensuring the permit cannot be issued until isolation is certified complete
B) No formal linkage; they are independent documents
C) The Isolation Certificate is issued only after the permit closes
D) Isolation Certificates are only required for confined space entry

53. Who typically certifies that isolation has been completed and verified before a permit is issued?
A) The designated Isolating Authority or Isolation Officer per site procedure
B) Any available worker on site
C) The WPR alone without verification
D) The security gate officer

54. If work scope changes mid-permit requiring additional isolation, the WPR should:
A) Stop work, notify the Issuing/Isolating Authority, and obtain an amended Isolation Certificate
B) Continue work assuming original isolation still applies
C) Apply an additional personal lock without notifying anyone
D) Wait until the next shift to report the change

55. The Isolation Certificate should list which of the following?
A) All isolation points, the isolation method used at each, and verification confirmation
B) Only the equipment name, without isolation point details
C) Only the requester's name and date
D) Only the estimated work duration

56. Before signing on to a Permit to Work, a WPR must confirm:
A) The referenced Isolation Certificate matches the actual field isolation and is still valid
B) The permit number only, without checking isolation status
C) That a certificate exists somewhere in the file, regardless of content
D) That isolation will be completed after work starts

57. What happens to the Isolation Certificate validity if the associated Permit to Work is suspended?
A) The isolation typically remains in place and locked, but must be reverified before work resumes
B) The isolation is automatically removed
C) The certificate becomes permanently invalid and must be recreated from scratch every time
D) Suspension has no effect on isolation status

58. A 'live' isolation register at the permit office is used to:
A) Track all currently active isolation certificates across the site for control and cross-checking
B) List only closed and historical certificates
C) Replace the need for on-site lock verification
D) Track only electrical isolations

59. When multiple permits reference the same isolation certificate, the WPR should ensure:
A) All permits are accounted for and coordinated before any isolation is removed
B) Isolation can be removed once any single permit closes
C) Only the first-issued permit matters for isolation removal
D) Coordination between permits is not required

60. Who is generally responsible for de-isolation and restoring equipment to service after work completion?
A) The Isolating Authority, following confirmation that all permits are closed and area is clear
B) Any worker present at end of shift
C) The WPR alone without authorization
D) De-isolation happens automatically after permit expiry

61. What should be checked if the Isolation Certificate reference number on a permit does not match field tags?
A) Work must not proceed until the discrepancy is resolved with the Isolating Authority

B) Assume the field tag is correct and proceed
C) Assume the paperwork is correct and proceed
D) Ignore minor mismatches as administrative errors

62. A confined space entry permit referencing hazardous energy equipment requires:
A) Verification that the associated Isolation Certificate covers all applicable energy sources into the space
B) No isolation certificate, since confined space permits are separate
C) Only a gas test, without isolation verification
D) Isolation only if electrical equipment is present

63. Isolation Certificates typically expire or require renewal:
A) Based on site-defined validity periods or upon significant change in conditions
B) Never, once issued they remain valid indefinitely
C) Only if the WPR requests renewal
D) Every time a new shift begins regardless of conditions

64. What is the WPR's responsibility regarding the physical inspection of isolation points listed on the certificate?
A) Physically verify each listed point in the field before starting work, not rely on paperwork alone
B) Trust the paperwork exclusively without a field check
C) Delegate verification entirely to another crew
D) Verification is only required for high-risk permits

65. If an Isolation Certificate lists a valve as closed and locked, but the WPR finds it open in the field, the correct action is:
A) Stop work immediately and report the discrepancy to the Issuing Authority
B) Close the valve themselves and proceed without reporting
C) Continue work assuming it will be fixed later
D) Note it informally and continue

66. A 'limit of isolation' boundary on a certificate defines:
A) The physical extent within which isolation has been verified as safe for work
B) The maximum number of workers allowed on the permit
C) The time limit for completing the isolation
D) The financial cost limit of the isolation work

67. Which document typically takes precedence if there is a conflict between the Permit to Work conditions and the Isolation Certificate?
A) Neither overrides the other; the discrepancy must be resolved with the Issuing/Isolating Authority before work proceeds
B) The Permit to Work always overrides the Isolation Certificate automatically
C) The Isolation Certificate always overrides the permit automatically
D) The most recently signed document automatically governs

68. For high-risk isolations (e.g., high pressure, high voltage), an additional independent check is often required by:
A) A second qualified person verifying isolation before the certificate is finalized
B) No additional check is required regardless of risk level
C) Only the original isolator's self-verification
D) The WPR alone, without a second check

69. Why must isolation certificates be retained after job completion?
A) For audit trail, incident investigation, and regulatory compliance purposes
B) They are discarded immediately upon permit closure
C) Retention is optional and site-dependent with no standard
D) Only electrical isolation certificates require retention

70. A 'master' or 'blanket' isolation certificate covering a system over multiple shifts requires:
A) Ongoing verification and controlled handover between shifts with a live status log
B) No further verification once initially issued
C) Reissuance of a new certificate every single day regardless of status
D) Only a single sign-off with no ongoing controls

71. If isolation cannot be fully achieved due to process constraints, the appropriate action is:
A) Escalate to engineering/operations for alternative controls or defer the work until isolation is possible
B) Proceed with partial isolation without documenting the limitation
C) Assume the risk is acceptable without formal review
D) Cancel the isolation certificate requirement altogether

72. The Isolating Authority's sign-off on a certificate confirms:
A) That isolation has been physically completed, tested, and verified per procedure
B) Only that paperwork has been filled out
C) That work has already started safely
D) That the permit is automatically extended

73. Who should be notified immediately if an isolation point fails or energy is detected unexpectedly during work?
A) The WPR, area supervisor, and Isolating Authority, with work stopped immediately
B) No one, if the leak/energy appears minor
C) Only the shift log, to be reviewed later
D) Only the contractor's head office

74. An Isolation Certificate register helps prevent which common incident cause?
A) Premature or unauthorized removal of isolation while work is still ongoing
B) Excessive documentation time
C) Overuse of Permit to Work forms
D) Delays in equipment procurement

75. Before final de-isolation, confirmation should include:
A) All tools, personnel, and temporary equipment removed and area declared safe
B) Only that the permit expiry date has passed
C) Only a verbal confirmation from one worker
D) No confirmation needed if the shift has ended

Category D — Positive Isolation Techniques

76. Positive isolation refers to:
A) A method of isolation that provides a physical, verifiable barrier against energy release (e.g., blind, disconnect)
B) Closing a valve only, without further verification
C) Any isolation method regardless of verification
D) A tag-only isolation with no physical barrier

77. A single closed valve is generally considered:
A) Not a positive isolation on its own, since valves can leak or be inadvertently opened
B) Always sufficient as positive isolation
C) Equivalent to a double block and bleed
D) Unnecessary if a permit is issued

78. Double block and bleed involves:
A) Two closed valves in series with a vent/bleed valve open between them to atmosphere
B) A single valve closed twice for redundancy
C) Two open valves with no bleed point
D) One valve and one blind flange only

79. The purpose of the bleed valve in a double block and bleed configuration is to:
A) Confirm no pressure build-up between the two block valves, indicating no leak-through
B) Increase system pressure for testing
C) Serve as a backup drain for waste disposal
D) Replace the need for the second block valve

80. A blind flange (blind/spade) provides isolation by:
A) Physically and permanently blocking flow through the pipeline cross-section at that point
B) Reducing flow rate without full blockage
C) Only indicating isolation without physically blocking flow
D) Allowing controlled leakage through a small orifice

81. Spectacle blinds are useful because they:
A) Allow quick visual confirmation of isolation status (open/closed position) without removing the blind
B) Cannot be used for hydrocarbon service
C) Eliminate the need for bolts
D) Are only used for electrical isolation

82. Why is a single block valve considered insufficient for high-hazard positive isolation?
A) Valves can fail internally, be leak-prone, or be inadvertently operated, providing no fail-safe barrier
B) Single valves are more reliable than blinds

C) Regulatory standards do not address valve reliability
D) Single valves cannot physically close a line

83. When installing a blind flange, the WPR/isolator should verify:
A) The correct rating, material, and gasket are used, and the blind is properly logged
B) Any available flat plate can be used regardless of rating
C) Gaskets are optional if bolts are tight
D) Logging blind installation is unnecessary

84. A blind list or blind register is used to:
A) Track the location, installation, and removal status of every blind on a job
B) Track only permanently installed blinds
C) Replace the Isolation Certificate entirely
D) Track valve maintenance history only

85. What should be verified before removing a blind flange at job completion?
A) The line is confirmed depressurized, drained, and safe, with proper authorization to remove
B) Only that the permit has expired
C) That the WPR personally installed it
D) No verification is required if it was logged

86. Chain and padlock isolation on a valve is used when:
A) The valve cannot be blinded and mechanical restraint plus lock provides an acceptable secondary control
B) It always replaces the need for a blind
C) It is the preferred method for all high-hazard isolations
D) It requires no accompanying tag

87. A car-seal (car-sealed) valve position is:
A) A valve secured in a fixed open or closed position with a seal to detect unauthorized operation
B) A valve with no seal or tracking
C) Only used on relief valves
D) Equivalent to a full blind isolation

88. For electrical isolation, the positive isolation equivalent to a blind flange is generally:
A) Physical disconnection or removal of a fuse/link with the breaker locked open and tested dead
B) Simply switching the breaker to the off position without further verification
C) Placing a warning tag on the panel only
D) Reducing voltage rather than fully disconnecting

89. Why must double block and bleed be periodically monitored during long-duration work?
A) To detect any pressure build-up indicating valve leak-through over time
B) Monitoring is unnecessary once initially verified
C) Bleed valves close automatically if a leak occurs
D) Only the first verification check is required by procedure

90. A spade inserted between flanges differs from a spectacle blind in that:
A) A spade is a single removable plate, while a spectacle blind has both open and closed positions on one plate
B) A spade cannot be used for isolation
C) A spectacle blind cannot show isolation status
D) Spades are always thicker rated than spectacle blinds

91. Positive isolation is most critical for which type of work?
A) High-hazard work such as vessel entry, hot work near hydrocarbons, or line breaking on live systems
B) Routine housekeeping in a non-hazardous area
C) General office administrative tasks
D) Painting of exterior structures with no process connection

92. What is the risk of relying solely on a closed valve without additional verification for line-breaking work?
A) Undetected internal leakage could expose workers to hazardous energy release during the break
B) There is no risk if the valve appears closed
C) Closed valves eliminate all risk automatically
D) Verification is only needed for gas lines, not liquid lines

93. A 'line walk' or 'isolation walk-down' before line breaking is performed to:
A) Physically trace the isolation boundary and confirm all valves/blinds are correctly positioned
B) Save time by skipping physical verification
C) Replace the need for the Isolation Certificate
D) Only required for underground piping

94. Which factor determines whether a blind or a double block and bleed is selected for a given isolation?
A) Risk level, fluid hazard class, duration of work, and site-specific procedure requirements
B) Personal preference of the WPR with no defined criteria
C) Cost of materials only
D) Availability of bolts on site

95. Removal of a positive isolation device (blind/spade) should only occur after:
A) The Isolating Authority confirms work completion and authorizes de-isolation
B) Any worker decides the job looks finished
C) The end of the shift, regardless of work status
D) The permit paperwork is misplaced

96. A tell-tale hole in a blind or spacer ring serves to:
A) Provide early visual/physical warning of residual pressure before full removal of bolts
B) Decorate the blind for identification purposes only
C) Weaken the blind intentionally for easier removal
D) Serve no functional safety purpose

97. Why should isolation valves used for double block and bleed be visually inspected before use?
A) To confirm they are in good working condition and capable of providing a reliable seal
B) Visual inspection is not required if the valve is tagged
C) Only new valves require inspection
D) Inspection is the sole responsibility of the vendor, not site personnel

98. When positive isolation is not achievable due to system design, the WPR should:
A) Escalate for engineering review of alternative controls before proceeding with high-hazard work
B) Proceed with the closest available method without escalation
C) Use a warning tag as a full substitute for positive isolation
D) Assume risk is automatically acceptable

99. A pressure gauge installed between double block valves is used to:
A) Continuously monitor for pressure build-up that would indicate valve leak-through
B) Measure ambient temperature only
C) Replace the bleed valve function entirely
D) Serve only as a decorative instrument

100. Documentation of blind installation and removal dates/times is important because:
A) It provides traceability and prevents equipment from being returned to service with a blind still installed (or missing)
B) It has no bearing on safe start-up
C) Only removal needs to be logged, not installation
D) Documentation is optional for routine blinds

Category E — Zero Energy Verification & Testing

101. Zero energy state means:
A) All identified hazardous energy sources have been isolated and verified to be at a safe, non-hazardous level
B) The equipment appears switched off, without further checks
C) Energy has been reduced but not eliminated
D) The permit has been signed regardless of physical verification

102. For electrical equipment, verifying zero energy state typically requires:
A) Testing with a calibrated voltage tester at the point of work after isolation
B) Visual inspection of the breaker position only
C) Assuming zero energy once the breaker is switched off
D) Reviewing the single-line diagram only, without a field test

103. Try-and-test procedure for mechanical equipment involves:
A) Attempting to start the equipment locally and remotely to confirm it does not operate after isolation
B) Physically dismantling the equipment to check
C) Testing only once, regardless of equipment complexity
D) A written declaration without physical attempt

104. Why must a voltage tester itself be verified before and after testing a circuit?
A) To confirm the tester is functioning correctly and not giving a false 'no voltage' reading
B) Testers never fail and require no verification
C) Verification is only required annually, not per use

D) Only the 'before' test matters, not 'after'

105. For pressurized systems, zero energy verification includes:
A) Confirming pressure gauges read zero/atmospheric and bleed valves show no discharge
B) Assuming zero pressure once the pump is stopped
C) Checking only the upstream isolation valve position
D) Skipping verification if the system was recently drained

106. Residual pressure trapped between two closed valves should be:
A) Safely bled off and verified before work begins
B) Left in place since it poses no risk once valves are closed
C) Ignored unless the pressure exceeds a very high threshold
D) Released directly into the work area without controls

107. Verification of zero energy for suspended loads or spring-loaded mechanisms includes:
A) Physically securing/blocking the load and confirming it cannot move under stored energy
B) No verification needed if the crane operator has left the area
C) Assuming the brake alone is sufficient with no physical block
D) Relying solely on a warning sign nearby

108. Why should zero energy verification be performed at the actual point of work, not just at the isolation point?
A) Conditions can differ along the system, and localized hazards may remain even if the main isolation point is confirmed safe
B) The isolation point verification always applies uniformly to the entire system
C) Point-of-work verification is redundant and unnecessary
D) Only applicable for electrical systems

109. A gas test for zero energy/atmospheric verification prior to entry should measure:
A) Oxygen level, flammable gas concentration, and toxic gas presence as applicable
B) Only the ambient temperature
C) Only the noise level in the space
D) Nothing beyond a visual inspection

110. If a 'try-out' test unexpectedly shows the equipment can still operate, the correct action is:
A) Stop immediately, reassess the isolation, and correct before proceeding with any further steps
B) Continue work carefully since the test confirmed no actual movement occurred
C) Ignore the result if it happened only once
D) Report it only after work is completed

111. Verification of zero mechanical energy on rotating equipment may include:
A) Confirming shaft rotation has fully stopped and applying a mechanical brake or block
B) Assuming rotation has stopped once the motor is switched off
C) Skipping verification for small equipment
D) Verifying only the motor's electrical isolation, not the shaft itself

112. Why is documented verification (not just verbal confirmation) required for zero energy state?
A) It creates an auditable record and reduces reliance on memory or assumption
B) Documentation slows down work unnecessarily with no safety benefit
C) Verbal confirmation is equally valid under GI-2.100
D) Only high-voltage equipment requires documented verification

113. A thermal hazard verification before work on a recently shut-down hot line includes:
A) Confirming surface/line temperature has reduced to a safe working level
B) Assuming the line has cooled based on shutdown time alone
C) Skipping temperature checks if PPE is worn
D) Verifying temperature only at the very end of the line

114. Which best describes an appropriate sequence for verifying isolation of a pump before maintenance?
A) Confirm electrical lockout, verify zero voltage, confirm valves closed/blinded, bleed and verify zero pressure, then begin work
B) Begin work immediately once the pump stops running
C) Verify pressure only, skipping the electrical check
D) Rely on the operator's verbal confirmation alone

115. What role does a second, independent verifier play in high-risk zero energy checks?
A) Provides an additional layer of assurance and reduces the chance of a single point of human error
B) Independent verification is not part of standard practice
C) Only required if the first verifier is unavailable

D) Their role is purely administrative, not safety-related

116. If zero energy cannot be verified due to a faulty gauge or instrument, the WPR should:
A) Use an alternative verified method or repair/replace the instrument before proceeding
B) Estimate the reading and proceed with work
C) Proceed since the isolation valve is closed regardless
D) Disregard the instrument reading requirement altogether

117. Verification steps should be repeated if:
A) Work is interrupted for an extended period or isolation status may have changed
B) Never, once verified at the start of the job
C) Only if requested by the contractor
D) Only after a full week has passed

118. A 'dead' test on an electrical circuit must be performed:
A) Immediately before starting work, at the actual point of contact
B) Only once, at any time prior to the work day
C) Before isolation is applied, not after
D) Only by the electrical department, never by the WPR

119. Verification of zero energy for hydraulic systems should include checking:
A) Accumulator pressure has been released and confirmed at zero
B) Only that the hydraulic pump is switched off
C) The reservoir fluid level only
D) Hose condition only, without pressure verification

120. Why is it unsafe to assume 'cold' equals 'zero thermal energy' for insulated equipment?
A) Insulation can mask significant residual heat beneath the surface
B) Insulated equipment never retains heat
C) Surface temperature always matches internal temperature
D) Thermal verification is unnecessary for insulated lines

121. A pressure test point (bleed/vent) left open after verification serves to:
A) Provide continued confirmation that the isolated section remains at atmospheric pressure
B) Serve no further purpose once initial verification is complete
C) Replace the block valve function
D) Indicate the job is complete

122. What should be done if verification testing equipment (e.g., voltage tester, gas detector) is not calibrated?
A) Do not use it; obtain a calibrated instrument before verification
B) Use it anyway if no calibrated unit is available
C) Estimate readings without a functioning instrument
D) Skip verification and proceed based on isolation point status alone

123. Verification of zero energy should be conducted by:
A) A competent, authorized person following the defined procedure for that energy type
B) Any available person regardless of training
C) The requester of the work only
D) No specific competency is required

124. Which statement about 'assumed isolation' is correct?
A) Assumed isolation without physical verification is a leading cause of energy-release incidents
B) Assumed isolation is acceptable for low-risk work only, with no verification needed
C) Physical verification is only a recommendation, not a requirement
D) Assumed isolation is equivalent to verified isolation

125. The final step before declaring zero energy state achieved is:
A) Confirming and documenting all verification checks against the isolation certificate requirements
B) Applying the personal lock, without further checks
C) Notifying the control room verbally only
D) Assuming the state is achieved once isolation valves are shut

Category F — Group Lockout, Multi-Craft & Shift Handover Isolation

126. Group lockout procedures are required when:
A) Multiple individuals or crafts require protection from the same isolated hazardous energy source
B) Only one worker is assigned to the task
C) The job is expected to last less than one hour
D) Isolation involves a single, simple valve

127. A group lockout hasp or lock box allows:
A) Each individual worker to apply a personal lock, ensuring the isolation cannot be removed until all locks are cleared
B) Only the supervisor's lock to control the isolation for the entire group
C) Workers to share a single lock and key among the group
D) Removal of isolation once any one worker's lock is removed

128. In a multi-craft job (e.g., mechanical, electrical, instrumentation), the isolation must:
A) Address all hazards relevant to each craft, with each craft's WPR applying their own lock
B) Only address the primary craft's hazard, ignoring others
C) Be managed by a single craft representative for all others
D) Rely on a single lock for the entire multi-craft crew

129. Who is responsible for maintaining the group lockout log during a shared isolation?
A) A designated lockout coordinator or lead WPR, tracking all individuals under the group lock
B) No one; group lockout logs are optional
C) Each individual worker must maintain a separate, unrelated log
D) The security department exclusively

130. If a worker leaves a group lockout job before completion, the correct action is:
A) The worker removes only their own personal lock and updates the group log accordingly
B) All locks must be removed regardless of remaining workers
C) The worker's lock remains in place indefinitely without update
D) No action is required if the worker plans to return

131. During shift change on an ongoing group lockout job, the outgoing and incoming WPRs should:
A) Conduct a documented handover confirming isolation status, remaining locks, and job progress
B) Assume the incoming shift will figure out the status independently
C) Remove all locks and reapply new ones for the incoming shift regardless of necessity
D) Skip handover if the job is routine

132. A 'master lock' applied by the lockout coordinator in a group lockout system typically:
A) Secures the group lock box, and is only removed once confirmed all individual locks are cleared
B) Replaces the need for individual worker locks entirely
C) Is applied only after the job is complete
D) Has no functional role in group lockout

133. What is the risk of a single shared key being used by multiple workers in a group lockout?
A) It removes individual accountability and allows one worker to inadvertently expose others by removing isolation prematurely
B) There is no risk; shared keys are standard practice
C) Shared keys improve safety by simplifying the process
D) Shared keys are required by GI-2.100 for group work

134. When a new worker joins an in-progress group lockout job, they must:
A) Verify the isolation, sign onto the permit, and apply their own personal lock before starting work
B) Begin work immediately since the group lock is already in place
C) Rely on the existing group lock without adding their own
D) Notify only the site security office

135. A contractor group and a site operations group both requiring access to the same isolated equipment should:
A) Coordinate through a single group lockout system with a shared log and designated coordinator
B) Apply entirely separate, uncoordinated locks without communication
C) Assume the other group is unaware, and skip communication
D) Only the operations group needs to apply a lock

136. Group lockout coordination becomes especially critical during:

A) Turnarounds or major shutdowns involving multiple crews on shared equipment
B) Single-person routine inspection tasks
C) Office-based administrative reviews
D) Non-hazardous outdoor landscaping work

137. If the lockout coordinator is unavailable and a worker needs to sign off their lock, the WPR should:
A) Follow the site's documented delegation or emergency lock-removal procedure, not bypass controls informally
B) Remove the lock without documentation since the coordinator is absent
C) Wait indefinitely with no alternative process
D) Ask any nearby worker to authorize removal informally

138. A key box (lock box) used in group lockout should be located:
A) At a clearly identified, accessible point near the isolation area, secured under the group master lock
B) In an undisclosed location known only to the coordinator
C) In the site office, far from the isolation point
D) Anywhere convenient, without a defined location

139. Why should the group lockout log be updated in real time rather than at the end of the shift?
A) To ensure the log accurately reflects who is currently exposed to the isolated hazard at any given moment
B) Real-time updates are unnecessary; end-of-shift updates are sufficient
C) The log is only for record-keeping, not for active safety tracking
D) Only paper logs require real-time updates; digital logs do not

140. When a group lockout job is temporarily suspended (e.g., weather, material delay), the correct practice is:
A) Locks remain in place and the log is updated to reflect the suspension status
B) All locks are removed automatically during any suspension
C) The log is discarded until work resumes
D) Only the coordinator's lock remains; individual locks are removed

141. What distinguishes a 'personal danger tag' from a 'group lockout' in some site systems?
A) A personal danger tag protects an individual worker, while group lockout protects multiple workers/crafts under one coordinated system
B) They are functionally identical with no distinction
C) Personal danger tags are used only for electrical work
D) Group lockout is used only when no risk of energy release exists

142. Before final removal of a group lockout, the coordinator must confirm:
A) Every individual lock has been accounted for and removed by its owner (or via authorized procedure)
B) Only that the majority of locks have been removed
C) That the shift has ended, regardless of lock status
D) That the permit paperwork alone has been filed

143. Cross-shift group lockout jobs commonly fail safety when:
A) Handover communication is incomplete or undocumented, leading to confusion about active isolations
B) Handover procedures are followed exactly as documented
C) Both shifts independently verify isolation status thoroughly
D) Group lockout logs are reviewed by both shifts

144. A visiting inspector or auditor who needs brief access to a group-locked area should:
A) Be escorted and, if entering the hazard zone, apply their own lock or be added to the group log appropriately
B) Enter freely without any lock or log entry since they are not performing work
C) Remove an existing worker's lock temporarily for convenience
D) Bypass the isolation area entirely without any controls

145. Why is it important that group lockout systems clearly display the number of active locks or workers involved?
A) It allows anyone reviewing the isolation point to quickly assess how many people are currently protected/exposed
B) Display is purely for organizational neatness with no safety function
C) Only the coordinator needs this information; it need not be visible
D) The number of locks is irrelevant to safety assessment

146. A multi-day group lockout on a major piece of equipment should be reviewed:
A) Periodically (e.g., daily) to confirm isolation integrity and update the active worker list
B) Only once, at the start of the first day
C) Only if an incident occurs
D) Review is not required for multi-day jobs

147. What is the correct response if a worker's personal lock is found missing from a group lockout point without documentation?

A) Stop, investigate immediately, and do not proceed until the discrepancy is resolved and the worker's safety confirmed
B) Assume the worker forgot and continue work as normal
C) Replace it with a generic lock and continue
D) Report it only at the end of the shift

148. Isolation coordinators for large group lockout jobs are typically required to have:

A) Specific training and site authorization for isolation coordination duties
B) No formal training, since the role is purely administrative
C) Only general safety induction, same as all site workers
D) Certification is optional and site-dependent with no standard

149. When de-isolating equipment used in a completed group lockout job, restoration to service should not occur until:

A) All group members have signed off, tools/equipment removed, and the area confirmed clear and safe
B) The scheduled end time on the permit has passed, regardless of actual status
C) Only the coordinator declares it complete without checking with the group
D) One representative from each craft gives informal verbal approval

150. The main safety principle behind group lockout / multi-craft isolation is:

A) No single individual can remove isolation exposing others still working under its protection
B) Efficiency in reducing the number of locks applied at a site
C) Simplifying paperwork for the isolation coordinator
D) Reducing the number of people required to sign the permit

Category G — WPR Roles, Responsibilities & Authorization Levels

151. The Work Permit Receiver (WPR) is primarily responsible for:

A) Understanding, communicating, and ensuring compliance with the permit and isolation conditions for the work crew
B) Approving the original isolation certificate
C) Designing the isolation methodology for the job
D) Issuing permits to other workers on site

152. Before signing on to a permit involving isolation, the WPR must:

A) Physically verify the isolation matches the certificate and confirm the work area is safe
B) Sign based on the Issuing Authority's word alone, without a field check
C) Delegate the field check entirely to a junior crew member without follow-up
D) Assume isolation is correct if the permit number matches

153. If conditions on site change during the job (e.g., isolation appears compromised), the WPR must:

A) Stop work immediately, evacuate if necessary, and notify the Issuing Authority
B) Continue work cautiously without notifying anyone
C) Wait until the end of the shift to report
D) Handle it informally without involving the Issuing Authority

154. The Isolating Authority differs from the WPR in that the Isolating Authority:

A) Is responsible for planning, executing, and certifying the physical isolation, while the WPR manages the work crew under permit
B) Has no defined role separate from the WPR
C) Is only involved after the WPR completes the work
D) Is responsible solely for issuing the Permit to Work

155. A WPR who is not confident in interpreting an Isolation Certificate should:

A) Seek clarification from the Issuing/Isolating Authority before signing on or starting work
B) Sign on anyway and ask questions later
C) Proceed cautiously and figure it out during the job
D) Delegate the decision to the work crew without escalation

156. Who has the authority to suspend or cancel a permit if unsafe conditions are identified?

A) The Issuing Authority, Area Authority, or any competent person per site procedure, including the WPR
B) Only the site manager, with no other authorized person
C) Only government regulators, not site personnel
D) No one; permits run until their listed expiry regardless of conditions

157. The WPR's responsibility for briefing the work crew includes:
A) Communicating isolation status, hazards, PPE requirements, and emergency procedures before work begins
B) Providing only the work start and end time
C) Skipping the briefing if the crew has worked on similar jobs before
D) Delegating the briefing entirely to the crew foreman with no oversight

158. When a permit covers work extending beyond a single shift, the WPR must ensure:
A) A proper handover to the incoming WPR, including isolation and hazard status
B) The permit automatically extends without any review
C) No handover is needed if isolation locks remain physically in place
D) Isolation is removed and reapplied fresh each shift regardless of necessity

159. If the WPR identifies that isolation is inadequate for the scope of work, the correct action is:
A) Do not proceed; escalate to the Isolating/Issuing Authority for correction before work starts
B) Proceed cautiously while requesting additional PPE only
C) Adjust the isolation themselves without authorization
D) Assume the risk is acceptable if the job is short

160. What level of authorization is typically required to remove someone else's personal isolation lock?
A) A formal, documented emergency lock-removal procedure requiring specific management/safety authorization
B) Any worker with a spare key
C) General site supervisor verbal approval only, with no documentation
D) No authorization is required if the lock owner cannot be reached

161. The WPR must ensure that all workers under the permit:
A) Are competent, briefed, and using isolation devices/PPE correctly for the task
B) Are simply present on site, regardless of training
C) Have signed the permit, regardless of their understanding of the hazards
D) Are assigned by name only, without verifying competency

162. Why is it important that the WPR and Isolating Authority are typically different individuals for higher-risk work?
A) Separation of duties provides an independent check and reduces conflicts of interest or oversight gaps
B) Combining roles is always more efficient and equally safe
C) There is no safety rationale; it is purely administrative preference
D) Only cost considerations drive this separation

163. A WPR discovering that a required isolation device (lock/tag/blind) is missing at the start of shift should:
A) Stop work, investigate, and not proceed until isolation integrity is confirmed and restored
B) Assume it was removed accidentally and reapply without investigation
C) Continue work since the permit itself is still valid
D) Report it only if an incident occurs later

164. The Area Authority's role in the isolation and permit process typically includes:
A) Overseeing overall area safety, coordinating multiple permits, and resolving conflicts between simultaneous activities
B) Physically applying locks and tags on every job personally
C) Approving the isolation certificate exclusively, with no other responsibilities
D) Acting only as an observer with no formal authority

165. If a WPR is asked to sign a permit for work they were not physically present to verify isolation for, they should:
A) Decline to sign until they personally verify the isolation and conditions
B) Sign based on a colleague's assurance
C) Sign and verify isolation afterward
D) Delegate signing to another worker not involved in the job

166. Competency requirements for a WPR typically include:
A) Site-specific training on the Permit to Work system, isolation procedures, and hazard recognition
B) No formal training; experience alone is sufficient
C) Only a general safety induction with no isolation-specific training
D) Training is optional if the WPR has prior industry experience elsewhere

167. The chain of accountability in isolation and permitting exists to ensure:
A) Clear, traceable responsibility at each stage from isolation planning to work completion and de-isolation
B) Administrative complexity with no safety benefit
C) Only the final signatory bears responsibility
D) Accountability is shared equally with no distinct roles

168. A WPR who observes an unrelated worker interfering with isolation locks/tags should:

A) Intervene, report the incident, and notify the Issuing/Isolating Authority immediately
B) Ignore it if it does not affect their own permit
C) Reapply their own lock and say nothing
D) Wait to see if it becomes a problem before reporting

169. Ultimately, who bears responsibility for ensuring the work crew does not begin work until isolation is verified and the permit is valid?

A) The WPR, as the person directly accountable for the crew under the signed permit
B) The Issuing Authority alone, once the permit is signed
C) The crew members individually, without WPR oversight
D) No one specific; it is a shared, undefined responsibility

170. When authority levels are unclear (e.g., during an emergency or unusual situation), the WPR should default to:

A) The most conservative, safety-first action — stopping work and escalating to the highest available authority
B) Proceeding with work while the situation is clarified
C) Making an independent decision without escalation
D) Waiting passively for someone else to act

171. A WPR's signature on a permit legally and procedurally confirms:

A) That the WPR has read, understood, and accepts responsibility for ensuring the crew complies with all stated conditions
B) Only that the WPR was present on site that day
C) That the Issuing Authority is fully released from responsibility
D) That the permit is automatically valid for all future shifts

172. Refresher training for WPRs on isolation and permit procedures should occur:

A) At defined intervals or following procedure changes, incidents, or extended absence from permit duties
B) Only once, at initial certification, with no further requirement
C) Never, once the WPR has several years of experience
D) Only if requested voluntarily by the WPR

173. If a WPR is asked to supervise a crew larger than they can effectively monitor for isolation compliance, they should:

A) Raise the concern with the Issuing Authority and request additional supervision or a reduced crew size
B) Accept the assignment regardless, to avoid delaying the job
C) Delegate all monitoring informally to the crew foreman with no follow-up
D) Split attention evenly and hope for the best

174. The relationship between the Operations department and the WPR/Isolating Authority during isolation is best described as:

A) Collaborative, with Operations typically retaining control of the process isolation points and confirming release to maintenance
B) Entirely separate, with no coordination required
C) Operations has no role once a permit is issued
D) The WPR has full authority over Operations' isolation points

175. A WPR assigned to a unit they are unfamiliar with should, before accepting the role for a given job:

A) Complete a site/area-specific orientation and review relevant isolation points and hazards with the Area Authority
B) Proceed using general experience from other units without orientation
C) Rely solely on the written permit without a site walk
D) Decline all assignments outside their home unit permanently

Category H — Emergency Situations, Lock/Tag Removal & Special Cases

176. If a fire alarm sounds while a group lockout job is in progress, the WPR should:

A) Direct the crew to stop work, secure the area if safe to do so, and evacuate per site emergency procedure
B) Continue working since isolation locks are already in place
C) Remove all locks immediately regardless of the emergency type
D) Wait for the Isolating Authority before taking any action

177. Emergency lock removal (when a lock owner is unavailable and equipment must be restored urgently) requires:

A) A documented, authorized procedure involving verification the affected worker is not exposed, typically with management/safety sign-off

B) Any supervisor cutting the lock without documentation
C) Immediate removal by security without further checks
D) Waiting indefinitely with no defined process

178. If a worker cannot be located to confirm they are clear before their lock is removed in an emergency, the response should:
A) Escalate the search using all available means (radio, muster check, site-wide alert) before any lock removal is authorized
B) Assume they left the area and remove the lock
C) Proceed with restoration and search afterward
D) Delay indefinitely with no escalation

179. During an emergency evacuation, isolation locks applied for ongoing work should generally:
A) Remain in place unless removal is specifically required to control the emergency itself
B) Always be removed immediately regardless of the situation
C) Be replaced with tags only during evacuation
D) Be handed to the first responder to keep, with no log update

180. If hazardous energy is unexpectedly detected at a supposedly isolated point (e.g., unexpected pressure or voltage), the WPR must:
A) Immediately stop work, withdraw the crew, and report the finding before any further investigation
B) Investigate the source personally before stopping work
C) Continue cautiously if no one has been injured yet
D) Report it only in the shift log at the end of the day

181. A near-miss involving isolation failure (e.g., a valve found open that should have been isolated) should be:
A) Reported and investigated promptly to identify root cause and prevent recurrence
B) Only recorded if an injury actually occurred
C) Handled informally without documentation
D) Ignored if the job was completed without incident

182. Which is the correct approach when severe weather threatens an outdoor isolation point (e.g., risk of flooding a lock box)?
A) Assess risk to isolation integrity, relocate/protect devices if possible, and increase verification frequency
B) Assume weather has no effect on isolation devices
C) Remove all isolation temporarily until weather passes
D) No action is needed since isolation devices are weatherproof by design

183. If a contractor crew member is injured during isolated work, the WPR's immediate priority is:
A) Ensuring first aid/emergency response, then securing the scene and reporting per incident procedure
B) Continuing the work to complete the shift's schedule
C) Removing isolation immediately, regardless of relevance to the injury
D) Waiting for the incident investigation team before any first aid

184. Special case: isolation for a piece of equipment shared between two different operating units requires:
A) Coordination between both units' authorities to ensure isolation is respected and communicated on both sides
B) Only one unit's approval, since isolation is a single physical action
C) No special coordination beyond a standard single-unit permit
D) Isolation only by whichever unit initiated the request

185. A temporary bypass installed during isolated maintenance work must be:
A) Documented, approved, and removed/reviewed before final restoration to normal operation
B) Left permanently in place without review
C) Installed without documentation if the job is urgent
D) Approved verbally only, with no written record

186. If de-isolation is requested before the WPR has confirmed all crew members and tools are clear, the correct response is:
A) Refuse de-isolation until full confirmation is complete, regardless of schedule pressure
B) Allow de-isolation if the majority of the crew has left
C) Allow de-isolation and complete final checks afterward
D) Defer entirely to the Isolating Authority's judgment without providing crew status

187. A lock found broken or tampered with at an isolation point should result in:
A) Immediate work stoppage, investigation, and re-verification of isolation before continuing
B) Simple replacement of the lock without further investigation
C) Continuing work if the tag is still legible

D) No action unless a second incident occurs

188. When equipment must be temporarily re-energized for testing during an otherwise isolated job (e.g., partial run test), this requires:

A) A controlled, documented, and authorized temporary de-isolation procedure with the crew clear and aware
B) Simply removing the lock briefly without any documentation or crew notification
C) No special procedure since the job will be re-isolated afterward
D) Only verbal notice to the crew, given immediately before re-energizing

189. If two contractor companies dispute who has authority to remove a shared isolation point, the resolution should come from:

A) The site's designated Issuing/Isolating/Area Authority per the formal Permit to Work system
B) Whichever company arrived on site first
C) An informal agreement between the two contractor supervisors
D) The dispute should be left unresolved until the next scheduled meeting

190. Isolation for emergency repair work (unplanned, urgent) should still follow:

A) The same fundamental isolation and verification principles, adapted for urgency but not bypassed
B) No formal isolation process, given the urgency
C) A simplified process with no documentation
D) Isolation only if time permits after the repair is complete

191. What should the WPR do if instructed by a senior manager to bypass an isolation step to save time?

A) Respectfully decline and follow proper isolation procedure, escalating the concern if pressured
B) Comply, since seniority overrides standard procedure
C) Bypass only the least critical-seeming step
D) Comply but document it informally afterward

192. A repeated pattern of near-misses related to isolation on a specific unit should trigger:

A) A focused review of isolation procedures, equipment, and training on that unit
B) No specific action unless an actual injury occurs
C) Blame assigned to the most recent WPR involved, with no systemic review
D) A temporary halt on all documentation requirements to speed up work

193. If isolation devices are found missing after a public holiday or extended shutdown, the correct first step is:

A) Treat the equipment as NOT isolated and conduct a full re-verification before any work or restoration
B) Assume isolation is still valid since the equipment has not been used
C) Restore power/service directly, verifying afterward
D) Search for the missing devices without reassessing the isolation status

194. Emergency stop of equipment does NOT replace formal LOTO because:

A) An emergency stop may not physically isolate all hazardous energy sources or prevent unexpected restart
B) Emergency stops are permanent once activated
C) Emergency stops require the same verification as LOTO by design
D) There is no functional difference between the two

195. The overarching principle guiding all emergency and special-case isolation decisions is:

A) Worker safety and verified zero energy state take priority over schedule, cost, or convenience
B) Schedule adherence is the top priority in emergencies
C) Documentation can be skipped whenever time is limited
D) Decisions should default to whichever option is fastest to execute

196. If a WPR suspects a colleague has signed an Isolation Certificate without actually performing the field verification, the correct action is:

A) Report the concern through the appropriate safety/management channel rather than proceeding on the assumption isolation is valid
B) Say nothing and proceed, since the certificate is signed
C) Confront the colleague informally and drop the matter
D) Assume it is a one-time exception and continue as normal

197. During a plant-wide emergency shutdown (ESD), previously isolated equipment under maintenance should be treated as:

A) Still isolated per its existing certificate, with status reconfirmed once the ESD event is resolved
B) Automatically de-isolated by the ESD event
C) No longer requiring any isolation controls
D) Irrelevant to the ESD response

198. A permit-holder who finishes work early and wants to leave the isolation in place for a follow-up task the next day must:

A) Coordinate with the Issuing Authority to formally extend or reissue the relevant permit and isolation status, not leave it informally
B) Simply leave the locks in place with no communication
C) Remove all isolation since the day's work is finished
D) Rely on the next crew to figure out the status independently

199. Post-incident, before any isolation-related equipment is returned to service, an investigation should confirm:

A) Root cause is understood and corrective actions are identified and, where urgent, implemented
B) The equipment looks physically undamaged, with no further review needed
C) Only that the paperwork has been completed
D) That enough time has passed since the incident

200. The single most effective control against isolation-related fatalities across the industry has consistently been shown to be:

A) Strict adherence to verified, physical isolation with independent verification before work begins
B) Increased use of warning signage alone
C) Faster permit issuance
D) Reducing the number of required signatures on a permit

Answer Key — 200-Question Exam Bank

Answers are listed in question-number order, ten per row, for quick self-marking.

Q#	Answers
1-10	1:A 2:A 3:A 4:A 5:A 6:A 7:A 8:A 9:A 10:A
11-20	11:A 12:A 13:A 14:A 15:A 16:A 17:A 18:A 19:A 20:A
21-30	21:A 22:A 23:A 24:A 25:A 26:A 27:A 28:A 29:A 30:A
31-40	31:A 32:A 33:A 34:A 35:A 36:A 37:A 38:A 39:A 40:A
41-50	41:A 42:A 43:A 44:A 45:A 46:A 47:A 48:A 49:A 50:A
51-60	51:A 52:A 53:A 54:A 55:A 56:A 57:A 58:A 59:A 60:A
61-70	61:A 62:A 63:A 64:A 65:A 66:A 67:A 68:A 69:A 70:A
71-80	71:A 72:A 73:A 74:A 75:A 76:A 77:A 78:A 79:A 80:A
81-90	81:A 82:A 83:A 84:A 85:A 86:A 87:A 88:A 89:A 90:A
91-100	91:A 92:A 93:A 94:A 95:A 96:A 97:A 98:A 99:A 100:A
101-110	101:A 102:A 103:A 104:A 105:A 106:A 107:A 108:A 109:A 110:A
111-120	111:A 112:A 113:A 114:A 115:A 116:A 117:A 118:A 119:A 120:A
121-130	121:A 122:A 123:A 124:A 125:A 126:A 127:A 128:A 129:A 130:A
131-140	131:A 132:A 133:A 134:A 135:A 136:A 137:A 138:A 139:A 140:A
141-150	141:A 142:A 143:A 144:A 145:A 146:A 147:A 148:A 149:A 150:A
151-160	151:A 152:A 153:A 154:A 155:A 156:A 157:A 158:A 159:A 160:A
161-170	161:A 162:A 163:A 164:A 165:A 166:A 167:A 168:A 169:A 170:A
171-180	171:A 172:A 173:A 174:A 175:A 176:A 177:A 178:A 179:A 180:A
181-190	181:A 182:A 183:A 184:A 185:A 186:A 187:A 188:A 189:A 190:A
191-200	191:A 192:A 193:A 194:A 195:A 196:A 197:A 198:A 199:A 200:A

Appendix — Abbreviations (Short Form to Full Form)

Short Form	Full Form
LOTO	Lockout / Tagout
WPR	Work Permit Receiver
PTW	Permit to Work
IC	Isolation Certificate
DBB	Double Block and Bleed
ESD	Emergency Shutdown (system/device)
ZES	Zero Energy State
JSA	Job Safety Analysis
MOC	Management of Change
P&ID	Piping and Instrumentation Diagram
PPE	Personal Protective Equipment
GI	General Instruction
SIMOPS	Simultaneous Operations
HV	High Voltage
LV	Low Voltage
EWP	Electrical Work Permit
CSE	Confined Space Entry
OIM	Offshore Installation Manager (or equivalent Area Authority role)
RCA	Root Cause Analysis
NDE	Non-Destructive Examination